

# SELF-GENERATION INCENTIVE PROGRAM: RENEWABLE FUEL USE REPORT NO. 29

Submitted to:  
Pacific Gas and Electric Company  
SGIP Working Group

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## GLOSSARY

### Abbreviations and Acronyms

| <b>Term</b>        | <b>Definition</b>                      |
|--------------------|--|
| ADG                | Anaerobic Digester Gas                 |
| CEC                | California Energy Commission           |
| CHP                | Combined Heat and Power                |
| CSE                | Center for Sustainable Energy          |
| CO <sub>2</sub>    | Carbon dioxide                         |
| CO <sub>2</sub> eq | Carbon dioxide equivalent              |
| CPUC               | California Public Utilities Commission |
| DBG                | Directed Biogas                        |
| DG                 | Digester Gas                           |
| FC                 | Fuel Cell                              |
| GT                 | Gas Turbine                            |
| ICE                | Internal Combustion (IC) Engine        |
| IOU                | Investor Owned Utility                 |
| MT                 | Microturbine                           |
| PA                 | Program Administrator                  |
| PBI                | Performance Based Incentive            |
| PG&E               | Pacific Gas and Electric Company       |
| PY                 | Program Year                           |
| RFU                | Renewable Fuel Use                     |
| SCE                | Southern California Edison Company     |
| SCG                | Southern California Gas Company        |
| SDG&E              | San Diego Gas and Electric Company     |
| SGIP               | Self-Generation Incentive Program      |
| WWTP               | Wastewater Treatment Plant             |

## Key Terms

| Term  | Definition  |
|---|---|
| 2017+ RFU Requirement                           | For reporting purposes, projects with RFU requirements with application dates in 2017 or later are referred to as <i>2017+ RFU requirement</i> . Depending on the year of the application, all SGIP projects are required to use a certain percentage of renewable fuel.  |
| Applicant                                       | The entity, either the Host Customer, System Owner, or third party designated by the Host Customer, that is responsible for the development and submission of the SGIP application materials and is the main contact for the SGIP Program Administrator for a specific SGIP application.  |
| Biogas  | A gas composed primarily of methane and carbon dioxide produced by the anaerobic digestion of organic matter. This is a renewable fuel. Biogas is typically produced in landfills, and in digesters at wastewater treatment plants, food processing facilities, and dairies.  |
| Biogas Baseline                                 | The assumed treatment of biogas fuel in the absence of the SGIP generator. See <i>Flaring and Venting</i> .   |
| Combined Heat and Power (CHP)                   | A system that produces both electricity and useful heat simultaneously; sometimes referred to as “cogeneration.”  |
| CO <sub>2</sub> Equivalent (CO <sub>2eq</sub> ) | When reporting emission impacts from different types of greenhouse gases, total GHG emissions are reported in terms of tons of CO <sub>2</sub> equivalent so that direct comparisons can be made. To calculate CO <sub>2eq</sub> , the global warming potential of a gas as compared to that of CO <sub>2</sub> is used as the conversion factor (e.g., the global warming potential (GWP) of methane is 21 times that of CO <sub>2</sub> ). Thus, the CO <sub>2eq</sub> of a given amount of methane is calculated as the product of the GWP factor (21) and the amount of methane.  |
| Completed                                       | Projects that have been installed and begun operating, have passed their SGIP eligibility inspection, and were issued an incentive payment.   |
| Confidence Interval                             | A kind of interval estimate of a population parameter (such as the mean value) used to indicate the reliability of the estimate. It is an observed interval (i.e., calculated from observations) that frequently includes the parameter of interest. How frequently the observed interval contains the parameter is determined by the confidence level or confidence coefficient. A confidence interval is intended to give the assurance that if the statistical model is correct. The procedure for constructing the interval would deliver a confidence interval that included the true value of the parameter for the proportion of the time set by the confidence level. |
| Confidence Level (also Confidence Coefficient)  | The degree of accuracy resulting from the use of a statistical sample. For example, if a sample is designed at the 90/10 confidence (or precision) level, resultant sample estimates will be within ±10 percent of the true value, 90 percent of the time.  |
| Directed Biogas                                 | Biogas delivered through a natural gas pipeline system and its nominal equivalent used at a distant customer’s site. Within the SGIP, this is classified as a renewable fuel.   |
| Electrical Conversion Efficiency                | The ratio of electrical energy produced to the fuel energy used (lower heating value).  |
| Flaring (of Biogas)                             | A flaring baseline means that there is <i>prior</i> legal code, law or regulation requiring capture and flaring of the biogas. In this event an SGIP project <i>cannot</i> be credited with GHG emission reductions due to capture of <b>methane</b> in the biogas. A project   |

| Term                           | Definition  |
|--------------------------------|---|
|                                | cannot take credit for a prior action required by legal code, law or regulation. See also: <i>Venting (of Biogas)</i> .   |
| Greenhouse Gas (GHG) Emissions | For the purposes of this analysis GHG emissions refer specifically to those of CO <sub>2</sub> and methane, expressed as CO <sub>2</sub> eq.  |
| Legacy RFU Requirement         | For reporting purposes, projects with RFU requirements with application dates prior to 2017 are referred to as <i>Legacy RFU Requirement</i> . These projects received higher incentives and are required to use a minimum of 75% renewable fuel.   |
| Lower Heating Value (LHV)      | The amount of heat released from combustion of fuel assuming that the water produced during the combustion process remains in a vapor state at the end of combustion. Units of LHV are typically Btu/SCF of fuel.   |
| Metric Ton                     | Common international measurement for the quantity of greenhouse gas emissions. A metric ton is equal to 2,205 pounds.   |
| Onsite Biogas                  | Biogas projects where the biogas source is located directly at the host site where the SGIP system is located. See also: <i>Directed Biogas</i> .   |
| Prime Mover                    | A device or system that imparts power or motion to another device such as an electrical generator. Examples of prime movers in the SGIP include gas turbines, IC engines, and wind turbines.  |
| Rebated Capacity               | The capacity rating associated with the rebate (incentive) provided to the program participant. The rebated capacity may be lower than the manufacturer’s nominal “nameplate” system size rating.   |
| Venting (of biogas)            | A venting baseline means that there is no <i>prior</i> legal code, law or regulation requiring capture and flaring of the biogas. Only in this event can an SGIP project be credited with GHG emission reductions due to capture of <b>methane</b> in the biogas. A project cannot take credit for a prior action required by legal code, law or regulation. See also: <i>Flaring (of Biogas)</i> . |

# 1 INTRODUCTION AND EXECUTIVE SUMMARY

The purpose of renewable fuel use (RFU) reports is to provide the Energy Division (ED) of the California Public Utilities Commission (CPUC) with Self-Generation Incentive Program (SGIP) project renewable fuel use information. The report specifically contains compliance determinations of RFU facilities with SGIP renewable fuel use requirements. In addition, the reports assist the ED in making recommendations concerning modifications to the renewable project aspects of the SGIP.

## 1.1 REGULATORY AND REPORTING HISTORY

This report fulfills CPUC Decision (D.) 02-09-051 (September 19, 2002). That decision required SGIP<sup>1</sup> Program Administrators (PAs) to provide updated information every six months<sup>2</sup> on completed SGIP projects using renewable fuel.<sup>3</sup> CPUC Rulemaking 12-11-005 (November 8, 2012) reduced the frequency of the filing requirement for these reports from a semi-annual to an annual filing requirement. CPUC D. 16-06-055 (June 23, 2016) revised the SGIP pursuant to Senate Bill (SB) 871 and Assembly Bill (AB) 1478.<sup>4</sup> D. 16-06-055 states that an SGIP M&E Plan should be developed by ED staff in consultation with program

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<sup>1</sup> The SGIP provides incentives to eligible utility customers for the installation of new qualifying technologies that are installed to meet all or a portion of the energy needs of a facility. The Program is implemented by the CPUC and administered by Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE) and Southern California Gas Company (SCG) in their respective territories, and the Center for Sustainable Energy (CSE) in San Diego Gas and Electric (SDG&E) territory.

<sup>2</sup> Ordering Paragraph 7 of Decision 02-09-051 states:

“Program administrators for the self-generation program or their consultants shall conduct on-site inspections of projects that utilize renewable fuels to monitor compliance with the renewable fuel provisions once the projects are operational. They shall file fuel-use monitoring information every six months in the form of a report to the Commission, until further order by the Commission or Assigned Commissioner. The reports shall include a cost comparison between Level 3 and 3-R projects....”

