SIERRA CLUB-_UCS DATA REQUEST
SIERRA CLUB-SCG-09
SOCALGAS 2019 GRC – A.17-10-008
SOCALGAS RESPONSE
DATE RECEIVED: JUNE 27, 2018
DATE RESPONDED: JUNE XX, 2018

1. Exh. SCG-223 at p. CLH-19 states: "As an Alternative Fuel Provider Fleet, 90% of SoCalGas' annual light duty vehicle purchases are required under the EPAct to be approved AFVs." Pages CLH-24-25 discuss the EV alternatives to passenger vehicles and the lack of EV options for compact rucks & vans but does not identify natural gas vehicle ("NGV") options in these vehicle categories.

    a. Is SoCalGas aware of any NGV passenger models currently available in the United States market for purchase by SoCalGas? If yes, please identify the vehicle models.
    b. Please identify the make and model(s) of hybrid vehicles currently in SoCalGas' Fleet and whether or not each model is a plug-in hybrid electric vehicle.
    c. If any of the above hybrid models are not plug-in hybrid vehicles, please state whether it is SoCalGas' position that these vehicles qualify as Alternative Fuel Vehicles under the EPAct and explain the basis for that position.
    d. Is SoCalGas aware of any NGV compact truck and van models currently available in the United States market for purchase by SoCalGas? If yes, please identify the vehicle models.

SoCalGas Response 1:

a. SoCalGas is not aware of any Original Equipment Manufacturer (OEM) CNG Passenger sedan vehicle offerings, however there are a variety of OEM CNG offerings for trucks, vans, SUV's, Medium-duty, and Heady-duty trucks. Please visit the U.S. Department of Energy, Alternative Fuels Data Center website below for a listing of CNG vehicles:
https://www.afdc.energy.gov/vehicles/search/results/?view_mode=grid&search_field=vehicle&search_dir=desc&per_page=59&current=true&display_length=25&fuel_id=3,-1&all_categories=y&manufacturer_id=365,377,211,410,235,231,215,223,225,409,379,219,213,209,351,359,385,275,424,361,387,243,227,239,425,263,217,391,349,381,237,221,347,395,67,394,117,201,139,0,426,415,113,205,408,71,5,51,9,13,11,57,81,416,195,141,197,417,121,53,397,418,85,414,21,17,143,23,398,27,399,31,207,396,107,35,193,125,419,115,147,405,199,-1

b. The 85 Hybrid Automobiles described in Sierra Club-001 data response 2a are comprised of Toyota Prius Hybrid and Chevrolet Malibu Hybrid. Neither of these vehicle models are plug-in vehicles.

c. These Hybrid vehicles qualify for ½ AFV credit. Please see the EPAct website below for more information regarding Hybrid AFV's.
https://epact.energy.gov/faqs/?question=how-can-i-tell-if-a-particular-light-duty-hybrid-vehicle-is-an-afv-or-otherwise-eligible-for-credit-under-epact

SoCalGas Response 1:-Continued

d. SoCalGas has already answered this data request in SCG-223, page CLH-25, lines 1 – 2, "SoCalGas confirms that it is also unaware of any electric or hybrid vehicle options for [the compact trucks & van] vehicle category.

SIERRA CLUB-_UCS DATA REQUEST
SIERRA CLUB-SCG-09
SOCALGAS 2019 GRC – A.17-10-008
SOCALGAS RESPONSE
DATE RECEIVED: JUNE 27, 2018
DATE RESPONDED: JUNE XX, 2018

2. In response to Data Request Sierra Club-UCS-04, Q.2, SoCalGas stated it "does not track total vehicle miles traveled or average daily mileage for each class of vehicle." Exh. SCG-223 at p. CLH-56 now states:"SoCalGas vehicles average approximately 10,000 miles per year."

   a. Please provide the workpapers or all underlying data supporting the statement that "SoCalGas vehicles average approximately 10,000 miles per year."

SoCalGas Response 2:

a. SoCalGas objects to this request on the grounds that the request for "all underlying data" is unduly burdensome. Subject to and without waiving this objection, SoCalGas responds as follows: SoCalGas provided a dataset in ORA-SCG-035-Q2A that shows the age and mileage of vehicles in the SoCalGas Fleet. SoCalGas filtered this data to only the Over The Road (OTR) vehicles (vehicle types 1 – 5), converted the age in months to age in years by dividing by 12, and divided the meter by the age in years, then filtering out any units less than 1 year old. This methodology provides a high-level estimate of miles per year since as noted in Sierra Club-UCS-04, Q2, SoCalGas is unable to provide detailed mileage data.