Ordering Paragraph 9 of Decision 02-09-051 states:

“Program administrators shall file the first on-site monitoring report on fuel-use within six months of the effective date of this decision [September 19, 2002], and every six months thereafter until further notice by the Commission or Assigned Commissioner.”

<sup>3</sup> The Decision defines renewable fuels as wind, solar, biomass, digester gas, and landfill gas. Renewable fuel use in the context of this report effectively refers to biogas fuels obtained from landfills, wastewater treatment plants, food processing facilities, SYNGAS, and dairy anaerobic digesters.

<sup>4</sup> Decision Revising the Self-Generation Incentive Program Pursuant to Senate Bill 861, Assembly Bill 1478, and Implementing Other Changes. Decision 16-06-055. June 23<sup>rd</sup>, 2016. Date of Issuance: 07/01/2016.

<http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M163/K928/163928075.PDF>



administrators. On January 13, 2017, the CPUC ED submitted their plan to measure and evaluate the progress and impacts of the SGIP for Program Years 2016 – 2020.

The 2017 SGIP M&E plan states that “... to maximize the ability to use the RFURs in a timely fashion to sanction those SGIP participants that do not meet renewable fuel use requirements, the RFUR shall include an analysis of renewable fuel use data collected through June 30<sup>th</sup> of the year the report is delivered. Furthermore... the cost analysis performed in the RFUR is no longer required.”<sup>5</sup>

Due to an ongoing interest in the potential for renewable fuel use projects to reduce greenhouse gas (GHG) emissions,<sup>6</sup> a section on GHG emission impacts from renewable fuel SGIP projects was added to the reports beginning with RFU Report No. 15. GHG emissions used in RFU Report No. 29 are taken from the most recent SGIP Impact Evaluation Report, completed in 2020 for calendar years 2018-2019.<sup>7</sup>

Incomplete compliance determinations create uncertainty in assessing the overall status of Renewable Fuel Use projects. While this report does not address reasons for incomplete determinations, during a previous compliance period (RFU Report No. 25), the PAs and the CPUC directed the evaluation consultant to investigate projects associated with incomplete compliance determinations. RFU Report No. 25 contains the findings from additional research performed to understand the reasons for incomplete compliance determinations.

This report (RFU Report No. 29) includes summary statistics for all renewable fuel use projects installed under the SGIP since the Program’s inception in 2001. Results of analysis of renewable fuel use compliance presented in this RFU Report are based on the 12 months of operation from July 1, 2019 through June 30, 2020. In accordance with the CPUC’s 2017 SGIP M&E plan, this report no longer contains a cost analysis of RFU projects.

## **1.2 RFU REPORT METHODOLOGY AND DATA OVERVIEW**

SGIP RFU Report No. 29 presents information on the renewable fuel usage from the 168 renewable fuel projects rebated by the SGIP as of June 30, 2020. The report leverages information found in the SGIP

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<sup>5</sup> The term “RFUR” in this quote refers to Renewable Fuel Use Report.

<sup>6</sup> While the SGIP was initially implemented in response to AB 970 (Ducheny, chaptered 09/07/00) primarily to reduce demand for electricity, SB 412 (Kehoe, chaptered 10/11/09) limits the eligibility for incentives to distributed energy resources that the CPUC, in consultation with the California Air Resources Board (CARB), determines will achieve reduction of greenhouse gas emissions pursuant to the California Global Warming Solutions Act of 2006.

<sup>7</sup> 2018 – 2019 SGIP Impact Evaluation Report. Verdant Associates, 2020.



Statewide Project Database, the Inspection Reports prepared by third-party consultants, metered data (electrical generation, fuel consumption, and other biogas usage documentation) provided to Verdant through data requests to each project's Performance Data Provider (PDP), and discussions with project contacts.

SGIP RFU projects are fueled by a variety of renewable sources. These renewable sources can be either located onsite (onsite biogas) or at a location other than the SGIP generator (directed biogas). Of the 168 RFU projects rebated by the SGIP as of June 30, 2020, 104 are fueled by on-site biogas. Sources of on-site biogas include landfills; digester gas (DG) from wastewater treatment plants (WWTPs), dairies, and food processing facilities; and syngas from food processing facilities. The remaining 64 facilities are fueled by directed biogas which is procured off-site, cleaned up, and injected into the natural gas distribution system. Sources of directed biogas include landfills and wastewater treatment plants. The technologies that utilize these biogas resources include fuel cells (FCs), internal combustion engines (IC engines or ICEs), microturbines (MTs) and gas turbines (GTs). Fuel cells in the program operate either in combined heat and power (FC-CHP) mode, or in electric only mode (FC-Elec.).

Projects that received incentives at renewable levels (formerly Level 3R projects, then called a biogas adder until Program Year (PY) 2016) are required to comply with minimum renewable fuel usage requirements. Namely, these projects are required to consume a minimum of 75 percent of their energy input on an annual energy basis from renewable sources. Of the 168 RFU projects discussed in this report, 158 received incentives at a pre-PY 2017 renewable level and are therefore required to comply with the SGIP's legacy minimum renewable fuel use requirements (75 percent).<sup>8</sup> The compliance period is defined by the project's warranty which can be three, five, or ten years depending on the technology type and the year the project applied to the SGIP. Beginning with PY 2017, all fueled projects must procure a minimum amount of biogas (10 percent for PY 2017 projects). These will be referred to as 2017+ RFU requirements. As of June 30, 2020, two PY 2017 fueled projects have been issued an upfront incentive and are subject to PY 2017 biogas consumption requirements. As of this report's publish date, there are no new RFU projects online that applied to SGIP after PY 2017.

The methodology used to assess compliance with SGIP minimum renewable fuel use requirements is different for on-site biogas projects than for directed biogas projects. Historically, on-site biogas projects that operate exclusively on renewable fuel (no natural gas supplementation) were automatically assumed to be in compliance. However, during the RFU Report No. 25 reporting period, fuel supply systems for on-site biogas projects were physically inspected to verify compliance. All such systems were found to be in compliance, and repeated inspection for subsequent reports was deemed unnecessary. For projects

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<sup>8</sup> These requirements will be referred to as *legacy* RFU requirements throughout the report.



equipped with two fuel supplies (biogas and natural gas, blended), we use metered electrical generation, natural gas consumption data, and biogas consumption data to arrive at an estimate of renewable fuel usage. For directed biogas projects, compliance determinations are made following the audit protocols prepared by a third-party consultant (see Appendix B). A detailed overview of renewable fuel use compliance findings is presented in Section 3.

**TABLE 1-1: RFU PROJECT DESIGNATIONS**

| <b>Compliance Status</b> | <b>Compliance Methodology</b> | <b>Renewable Only</b> | <b>Non-Renewable &amp; On-Site Renewable</b> | <b>Off-Site, Directed Renewable</b> |
|--------------------------|-------------------------------|-----------------------|--|-------------------------------------|
| In Compliance            | Implied Compliance            | 18                    | -  | -                                   |
|                          | Evaluated Compliance          | -                     | 7  | -                                   |
| Not Compliant            | Evaluated Compliance          | -                     | 1  | -                                   |
| No Compliance Required   | Out of Warranty               | 38                    | 19   | -                                   |
|                          | RFU Procurement Term Ended    | -                     | -  | 63                                  |
|                          | No Renewable Incentives       | 4                     | 4  | -                                   |
|                          | <1 Year Operation             | -                     | 2  | -                                   |
| Unknown Compliance       | No Compliance Determined      | -                     | 9  | 1                                   |
| Non-Operational          | System Offline                | -                     | 1  | -                                   |
|                          | System Decommissioned         | -                     | 1  | -                                   |

### 1.3 SUMMARY OF RFU REPORT NO. 29 FINDINGS

The following bullets represent a summary of key findings from this report:

- As of June 30, 2020, there were 168 RFU facilities deployed under the SGIP, representing approximately 109 MW of rebated generation capacity. Of these facilities, 158 were subject to Legacy RFU requirements, received higher renewable incentives, and represented 103.6 MW of rebated capacity. Two facilities are subject to 2017+ RFU requirements, representing 1.3 MW of rebated capacity. These projects had not yet been operational for a full year and were therefore not subject to compliance requirements. The remaining other eight pre-2017 RFU projects which did not receive renewable incentives represented 3.8 MW of rebated capacity.
- Of the 158 projects that are subject to legacy RFU requirements, 56 (about 35 percent by project count) operated solely from on-site renewable fuels. Of these 56 projects:

- 18 projects are assumed to be in compliance with renewable fuel use requirements, and
- 38 projects were out of warranty and as such were no longer subject to reporting and compliance requirements.
- Of the remaining 102 dual-fuel (having both renewable and non-renewable fuel supplies) and directed biogas facilities receiving higher legacy renewable incentives:
  - Seven blended on-site biogas projects were found to be in compliance with renewable fuel use requirements based on the methodologies described in this report,
  - One blended on-site biogas project was determined to be out of compliance with renewable fuel requirements based on methodologies described in the report,
  - Nine blended on-site biogas projects and one directed biogas project could not have their compliance determined until additional data are received,
  - Two blended on-site biogas projects were non-operational. One was offline for the entire evaluation period and the other was decommissioned.
  - Nineteen blended on-site biogas projects were out of warranty and as such were no longer subject to reporting and compliance requirements, and
  - Sixty-three directed biogas projects completed their renewable fuel use procurement term and as such were no longer subject to reporting and compliance requirements.
- RFU facilities are powered by a variety of renewable fuel (i.e., biogas) resources. Approximately 29 percent of the rebated capacity (31.6 MW) of RFU facilities deployed through June 30, 2020 was powered by directed biogas.<sup>9</sup> The remaining 71 percent (77.1 MW) was fueled primarily by on-site biogas with a few projects fueled by syngas.<sup>10</sup>
- Prime movers used at RFU facilities include fuel cells, gas turbines, microturbines, and internal combustion engines. Internal combustion engines are the dominant prime mover technology with 45.6 MW (about 42 percent) of the approximately 109 MW of rebated capacity. Electric-only fuel cells provide 24.7 MW (about 23 percent of all RFU capacity). CHP fuel cells, gas turbines, and microturbines make up the remainder of the RFU capacity.
- RFU facilities have considerable potential for reducing GHG emissions. The magnitude of the GHG emission reduction depends largely on the way in which the biogas would have been treated in

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<sup>9</sup> Directed biogas usage is not verified beyond the five-year or ten-year contractual agreement period unless otherwise specified.

<sup>10</sup> Syngas refers to “synthesis gas.” Unlike biogas, which is formed by biological decomposition of biomass materials, syngas is produced through thermal chemical processes. In general, biomass materials are heated under low to zero oxygen conditions causing the volatilization of carbon in the biomass and produces a mixture of carbon-hydrogen gases including methane, propane, ethane, and more complex gases.

the absence of the program (i.e., the “baseline” condition). RFU facilities that would have been venting biogas directly to the atmosphere (e.g., dairy manure disposal ponds) have a much higher GHG emission reduction potential than RFU facilities that would have been required to capture and destroy methane (e.g., landfill gas operations).

- In general, the 2018-2019 SGIP Impacts Evaluation Report<sup>11</sup> showed that RFU facilities for which biogas flaring was the baseline condition decreased GHG emissions by around 0.12 - 0.31 metric tons of carbon dioxide equivalent (CO<sub>2</sub>eq) per MWh of generated electricity.
- The GHG emission reduction rate of RFU facilities for which biogas venting was the baseline condition is around 4.74 – 5.40 metric tons of CO<sub>2</sub>eq per MWh of generated electricity; an order of magnitude greater in GHG emission reduction potential.
- The 2018-2019 SGIP Impact Evaluation Report found that renewable-fueled projects reduced emissions by 168 thousand metric tons of CO<sub>2</sub>eq during 2019.
- Potential for GHG emission reductions from RFU facilities may also be affected by using waste heat recovery at the RFU facility. In general, RFU facilities that use waste heat recovery increase the potential for GHG emission reduction if natural gas would otherwise have been used to generate process heat.

The number of potential RFU projects requiring compliance going forward is shown below in Table 1-2. As shown in the table, the number is steadily decreasing. The numbers include seven new potential pipeline projects which have not yet been paid. One of the pipeline projects falls under the pre-2017 RFU requirements whereas the remaining six projects fall under the 2017+ requirements.

**TABLE 1-2: RFU PROJECTS REQUIRING COMPLIANCE BY RFU REPORT NUMBER**

| RFU Report # | Report Ending Date | Number of Projects Requiring Compliance Determination |
|--------------|--------------------|---|
| 29           | June 2020          | 19  |
| 30           | June 2021          | 19*   |
| 31           | June 2022          | 16  |
| 32           | June 2023          | 12  |
| 33           | June 2024          | 10  |
| 34           | June 2025          | 8   |
| 33           | June 2026          | 2   |

\* Two projects will no longer require a compliance determination, but two new projects were added, and the total remains the same.

<sup>11</sup> The 2018-2019 SGIP Impacts Evaluation Report is currently in draft form and has not yet been released. Footnote to be updated once the 2018-2019 impact report has been finalized.

## 1.4 CONCLUSIONS AND RECOMMENDATIONS

In accordance with the original CPUC Decision 02-09-051 in September 2002, the overall purpose of the renewable fuel use reports is to help ensure that projects receiving increased incentives for being renewably fueled are in fact meeting SGIP renewable fuel use requirements. Prior Renewable Fuel Use Reports have documented consecutive occurrences of non-compliance with renewable fuel use requirements. This report found only one biogas project being out of compliance with SGIP renewable fuel use requirements.

While only one project was found to be out of compliance, numerous on-site and directed biogas projects could not have their compliance status determined due to insufficient data. We find that for on-site biogas projects, many data availability issues originate during the PBI setup process. In other situations, the PDP reported that their meter no longer was communicating, and therefore no data could be gathered. For directed biogas projects, historical compliance issues were due to difficulties in working with gas marketers and delays in obtaining appropriate documentation.

One final consideration regarding directed biogas projects is their limited term as renewable projects. SGIP rules require that directed biogas projects meet minimum renewable fuel use requirements for contract period of five to ten years.<sup>12</sup> After this contract term, directed biogas projects are no longer required to procure directed biogas and can operate on non-renewable fuel. During this reporting period we find that most directed biogas projects have fulfilled their compliance terms and will possibly continue operating on 100 percent natural gas.

Considering these conclusions and the general findings of this report, we make the following recommendations:

### 1. Ensure Complete Monitoring and Streamlined Data Delivery of Fuel Supply Data

As per the SGIP guidelines, all technologies 30 kW or larger must install metering and monitoring that measures net electrical output from the system. Furthermore, CHP and electric-only fuel cell technologies must also install metering and monitoring equipment that measures and reports fuel input.<sup>13</sup>

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<sup>12</sup> The 5 year requirement is for projects with a program year of 2010 or earlier. Projects with a program year of 2011 or later were required to procure directed biogas for a period of 10 years.

<sup>13</sup> 2015 Self-Generation Incentive Program Handbook. January 13, 2015. Page 60 (Metering & Data Collection): *“All SGIP technologies 30 kW or larger must install metering and monitoring equipment that measures net electrical output from the system(s). Combined heat and power technologies operating on non-renewable fuels will in addition install metering and monitoring equipment that measures and reports useful thermal energy delivered to the Site from the CHP system as well as fuel input to the generator(s).”*

During this reporting period, Verdant Associates had to work with individual PDPs to obtain metered data from metering equipment to make compliance determinations. In some cases, these data were not sufficient to make compliance determinations.

While the breakout between renewable and non-renewable fuel was gathered for many PBI projects, the meter interval data, which shows the breakout of renewable and non-renewable fuel could not be directly downloaded from the SGIP Application Portal. Having these data readily available from the portal for download would streamline this process further. There were several other projects where the compliance could not be determined either because of data communication issues or because a fuel meter was never installed at the location. Finally, the meter interval data provided by the PDPs only accounts for the breakout of fuel types by volume of fuel. Additional calculations and assumptions were made on the heat content of the renewable fuel to determine the compliance.

The PAs should work with PDPs to ensure that metering equipment is installed, operational, communicating and the data should be made available in format that can be used to determine the compliance.

## **2. Identify Ways to Increase Participation of Biogas Projects – Particularly Those That Would Have Otherwise Vented Biogas to the Atmosphere**

Biogas projects represent a significant source of GHG reductions for the SGIP. During 2019, biogas projects contributed 168 thousand metric tons of CO<sub>2</sub>eq GHG reductions. To ensure continued program wide GHG reductions, we recommend that the PAs identify ways to increase adoption of self-generation technologies at dairies, landfills, wastewater treatment plants, and other facilities that produce excess biogas. Emphasis should be placed on facilities that would otherwise have vented methane to the atmosphere like dairy digesters since this vented methane has far greater global warming potential than biogas that would have otherwise been flared.