SIERRA CLUB-_UCS DATA REQUEST
SIERRA CLUB-SCG-09
SOCALGAS 2019 GRC – A.17-10-008
SOCALGAS RESPONSE
DATE RECEIVED: JUNE 27, 2018
DATE RESPONDED: JUNE XX, 2018

3. In response to Data Request Sierra Club-UCS-03, Q.15 (d), SoCalGas stated: "Light trucks and vans refers to ½ Ton vehicles such as Ford 150, Chevrolet 1500, Dodge 1500." In response to Data Request Sierra Club-UCS-04, Q.1, SoCalGas states that SoCalGas-defined classifications of vehicles are not DOT classifications and that under the SoCalGas Vehicle Type Classification, light truck & vans are 6,001 GVW to 10,000 GVW. Exh. SCG-223 at p. CLH-25 now states that "Vehicles in the SoCalGas 'light-duty trucks and vans' category are generally comprised of DOT Class 2, and Class 3 vehicles with a Gross Vehicle Weight Rating (GVWR) range of 6,001 – 14,000 pounds."

   a. Please explain the discrepancy between SoCalGas' response to the above-referenced data requests and the description of light duty trucks and vans in Exh. SCG-223.

SoCalGas Response 3:

a. SoCalGas objects to this request on the grounds that it is argumentative, assumes facts not in evidence and mischaracterizes SoCalGas' response to data requests. Subject to and without waiving these objections, SoCalGas responds as follows: There is no discrepancy. As stated, rebuttal testimony of Carmen L. Herrera, Exhibit SCG-223, page CLH-25, "Vehicles in the SoCalGas "light-duty trucks and vans" category are generally comprised of DOT class 2, and Class 3 vehicles with a Gross Vehicle Weight Rating (GVWR) range of 6,001 – 14,000 pounds." That is to say, a vehicle with a GVWR of 10,001 pounds falls under the SoCalGas vehicle classification of "light duty truck and vans, which would translate generally into the DOT Class 3 classification. Please refer to SCG-223, page CLH-25 to CLH-26, Table CLH-20 for reference of SoCalGas vehicle type to DOT class categories translation.

SIERRA CLUB-_UCS DATA REQUEST
SIERRA CLUB-SCG-09
SOCALGAS 2019 GRC – A.17-10-008
SOCALGAS RESPONSE
DATE RECEIVED: JUNE 27, 2018
DATE RESPONDED: JUNE XX, 2018

4. Exh. SCG-223 at p. CLH-20 states: "SoCalGas is currently only able to charge on Level 1 (standard 110V outlets) as SoCalGas does not have any Level 2 or Level 3 (fast-charging) infrastructure for Fleet vehicles at any base."

   a. Please provide all analysis SoCalGas has conducted on the cost of installing Level 2 and Level 3 electric charging infrastructure for light, medium, and heavy-duty vehicles.

SoCalGas Response 4:

a. SoCalGas objects to this request on the grounds that electric charging infrastructure is outside the scope of Exhibit SCG-23's GRC request.

SIERRA CLUB-_UCS DATA REQUEST
SIERRA CLUB-SCG-09
SOCALGAS 2019 GRC – A.17-10-008
SOCALGAS RESPONSE
DATE RECEIVED: JUNE 27, 2018
DATE RESPONDED: JUNE XX, 2018

5. Exh. SCG-223 at p. CLH-24 states: "SoCalGas continues to evaluate this [passenger] vehicle category for electric and hybrid options that meet business requirements."

   a. Please provide all analysis supporting the claim that SoCalGas continue to evaluate electric and hybrid passenger vehicle options for passenger vehicles.

SoCalGas Response 5:

a. SoCalGas objects to this request on the grounds that the rebuttal testimony speaks for itself, and this request assumes facts not in evidence. Subject to and without waiving these objections, SoCalGas responds as follows: In addition to CLH-24 of Exhibit SCT-223, please refer to data response Sierra Club/UCS-SCG-001, Q2a; data response Q1b., above; and, CLH-26, lines 16 to CLH-27, line 2 of Exhibit SCG-223.