## **3. The Renewable Fuel Usage Report Going Forward**

Beginning in PY 2020, all SGIP generation projects are required to operate on 100% renewable fuel. The total number of RFU projects in the SGIP subject to verification requirements is steadily decreasing. There are now more projects reaching the end of their compliance period year over year compared to the number of new RFU projects.

Regarding the role of the RFU report going forward, first we note that there are existing “legacy RFU” projects that have not completed their verification periods. The CPUC and the SGIP PAs should consider whether ongoing fuel use verification of legacy RFU projects is useful considering existing fuel use verification issues. Going forward, as the program transitions to 100% renewable fuel generation projects, the purpose of the RFU Report comes into question. Historically, the RFU report has inferred compliance of all projects that operate on 100% biogas fuel only if we can confirm that projects are not also equipped with a natural gas supply (even if they intend to operate on 100% biogas). If future projects will not be equipped with a natural



gas supply, then we would recommend that compliance be inferred for those projects. If future projects will be equipped with a natural gas supply for startup, to address biogas availability issues, or if they meet SGIP requirements using directed biogas, then we would recommend continued verification of these projects.

## 2 PROJECT CLASSIFICATIONS AND FUEL USE SUMMARY

The incentives and requirements for SGIP projects utilizing renewable fuel have varied throughout the life of the SGIP.<sup>14</sup> This report focuses on assessment of compliance with the SGIP’s minimum RFU Requirements, which have changed over time. Table 2-1 below summarizes these changes.

**TABLE 2-1: RFU REQUIREMENT CHANGES BY PROGRAM YEAR**

| Application Year | Minimum % of Renewable Fuel Required | Total Number of Projects | Total Rebated Capacity [kW] |
|------------------|--------------------------------------|--------------------------|-----------------------------|
| Pre-2017         | 75%                                  | 158                      | 103,631                     |
| 2017             | 10%                                  | 2                        | 1,273                       |
| 2018             | 25%                                  | 0                        | -                           |
| 2019             | 50%                                  | 0                        | -                           |
| <b>Total</b>     |                                      | <b>160</b>               | <b>104,904</b>              |

Legacy RFU projects with pre-2017 application dates that were subject to RFU requirements (received additional incentives to incorporate a minimum percentage of renewable fuel) were required to utilize renewable fuel for at least 75 percent of their total fuel usage (energy basis). Beginning in 2017, 2017+ RFU requirements direct all fuel-consuming projects to utilize renewable fuel for at least 10 percent of their total fuel usage (energy basis). In 2018, this minimum requirement increased to 25 percent, and in 2019 the requirement increased again to 50 percent. Starting in 2020, all fuel-consuming projects are required to utilize 100 percent renewable fuel. To date, there have been no projects that are subject to the PY 2018 or later requirements.

There are an additional eight pre-2017 RFU projects in this report that were not subject to any RFU requirements as they did not claim the higher incentives for renewable fuels. These details are shown below in Table 2-2.

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<sup>14</sup> A list of program handbooks going back to 2011, along with other project information can be found on the SGIP Online Application Database at <https://www.selfgenca.com/home/resources/>.

**TABLE 2-2: SUMMARY OF RFU PROJECT DIFFERENCES**

| Parameter                                  | RFU Projects                   |                                    |  |
|--|--------------------------------|------------------------------------|--|
|  | No Minimum RFU Requirement     | Legacy RFU Requirement             | 2017+ RFU Requirement                        |
| Allowed level of annual renewable fuel use | 0 – 100%                       | 75 – 100%                          | 10 – 100%                                    |
| Heat recovery                              | Required                       | Not Required                       | Not Required                                 |
| Incentive level                            | Same as non-renewable projects | Higher than non-renewable projects | Only allowable incentive level going forward |
| No. of projects                            | 8                              | 158                                | 2  |
| Rebated capacity (MW)                      | 3.8                            | 103.6                              | 1.3  |

## 2.1 DIRECTED BIOGAS PROJECTS

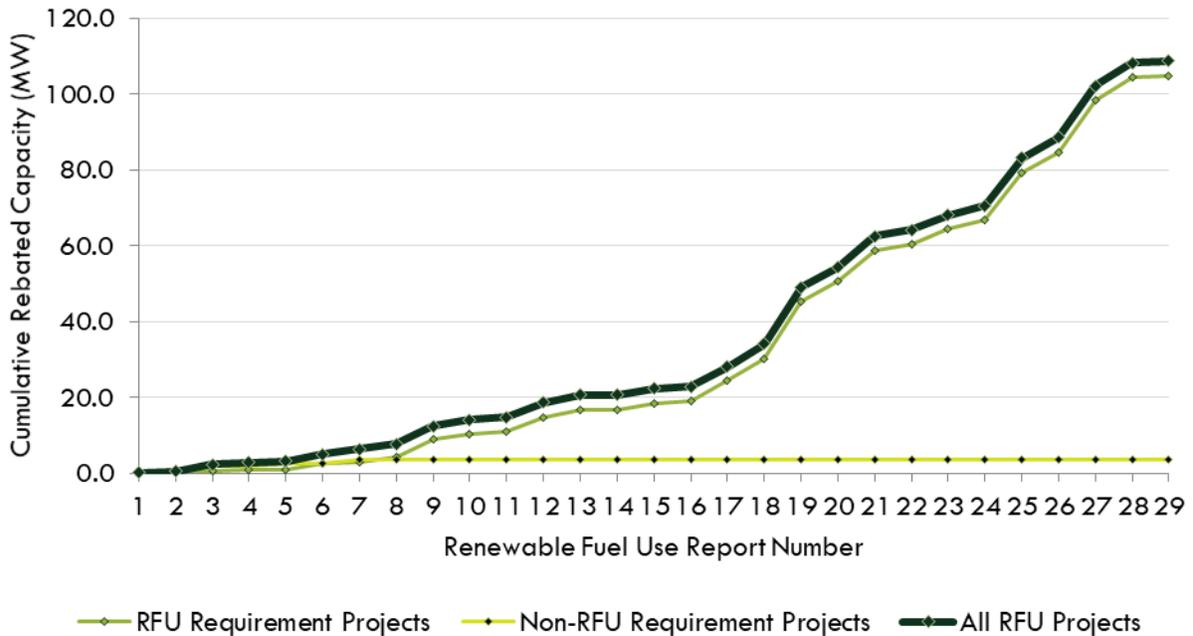
In CPUC Decision 09-09-048 (September 24, 2009), eligibility for biogas incentives was expanded to include “directed biogas” projects. Directed biogas projects purchase biogas fuel that is produced at another location than the project site. The procured biogas is processed, cleaned-up, and injected into a natural gas pipeline for distribution. Although the purchased biogas is not likely to be delivered and used at the SGIP renewable fuel project, the SGIP is credited with the use of biogas resources. Deemed to be RFU projects, directed biogas projects were eligible for higher incentives (relative to non-renewable projects) under the SGIP, and subject to the fuel use requirements of RFU requirement projects.

RFU Report No. 17, released in 2011, marked the first appearance of completed directed biogas projects under the SGIP. Each project is equipped with an on-site supply of utility-delivered natural gas. As such, the directed biogas is not literally delivered, but notionally delivered, as the biogas may actually be utilized at any other location along the pipeline route. Beginning in PY 2011 eligibility for directed biogas as a renewable fuel was limited to in-state sources. The SGIP requires that directed biogas projects comply with minimum renewable fuel use requirements (75 percent energy consumption) for five years, after which they are allowed to operate on 100 percent non-renewable fuel.

## 2.2 PROJECT CAPACITIES, FUEL TYPES, AND PRIME MOVER TECHNOLOGIES

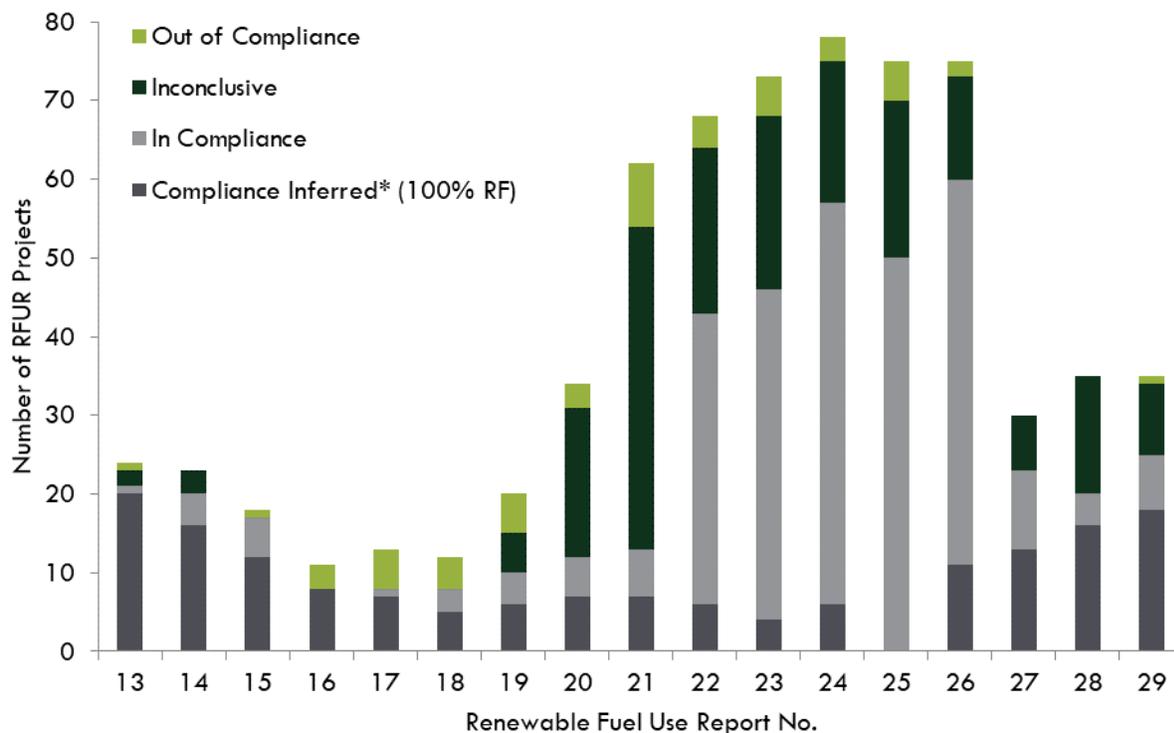
The capacity of RFU requirement and non-RFU requirement projects, and the combined total (RFU projects) covered by each RFU report is depicted graphically in Figure 2-1.

**FIGURE 2-1: PROJECT CAPACITY TREND (RFU REPORTS 1-29)**



Up to and including RFU Report No. 12, there had been no instances where available data indicated non-compliance with the Program’s renewable fuel use requirements. However, note that prior to RFU Report No. 13, some data were not available to evaluate compliance of projects. Figure 2-2 shows the history of compliance back to RFU Report No. 13 for all projects that were subject to the renewable fuel use requirement when the respective report was written. Note that this figure does not show those projects whose compliance was not evaluated due to either not having been operational for a full year or due to their compliance period having elapsed.

**FIGURE 2-2: RFU REQUIREMENT PROJECT COMPLIANCE HISTORY**

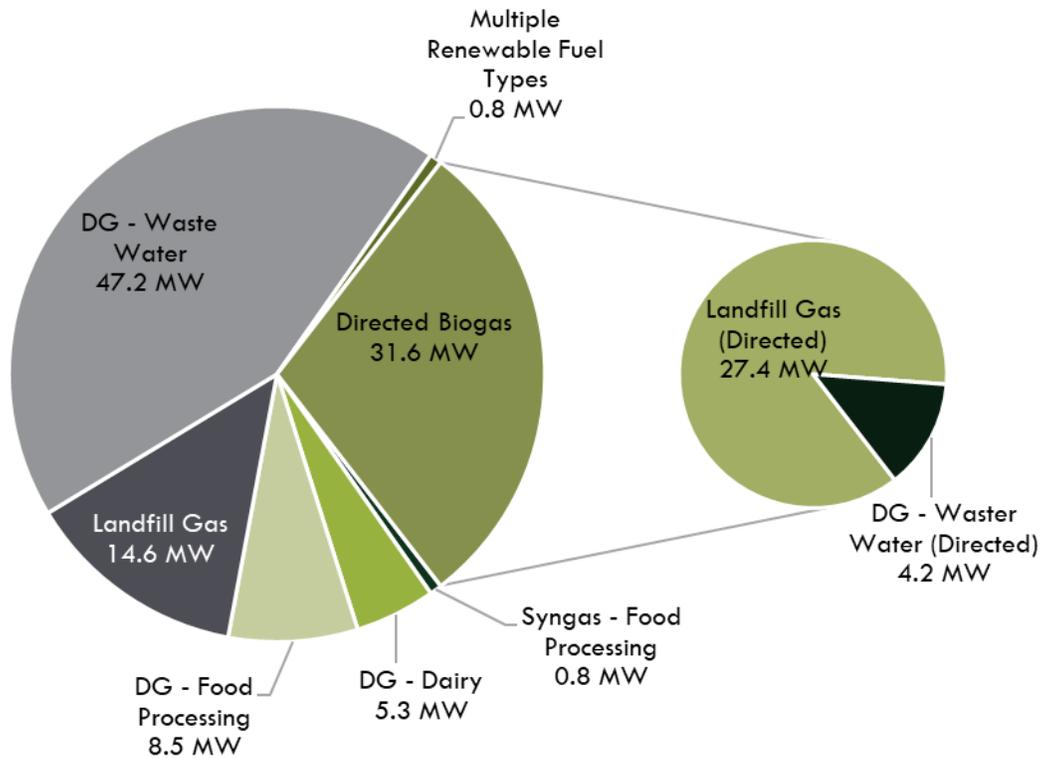


\* During RFU Report 25, compliance with renewable fuel use requirements was not inferred for dedicated biogas projects.

RFU projects typically use biogas derived from landfills or anaerobic digestion processes that convert biological matter to a renewable fuel source. Anaerobic digesters are used at dairies, wastewater treatment plants, or food processing facilities to convert wastes from these facilities to biogas. Figure 2-3 shows a breakout of all RFU projects as of June 30, 2020, by source of biogas (e.g., landfill gas, dairy digester gas, food processing digester gas, syngas) on a rebated capacity basis. Based on total rebated capacity, the largest contribution of biogas used in SGIP RFU projects is delivered as directed biogas.<sup>15</sup> Note that this does not account for directed biogas projects that completed their compliance period and continue operating on natural gas. Dairy digesters provide the smallest contribution to total rebated RFU project capacity.

<sup>15</sup> The biogas source of directed biogas projects is not always known. Historically, the primary source of SGIP directed biogas has been landfill gas.

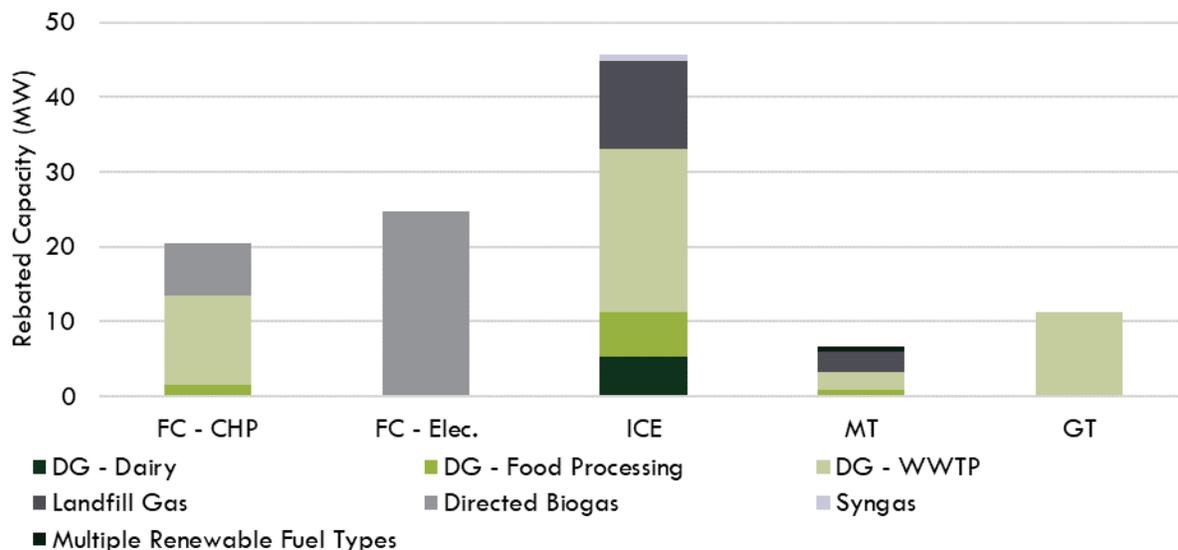
**FIGURE 2-3: RENEWABLE FUEL USE PROJECT REBATED CAPACITY BY FUEL TYPE**



\* DG = Digester Gas

Figure 2-4 provides a breakdown of the relative contribution of the different biogas fuels by prime mover technology. Internal combustion engines are the dominant technology with more than 40 percent of rebated RFU capacity.