SIERRA CLUB-_UCS DATA REQUEST
SIERRA CLUB-SCG-09
SOCALGAS 2019 GRC – A.17-10-008
SOCALGAS RESPONSE
DATE RECEIVED: JUNE 27, 2018
DATE RESPONDED: JUNE XX, 2018

6. Exh. SCG-223 at p. CLH-29 states that only 13 percent of the SoCalGas Fleet has any electric or hybrid options available in the marketplace.

   a. Please identify the make and model of each vehicle in the SoCalGas Fleet for which SoCalGas asserts it does not have an electric or hybrid option available.

SoCalGas Response 6:

a. Please refer to the detailed list of vehicles in the SoCalGas Fleet in ORA-SCG-035-Q2a-Data, tab ORA_2A_Detail for a complete list of vehicles in the SoCalGas Fleet by make and model. Please also refer to rebuttal testimony, SCG-223, CLH-24 line 15 – page CLH-29, line 8 for a detailed description of types of vehicles that have an electric or hybrid option available; all other vehicles not mentioned in the cited sections of rebuttal do not have electric or hybrid vehicle options. Figure CLH-21 on page CLH-29 contains the correct percentage of total electric or hybrid options available in the marketplace, which is 16% with rounding. SoCalGas will make this revision at the earliest opportunity.

SIERRA CLUB-_UCS DATA REQUEST
SIERRA CLUB-SCG-09
SOCALGAS 2019 GRC – A.17-10-008
SOCALGAS RESPONSE
DATE RECEIVED: JUNE 27, 2018
DATE RESPONDED: JUNE XX, 2018

7. Exh. SCG-223 at p. CLH-24 states: "SoCalGas provides a full rebuttal to [Sierra Club's argument regarding relative costs of natural gas refueling v. electric vehicle charging] in Section, IV.F.3." Citing to page 66 of the CPUC's Proposed Transportation Electrification Standard Review Projects Decision, issued March 30, 2018 (A.17-01-020 *et al.*) ("Proposed Decision"), Section IV.F.3, footnote 152 of Exh. SCG-223 asserts that the cost-estimate for electric vehicle infrastructure "assumes 18,234 vehicles served by 10,491 charge points or 1.74 vehicles per EV charger."

   a. The full cite to the Proposed Decision referenced by SoCalGas states the "cost estimates assumed 18,234 vehicles at 930 sites with 10,491 charge points." In comparing costs, did SoCalGas evaluate the approximately 11 charge points available per site?

   b. Did SoCalGas consider the financial savings from potential eligibility for SCE's medium and heavy-duty charging infrastructure program?

SoCalGas Response 7:

SoCalGas objects to this request on the grounds that electric vehicle charging infrastructure is outside the scope of Exhibit SCG-023's GRC request. Subject to and without waiving this objection, SoCalGas responds as follows:

a. SoCalGas is not requesting funding for electric vehicle charging infrastructure in its GRC request as contained in Exhibit SCG-023. In its rebuttal, SoCalGas calculated 1.74 vehicles per EV charger by dividing 18,234 vehicles by 10,491 charge points as stated in footnote 152 on page CLH-61.

b. SoCalGas is not requesting funding for electric vehicle charging infrastructure in its GRC request as contained in Exhibit SCG-023. In its rebuttal, SoCalGas evaluated cost as discussed in response to Q7a, not potential cost savings.

SIERRA CLUB-_UCS DATA REQUEST
SIERRA CLUB-SCG-09
SOCALGAS 2019 GRC – A.17-10-008
SOCALGAS RESPONSE
DATE RECEIVED: JUNE 27, 2018
DATE RESPONDED: JUNE XX, 2018

8. In determining future fuel costs for NGVs, does SoCalGas account for fuel credits for CNG under the LCFS?

   a. If yes, has SoCalGas accounted for proposed changes to LCFS that would make CNG a deficit generating fuel by 2024? (See page 4, ARB Proposed Amendments to LCFS, https://www.arb.ca.gov/regact/2018/lcfs18/15daynotice.pdf)

SoCalGas Response 8:

a. SoCalGas objects to this request on the grounds that fuel costs for NGVs are outside the scope of Exhibit SCG-23's GRC request.