**FIGURE 2-4: CONTRIBUTION OF BIOGAS FUEL TYPE BY PRIME MOVER TECHNOLOGY**



## 2.3 SUMMARY OF COMPLETED RFU REQUIREMENT PROJECTS

There were two new RFU requirement projects completed during the RFU Report No. 29 twelve-month reporting period. Both the completed projects used IC engines and are fueled by on-site biogas sources. A total of 160 RFU requirement projects had been completed as of June 30, 2020. A list of all SGIP projects utilizing renewable fuel (RFU requirement and Non- RFU requirement projects) is included as Appendix A. Only one of these projects is subject to 2017+ RFU requirements, while the rest are subject to Legacy RFU requirements.

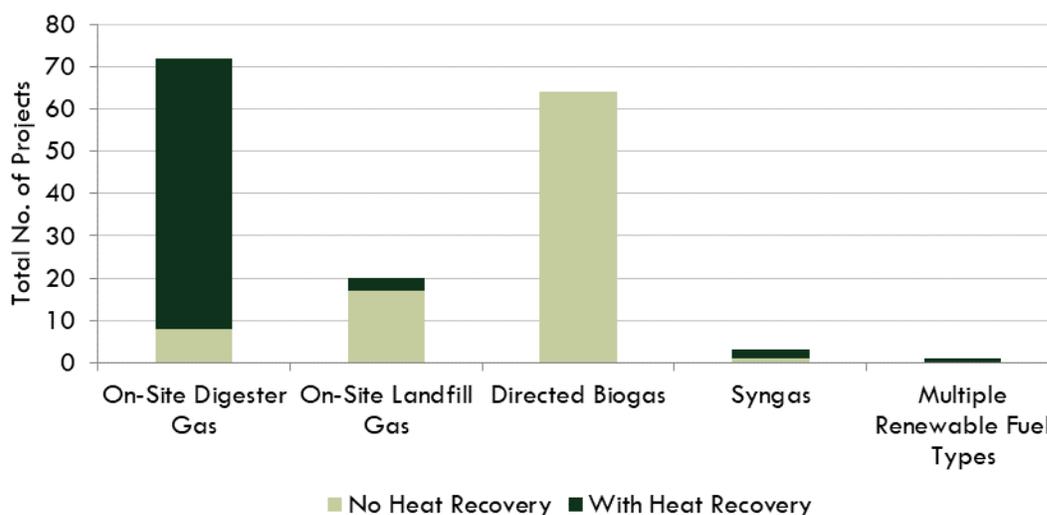
The 160 completed RFU requirement projects represent 104.9 MW of rebated generating capacity. The prime mover technologies used by these projects are summarized in Table 2-3. Fuel cells alone (both FC-CHP and FC-Elec) account for about 44 percent of RFU requirement rebated capacity, with IC engines, gas turbines, and microturbines making up the remaining 55 percent. The availability of out-of-state directed biogas as an eligible SGIP renewable fuel until PY 2010 led to significant growth in fuel cell projects during that period. The average sizes of fuel cell and IC engine projects are two to four times those of microturbine projects.

**TABLE 2-3: SUMMARY OF PRIME MOVERS FOR RFU REQUIREMENT PROJECTS**

| Prime Mover                | Number of Projects | Total Rebated Capacity (kW) | Arithmetic Average Rebated Capacity per Project (kW) |
|----------------------------|--------------------|-----------------------------|--|
| Fuel Cell - CHP            | 21                 | 19,410                      | 924  |
| Fuel Cell - Elec.          | 58                 | 24,660                      | 425  |
| Internal Combustion Engine | 54                 | 43,756                      | 810  |
| Microturbine               | 26                 | 5,849                       | 225  |
| Gas Turbine                | 1                  | 11,230                      | 11,230   |
| All                        | 160                | 104,904                     | 656  |

Many RFU requirement projects recover waste heat even though they are exempt from heat recovery requirements. Waste heat recovery incidence by renewable fuel type is summarized in Figure 2-5.

**FIGURE 2-5: SUMMARY OF WASTE HEAT RECOVERY INCIDENCE BY TYPE OF RENEWABLE FUEL FOR RFU REQUIREMENT PROJECTS**

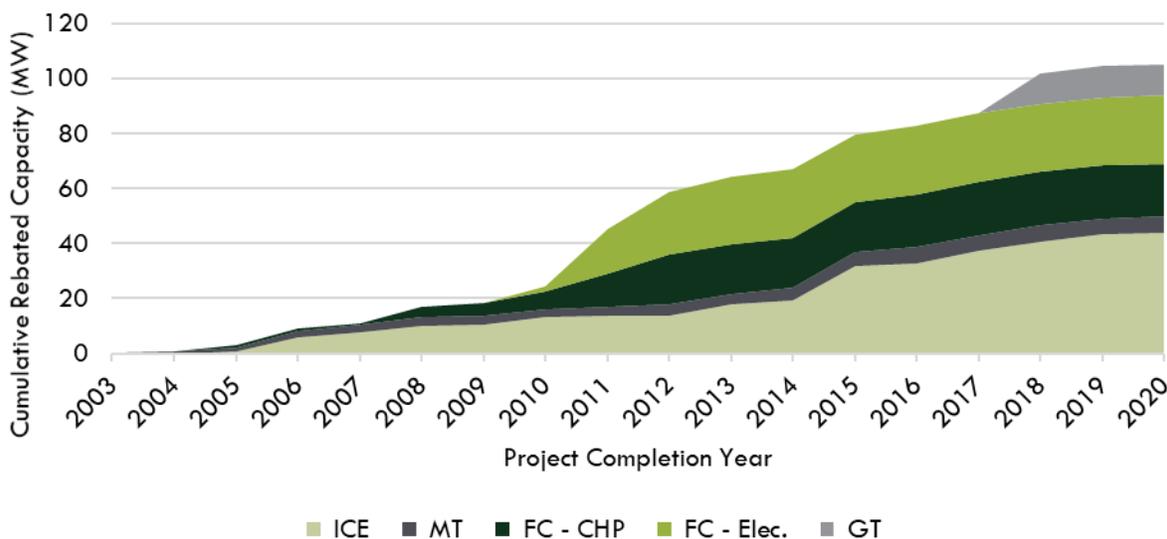


Verification inspection reports obtained from PAs and information from secondary sources such as direct contact with the participant, technical journals, industry periodicals, and news articles indicate that 69 of the 160 RFU requirement projects recover waste heat. The majority (all but 8) of the 69 on-site digester gas systems include waste heat recovery. Waste heat recovered from digester gas systems is generally used to pre-heat waste-water sludge prior to being pumped to digester tanks. Conversely, only three of twenty on-site landfill gas systems include waste heat recovery. In addition, those landfill gas systems that

do recover heat do not use it directly at the landfill site.<sup>16</sup> Instead, the landfill gas is piped to an adjacent site that has both electric and thermal loads, and the gas is used in a prime mover at that site. None of the 64 completed directed biogas projects include waste heat recovery.

Figure 2-6 shows the cumulative RFU requirement capacity for each year by technology. Calendar year 2015 saw the largest growth in IC engine projects with over 12 MW of rebated capacity. Electric-only fuel cells were by far the most common RFU requirement projects introduced in 2011 and 2012 with over 21 MW of rebated capacity completed in both years. This period is also aligned with the eligibility of out-of-state directed biogas projects for increased SGIP incentives. The first half of 2018 saw the installation of a single, large gas turbine project.

**FIGURE 2-6: CUMULATIVE REBATED RFU REQUIREMENT CAPACITY BY TECHNOLOGY AND PROJECT COMPLETION YEAR**



<sup>16</sup> In general, above-ground digesters have a built-in thermal load as they operate better if heated. Landfill gas and covered lagoon operations do not typically use recovered waste heat to increase the rate of the anaerobic digestion process.

### 3 FUEL USE AT RFU REQUIREMENT PROJECTS – COMPLIANCE DETERMINATION

Legacy RFU requirement projects are allowed to use a maximum of 25 percent non-renewable fuel; the remaining 75-100 percent must be renewable fuel. Beginning in PY 2017, 2017+ RFU requirements dictate that *all* fuel consuming SGIP projects must use a minimum percentage of renewable fuel, making all projects subject to RFU Requirements. The period during which RFU requirement projects are obliged to comply with this requirement is specified in the SGIP contracts between the host customer, the system owner, and the PAs. Specifically, this compliance period is the same as the equipment warranty requirement. For PY01-PY10 applications, microturbine and IC engine systems must be covered by a warranty of not less than three years. Fuel cell systems must be covered by a minimum five-year warranty. For PY11 - PY19 projects, all generation systems must have a minimum ten-year warranty. Therefore, the fuel use requirement period is three, five, or ten years, depending on the technology type and program year. The SGIP applicant must provide warranty (and/or maintenance contract) start and end dates in the Reservation Confirmation and Incentive Claim Form.

Facilities are grouped into three categories in assessing renewable fuel use compliance:

- “Dedicated” RFU requirement facilities located where biogas is produced (e.g., wastewater treatment facilities, landfill gas recovery operations) and the biogas is the only source for the prime mover.
- “Blended” on-site RFU requirement facilities located where biogas is produced that use a blend of biogas and non-renewable fuel (e.g., natural gas); and
- “Directed” RFU requirement facilities, located somewhere other than where biogas is produced and not necessarily directly receiving any of the biogas.

Fuel supply and contract status for RFU requirement projects are summarized in Table 3-1. Thirty-seven of the total 158 RFU requirement projects had active warranty status or completed their directed biogas procurement term during this reporting period. There were 121 RFU requirement projects had an expired warranty or completed their directed biogas procurement term before the beginning of this reporting period. Along with the 37 RFU requirement projects with active warranties, there are two projects that had not yet completed one year of operation. Eighteen projects operated solely on renewable fuel.

**TABLE 3-1: SUMMARY OF FUEL SUPPLIES AND WARRANTY STATUS FOR RFU REQUIREMENT PROJECTS**

| Fuel Supply  | Warranty/Renewable Fuel Use Requirement Status |                       |                  |                       |                  |                       |
|--------------|--|-----------------------|------------------|-----------------------|------------------|-----------------------|
|              | Active*  |                       | Expired          |                       | Total            |                       |
|              | No. Projects (n)                               | Rebated Capacity (kW) | No. Projects (n) | Rebated Capacity (kW) | No. Projects (n) | Rebated Capacity (kW) |
| Dedicated    | 18   | 11,674                | 38               | 15,228                | 56               | 26,902                |
| Blended      | 19**   | 32,194                | 19               | 13,688                | 38               | 45,886                |
| Directed     | 1  | 500                   | 63               | 31,070                | 64               | 31,570                |
| <b>Total</b> | <b>37</b>                                      | <b>43,868</b>         | <b>121</b>       | <b>60,486</b>         | <b>158</b>       | <b>104,354</b>        |

\* Only active projects that have been operational for one full year are required to comply with SGIP renewable fuel use requirements. Two projects that are considered ‘active’ have not completed one full year of operation.

\*\* One of these projects that should be active has been decommissioned. More details provided in Section 3.2.4.

### 3.1 FUEL USE AT DEDICATED ON-SITE RFU REQUIREMENT PROJECTS

Table 3-2 on the following page summarizes compliance determinations for dedicated RFU requirement projects. Dedicated RFU requirement projects are equipped with only a renewable fuel supply, they are not able to blend any amount of natural gas without significant re-engineering. All dedicated RFU requirement projects with application dates before 2017 are assumed to be in compliance with SGIP fuel use requirements since they are not physically able to consume other non-renewable fuels.



**TABLE 3-2: FUEL USE COMPLIANCE OF DEDICATED RFU REQUIREMENT PROJECTS**

| PA       | SGIP Reservation No. | Tech | Renewable Fuel Type      | Capacity (kW) | Operational Date* | Renewable Fuel Use | Compliance Status |
|----------|----------------------|------|--------------------------|---------------|-------------------|--------------------|-------------------|
| SCE      | SCE-SGIP-2012-0413   | MT   | DG - Food Processing     | 750           | 2/26/2014         | 100%               | Implied           |
| PG&E     | PGE-SGIP-2012-2110   | ICE  | DG - Food Processing     | 800           | 7/25/2014         | 100%               | Implied           |
| PG&E     | PGE-SGIP-2012-2415   | MT   | Landfill Gas             | 65            | 7/31/2014         | 100%               | Implied           |
| PG&E     | PGE-SGIP-2012-2432   | MT   | Landfill Gas             | 65            | 9/12/2014         | 100%               | Implied           |
| CSE      | SD-SGIP-2012-0486    | ICE  | DG - WWTP                | 145           | 11/26/2014        | 100%               | Implied           |
| SCE      | SCE-SGIP-2012-0433   | ICE  | DG - WWTP                | 627           | 4/21/2015         | 100%               | Implied           |
| PG&E     | PGE-SGIP-2014-2541   | ICE  | Syngas - Food Processing | 99            | 9/11/2015         | 100%               | Implied           |
| PG&E     | PGE-SGIP-2014-2854   | ICE  | Syngas - Food Processing | 160           | 11/13/2015        | 100%               | Implied           |
| PG&E     | PGE-SGIP-2015-2852   | ICE  | Syngas - Food Processing | 297           | 12/18/2015        | 100%               | Implied           |
| PG&E     | PGE-SGIP-2012-2052   | ICE  | Landfill Gas             | 2,852         | 12/21/2015        | 100%               | Implied           |
| PG&E     | PGE-SGIP-2014-2597   | ICE  | Landfill Gas             | 220           | 6/28/2016         | 100%               | Implied           |
| PG&E     | PGE-SGIP-2014-2832   | ICE  | DG - Dairy               | 800           | 11/29/2016        | 100%               | Implied           |
| SoCalGas | SCG-SGIP-2012-0158   | MT   | DG - WWTP                | 150           | 1/19/2017         | 100%               | Implied           |
| PG&E     | PGE-SGIP-2011-2049   | ICE  | DG - Food Processing     | 1000          | 4/7/2017          | 100%               | Implied           |
| PG&E     | PGE-SGIP-2011-2050   | ICE  | DG - Food Processing     | 1000          | 4/7/2017          | 100%               | Implied           |
| PG&E     | PGE-SGIP-2016-3030   | ICE  | DG - Dairy               | 1000          | 8/21/2017         | 100%               | Implied           |
| PG&E     | PGE-SGIP-2016-3048   | ICE  | DG - Dairy               | 600           | 10/18/2017        | 100%               | Implied           |
| SCE      | SCE-SGIP-2014-0937   | ICE  | DG - Digester            | 800           | 10/24/2017        | 100%               | Implied           |

\* Since assignment of a project’s operational date is subject to individual judgment, the incentive payment date as reported by the PAs is used as a proxy for the operational date for reporting purposes.



Given the program rule changes starting in PY2017, compliance will be determined for all projects with an application date of 2017 or later. For this reporting period, there were no dedicated renewable projects with program year 2017 or later.

## **3.2 FUEL USE AT BLENDED ON-SITE RFU REQUIREMENT PROJECTS**

Unlike dedicated RFU requirement sites, whose compliance is assumed, blended RFU requirement facilities are subject to compliance assessment. For blended facilities using both on-site renewable and non-renewable fuel, assessing compliance requires information on the amount of biogas consumed relative to the amount of non-renewable fuel consumed on-site. Some blended RFU requirement projects are equipped with a dedicated natural gas meter that measures the amount of non-renewable fuel being consumed by the project. Meters indicating the amount of renewable fuel being consumed by the SGIP project are owned and maintained by other program participants like system owners or host customers. To make a renewable fuel use compliance determination, it is sometimes necessary to estimate the renewable energy input and the total energy input (renewable + non-renewable fuel) of SGIP projects. The total energy input is estimated by dividing the metered electricity generation by the efficiency ratio of the generation equipment. Because this efficiency is not known for each blended biogas project, the average efficiency of all SGIP natural gas projects using the same generation technology is used as a proxy. For the ICE projects this was 28 percent, and for the FC project it was 37 percent. The energy density of biogas can have high variability, so no assumptions were made about its energy density. Instead, the energy input from biogas was calculated by subtracting the natural gas energy input from the total energy input. Since the metered natural gas consumption is volumetric, an assumption must be made about the energy density of the natural gas to calculate its total energy input. For natural gas energy density, the higher heating value of 1030 BTU per SCF is assumed. Once the biogas energy content is found by subtracting the natural gas energy content from the total energy content, the compliance of SGIP projects is assessed by dividing the energy content of the biogas by the total energy being supplied to the generator.