SIERRA CLUB-UCS DATA REQUEST
SIERRA CLUB-SCG-09
SOCALGAS 2019 GRC – A.17-10-008
SOCALGAS RESPONSE
DATE RECEIVED: JUNE 27, 2018
DATE RESPONDED: JULY 12, 2018

9. Exh. SCG-221 at p. ST-9 states: "SC-UCS made numerous erroneous claims regarding power-to-gas technology" but does not identify any specific assertion in Sierra Club/UCS' testimony that is erroneous.

    a. Please identify the specific concerns regarding power-to-gas technology in Sierra Club/UCS' testimony that SoCalGas believes are erroneous and explain the basis for this assertion.

SoCalGas Response 9:

Exhibit No.: Sierra Club-UCS-01 Page 2 states "…funding of projects such as power-to-gas, which can increase pollution and may not be aligned with state priorities…" The following are some examples of, but not an exhaustive listing, of environmental benefits and indications of alignment with state policy.

Power-to-gas technology reduces pollution in several ways. Power-to-gas:

- Can displace fossil based natural gas with hydrogen or methane generated from renewable electricity.
- Power-to-gas with methanation can be used to recycle CO_2 emitted by anaerobic digesters, landfill gas and other biogenic CO_2 resources.
- Can increase renewable energy production.
- Can reduce renewable energy curtailments.
- Offers long-term and seasonal renewable energy storage capacity.
- Can improve wind and solar generation economics.
- Supports hydrogen refueling infrastructure for light, medium and heavy-duty vehicles in transportation, off-road and marine applications.
- Reduces upstream fugitive methane and fossil CO_2 emissions by replacing natural gas extraction with hydrogen and renewable methane.

These environmental benefits are consistent with PU Code 740.1 and state policies. Power-to-gas is also being recommended as a clean energy solution in Europe See attachment Sierra Club-UCS-SCG-009 Q9 Power to Gas System Solution.pdf.

Exhibit No.: Sierra Club-UCS-01 Page 44, line 1 - 8 raises the issue of how one could "ensure the project would only utilize excess renewables and therefore not increase greenhouse emissions." Power-to-gas systems can be co-located at a wind or solar facility or, potentially a bilateral contract for the renewable electricity could control the power resources consumed.

SoCalGas Response 9 Continued:

Exhibit No.: Sierra Club-UCS-01 Page 44 states, line 9 – 18, "Even assuming a power-to-gas facility is optimized to use surplus renewable energy, the power-to-gas process would take zero emissions energy and convert it to a high global warming pollutant that poses leakage risks in pipeline infrastructure." Power-to-gas would not increase global warming by adding to methane emissions from pipelines. Power-to-gas would reduce fugitive methane and CO_2 emissions overall by displacing traditional natural gas production, treatment and gathering activities.[1]

Exhibit No.: Sierra Club-UCS-01 Page 44 line 19-25, implies that SoCalGas has pursued power-to-gas RD&D unilaterally and is subject to bias. SoCalGas has joined the U. S. Department of Energy (DOE) collaborative research and development agreement (CRADA) with the National Renewable Energy Laboratory (NREL) to develop a bio methanation project. To-date, the DOE has committed more that $2 million to developing power-to-gas and the results of the project will been presented at future DOE annual merit review meetings. As a result of this effort, NREL has filed a "Record of Invention" for the coupling of an electrolyzer and a biomethanation reactor.

[1] https://www.epa.gov/natural-gas-star-program/overview-oil-and-natural-gas-industry

78% of methane leakage in the supply chain occurs during production and processing.

SIERRA CLUB-UCS DATA REQUEST
SIERRA CLUB-SCG-09
SOCALGAS 2019 GRC – A.17-10-008
SOCALGAS RESPONSE
DATE RECEIVED: JUNE 27, 2018
DATE RESPONDED: JULY 12, 2018

10. Exh. SCG-221 at p. ST-16 states that the portrayal by Sierra Club/UCS of Policy & Environmental Solutions ("P&ES") as "not honest actors…is not accurate."

a. Sierra Club/UCS testimony at p. 12 quotes SoCalGas as asserting to the CEC that:

> [M]any have asserted that the best path to achieve [greenhouse gas reduction] goals is through widespread electrification [of all end-uses]. However, when appropriate analyses are conducted, it raises concerns around grid reliability and harmonization. This issue has been recognized through what is commonly known in California as "the duck curve."

Please provides all support for this statement, and include the referenced "appropriate analyses."

b. Sierra Club/UCS testimony at p. 13 states that:

> SoCalGas has also argued against electrification by making selective arguments about the cost. Although a study commissioned by SoCalGas concluded that Zero Net Energy ("ZNE") homes that continue to use natural gas have "higher annual utility costs" than all-electric homes, when SoCalGas referred to this study in comments to the CEC, it stated the opposite: that that the study found "modest homeowner annual cost savings" for natural gas.

Please explain the discrepancy between what SoCalGas asserted to the CEC and the above-referenced study results.

c. Sierra Club/UCS at p. 11 testimony states that:

> For example, one comment letter from SoCalGas to the CEC contains the bolded heading **"Electrification of Final End-Uses Impedes Implementation of Climate Goals."** SoCalGas separately argued, again at ratepayer expense, that electrification of final end-uses would "*decelerate* achievement of the state's climate goals."

i. Please explain how electrification of final end-uses would impede or decelerate achievement of the state's climate goals.

ii. If your response to (i) is that electrification would limit procurement opportunity for renewable natural gas, please provide supporting analysis on the potential availability of renewable natural gas in comparison with total fossil fuel use of end-uses.

SIERRA CLUB-UCS DATA REQUEST
SIERRA CLUB-SCG-09
SOCALGAS 2019 GRC – A.17-10-008
SOCALGAS RESPONSE
DATE RECEIVED: JUNE 27, 2018
DATE RESPONDED: JULY 12, 2018

SoCalGas Response 10:

a. SoCalGas' September 6, 2017 comment letter on CEC's Zero Net Energy Workshop, echoes the challenges of grid harmonization presented by the CEC at the workshop. See attachment Sierra Club-UCS-SCG-009 Q10a Attachment - September 6, 2017_SCG comment letter on CEC's Zero Net Energy Workshop.pdf. The full text of SoCalGas' comments provided three citations to articles discussing the challenges to the duck curve from increasing amounts of solar PV and the need to balance supply and demand.

> "Balanced Energy Approach
> With California's aggressive greenhouse gas reduction goals, many have asserted that the best path to achieve those goals is through widespread electrification. However, when appropriate analyses are conducted, it raises concerns around grid reliability and harmonization. This issue has been recognized through what is commonly known in California as "the duck curve," depicting net load over a 24-hour period. A comparison of forecasted versus actual net load shows that this issue develops faster and more pronounced than anticipated, and requires assertive mitigation. [6,7,8] The CEC reiterates in its latest ZNE strategy presentation that these concerns are exacerbated due to solar photovoltaic (PV) over-generation from buildings. SoCalGas urges the CEC to continue on the path of balanced energy, allowing builders and designers to utilize all available resources, from higher efficient energy systems to multiple fuel sources, both for conventional use and renewable generation systems. This approach fosters innovation, competition and flexibility, while still advancing California's energy policies. SoCalGas participates in multiple research and demonstration projects that showcase the feasibility and success of a balanced energy approach, and will continue to support the CEC in defining and executing similar projects in the future."
> [6] https://www.eia.gov/todayinenergy/detail.php?id=32172
> [7] http://www.scottmadden.com/wp-content/uploads/2016/10/Revisiting-the-Duck-Curve Article.pdf
> [8] http://www.nrel.gov/docs/fy16osti/65023.pdf

In the paragraph from the comment letter above, SoCalGas noted CEC also expressed concerns about solar PV, electrification and grid harmonization in their ZNE strategy presentation at their April 20, 2017 workshop. Specifically, on slide 5, CEC noted "**Electrification of homes**, which results in a larger PV array, must be coupled with **grid harmonization strategies** to avoid aggravating the duck curve issues and to realize the expected environmental benefits." (emphasis in original).

b. SoCalGas did not state there would be <u>lower annual utility costs</u> in the IEPR comment letter, dated November 13, 2017. See the attachment Sierra Club-UCS-SCG-009 Q10b CEC SoCalGas Draft 2017 IEPR Comments November 2017.pdf. The text and related footnote from the letter, shown below, note there would be comparable or lower costs and specifically referenced lower upfront costs and modest homeowner annual cost savings for ZNE homes using renewable natural gas (RNG) for natural gas appliances.

SoCalGas Response 10b Continued:

> Pipeline access allows renewable gas to be flexibly delivered to decarbonize natural gas end-uses in both the residential and commercial sectors. As California implements additional programs to decarbonize the residential energy market, **directing renewable gas to residential appliances can provide similar benefits at a comparable or lower cost than all-electric homes utilizing solar photovoltaic (PV) systems**.[21] Using renewable gas in the home removes the need to electrify end uses, which would be costly to ratepayers and create feasibility challenges. As 90% of homes in Southern California use natural gas, decarbonizing existing pipeline infrastructure with renewable gas is a more feasible GHG-reduction strategy than electrification and promotes customer choice, energy diversity, and resilience. (p. 5, emphasis added)
>
> [21] Renewable gas in a mixed-fuel home would provide lower upfront costs (5-10%), smaller solar PV sizes (-.4-0.7 kW) and modest homeowner annual cost savings. Navigant Consulting, Inc. 2017. "Strategy and Impact Evaluation of Zero-Net-Energy Regulations on Gas-Fired Appliances." Report prepared for Southern California Gas Company. March 7, 2017.

The preliminary analysis on the direct use of renewable natural gas is discussed on pages 33-35 of the Navigant study, dated March 7, 2017. The conclusion on page 35 states, "Under the Low and Medium RNG cost scenarios ($1.0-$1.2 per therm procurement cost), the RNG tariff would provide lower upfront costs, smaller solar PV sizes, and modest homeowner annual cost savings."

c. As explained in the June 30, 2017, letter referenced by SC/UCS (See attachment Sierra Club-UCS-SCG-009 Q10c SCG 2030 CEC EE Target Setting Comments June 2017.pdf):

> "SoCalGas also cautions that including electrification of final end-uses as a strategy to reduce energy consumption may preclude implementing California's goals to increase the use of renewable gas in the transportation and building sectors. The State recently adopted several policies that rely on the continued use of natural gas infrastructure to meet the state's decarbonization goals. Specifically, SB 1383 and CARB's Short-Lived Climate Pollutant (SLCP) Reduction Plan require the increased use of renewable gas to reduce methane from organic sources by 40% by 2030, including injection into natural gas pipelines and utilization in the transportation sector. [9] Reliable natural gas infrastructure is crucial to meeting these objectives and then delivery of renewable gas to end-uses."
>
> Furthermore, CARB's 2017 Climate Change Scoping Plan Update relies heavily on the SLCP Reduction Plan to achieve about one-third of GHG reductions needed to reach the 2030 goals[10] and demonstrates that California can meet its 2030 goals *without* electrification of buildings. The Proposed Scoping Plan Scenario (Proposed Scenario) analysis states that "this scenario does not include fuel-switching of natural gas or diesel end uses to electric end uses."[11] Rather, the 2030 goal can be met by extending existing programs such as Cap-and-Trade and the Low Carbon Fuels Standard, and implementation of new legislation such as SB 1383. CARB's economic analysis also demonstrates that the Proposed Scenario achieves the 2030 goal in a more cost-effective manner than alternative scenarios that include electrification of buildings.[12] Natural gas use in ultra-low emitting technology applications will also help achieve GHG

> emission reductions targets and generate air quality benefits. Replacing the use of fossil natural gas with renewable gas could be an effective "fuel-substitution" measure—not only to reduce

SoCalGas Response 10c Continued:

> GHGs associated with energy use, but also to reduce methane emissions from organic sources, which account for over 80% of California's methane emissions. Renewable gas can be used for all existing natural gas end-uses to lower net life-cycle GHG emissions by at least 40%.[13] A CARB/UC Davis study estimated that around 20% of California's residential natural gas can be supplied by renewable gas from organic sources such as dairy manure, landfills, organic municipal solid waste, and wastewater treatment facilities.[14]"

As part of the 2017 IEPR record, SoCalGas also submitted an analysis prepared by ICF on availability of renewable gas in California and the U.S. The letter titled 'Re-assessment of Renewable Gas' was submitted on July 14, 2017. See attachment Sierra Club-UCS-SCG-009 Q10c CEC_SoCalGas_Comments_ICF_Study_ReAssessment_of_Renewable_Natural_Gas July 2017.pdf. ICF reviewed available studies by UC-Davis, National Petroleum Council, American Gas Foundation and U.S. Department of Energy on available feedstocks for biogas. Based on the studies with a separate accounting for California resources, ICF estimated 109-216 Bcf/yr of in-state biogas potential. They also provided a summary of national studies showing biogas potential in the U.S. ranges from 1-9.6 Tcf/yr, depending on assumptions about percentage of biomass feedstock processed and conversion efficiencies.