### **3.2.1 Blended On-Site RFU Requirement Projects in Compliance**

During this reporting period seven blended RFU requirement projects were confirmed to be in compliance with SGIP renewable fuel use requirements.

- **PGE-SGIP-2012-2061.** This 3800 kW IC engine system utilizes a blend of digester gas from a wastewater treatment plant and natural gas. The system came online in October 2013 and is therefore required to comply with SGIP renewable fuel use requirements. At the time of the PG&E installation verification inspection, the system was operating on 90 percent digester gas and the

output of the IC engine modulated based on the diurnal cycle of the biogas production. Based on metered electrical generation and natural gas consumption data, renewable fuel use during the current reporting period was approximately 81 percent of the total fuel input and is therefore in compliance with SGIP renewable fuel use provisions for this reporting period.

- **SCE-SGIP-2011-0348.** This 650 kW IC engine system is installed at a wastewater treatment plant. The system utilizes a combination of wastewater digester gas produced on-site and natural gas. The system became operational in March 2014 and is therefore required to comply with SGIP renewable fuel use requirements. Based on metered electrical generation and natural gas consumption data, renewable fuel use during the current reporting period was approximately 83 percent of the total fuel input and is therefore in compliance with SGIP renewable fuel use provisions for this reporting period.
- **PGE-SGIP-2012-1987.** This 1,700 kW IC engine system utilizes a blend of digester gas from a wastewater treatment plant and natural gas. The system came online in April 2015 and is therefore required to comply with SGIP renewable fuel use requirements. Based on metered electrical generation and natural gas consumption data, renewable fuel use during the current reporting period was approximately 82 percent of the total fuel input and is therefore in compliance with SGIP renewable fuel use provisions for this reporting period.
- **PGE-SGIP-2012-1966.** This 1,132 kW IC engine system utilizes a blend of digester gas from a wastewater treatment plant and natural gas. The system came online in March 2015 and is therefore required to comply with SGIP renewable fuel use requirements. Based on metered electrical generation and natural gas consumption data, renewable fuel use during the current reporting period made up about 98 percent of the total fuel input and is therefore in compliance with SGIP renewable fuel use provisions for this reporting period.
- **SCG-SGIP-2014-0205.** This 1,400 kW fuel cell system utilizes a blend of digester gas from a wastewater treatment plant and natural gas. The system came online in November 2016 and is therefore required to comply with SGIP renewable fuel use requirements. Based on metered electrical generation and natural gas consumption data, renewable fuel use during the current reporting period made up about 95 percent of the total fuel input and is therefore in compliance with SGIP renewable fuel use provisions for this reporting period.
- **SD-SGIP-2017-1119.** This 1,200 kW IC engine system utilizes a blend of digester gas from a wastewater treatment plant and natural gas. The system came online in December 2019 and is therefore required to comply with SGIP renewable fuel use requirements. Based on metered electrical generation and natural gas consumption data, renewable fuel use during the current reporting period made up about 75 percent of the total fuel input and is therefore in compliance with SGIP renewable fuel use provisions for this reporting period.

- **SD-SGIP-2014-0747.** This 472 kW IC engine utilizes wastewater digester gas and natural gas. The system was noted as operational in May 2019 and is therefore required to comply with SGIP renewable fuel use requirements. Based on metered electrical generation and natural gas consumption data, renewable fuel use during the current reporting period made up about 77 percent of the total fuel input and is therefore in compliance with SGIP renewable fuel use provisions for this reporting period

### 3.2.2 Blended On-Site RFU Requirement Projects out of Compliance

During this reporting period one blended RFU requirement project was determined to be out of compliance with SGIP renewable fuel use requirements.

- **SCE-SGIP-2014-0986.** This 846 kW IC Engine utilizes wastewater digester gas and natural gas. The system was noted as operational in March 2019 and is therefore required to comply with SGIP renewable fuel use requirements. Based on metered electrical generation and natural gas consumption data, renewable fuel use during the current reporting period made up about 67 percent of the total fuel input and is therefore it is not in compliance with SGIP renewable fuel use provisions for this reporting period.

### 3.2.3 Blended On-Site RFU Requirement Project Compliance Status Inconclusive

Nine projects could not have their compliance status determined during this reporting period because they did not provide sufficient information to make a compliance determination:

- **PGE-SGIP-2012-2206.** This 977 kW IC engine utilizes a combination of wastewater digester gas and natural gas. The system became operational in November 2015 and is therefore required to comply with SGIP renewable fuel use requirements. Data required to make a compliance determination were not available in time for this report. The PDP indicated that only power output is metered at this site and not gas consumption. Additionally, the gas utility indicated that no gas consumption records were available for this project. Without gas consumption data, it is impossible to verify compliance.
- **PGE-SGIP-2012-2112.** This 190 kW IC engine utilizes a combination of wastewater digester gas and natural gas. The system became operational in July 2015 and is therefore required to comply with SGIP renewable fuel use requirements. The PDP indicated that only power output is metered at this site and not gas consumption. Without gas consumption data, it is impossible to verify compliance.
- **PGE-SGIP-2013-2484.** This 800 kW microturbine utilizes a variety of biogas sources as well as natural gas. The system became operational in August 2016 and is therefore required to comply

with SGIP renewable fuel use requirements. The PBI performance data provider (PDP) indicated that they have had an outstanding communication issue with this site beginning from 2018. Therefore, no compliance determination could be made.

- **SCE-SGIP-2012-0450.** This project consists of two 800 kW IC engine utilizing a combination of wastewater digester gas and natural gas. The system became operational in November 2015 and is therefore required to comply with SGIP renewable fuel use requirements. A breakdown of natural gas and biogas usage could not be tracked down; therefore, no compliance determination could be made. While the facility was running at 100% biogas at the time of inspection, the system does have a natural gas line. From the fuel data provided, it was not clear whether the metered data reflected only biogas, only natural gas, or a combination of the two fuels.
- **SCG-SGIP-2015-0237.** This 11.2 MW gas turbine utilizes wastewater digester gas and natural gas. The system was noted as operational in March 2018 and is therefore required to comply with SGIP renewable fuel use requirements. However, the team was unable to track down a breakdown of natural gas and digester gas. Therefore, no compliance determination could be made.
- **PGE-SGIP-2014-2788.** This 5.5 kW microturbine utilizes digester gas and natural gas. The system was noted as operational in November 2017 and is therefore required to comply with SGIP renewable fuel use requirements. It is not entirely clear whether this project runs entirely on renewable fuel or not. The inspection report does specify, but also mentions that the site should be derated to just over 5 kW, although the application data list this project at just over 16 kW. Another generator onsite also uses mostly natural gas but can handle up to 15% biogas. We were not able to gather metered fuel data to confirm that this project does indeed run on 100% renewable fuel. Therefore, no compliance determination could be made.
- **PGE-SGIP-2014-2813.** This 602 kW IC Engine utilizes wastewater digester gas and natural gas. The system was noted as operational in October 2018 and is therefore required to comply with SGIP renewable fuel use requirements. However, the team was unable to track down a breakdown of natural gas and digester gas. Therefore, no compliance determination could be made.
- **PGE-SGIP-2014-2843.** This 43kW micro turbine utilizes wastewater digester gas and natural gas. The system was noted as operational in October 2018 and is therefore required to comply with SGIP renewable fuel use requirements. However, the team was unable to track down a breakdown of natural gas and digester gas. Therefore, no compliance determination could be made.
- **SCE-SGIP-2014-1006.** This 2.8 MW IC Engine utilizes wastewater digester gas and natural gas. The system was noted as operational in October 2018 and is therefore required to comply with SGIP renewable fuel use requirements. However, the team was unable to track down a breakdown of natural gas and digester gas. Therefore, no compliance determination could be made.

### 3.2.4 Blended On-Site RFU Requirement Project Compliance Status – Non Operational

There were two final projects in this list which do not fall into one of the above categories during the reporting period. Technically, these projects are not considered out of compliance.

- **PGE-SGIP-2012-2212.** This 1,000 kW IC engine utilizes a combination of dairy digester gas and natural gas. The system became operational in March 2015 and is therefore required to comply with SGIP renewable fuel use requirements. The PDP indicated that the system is offline, and they did not have any communications from the site since 2018. The PDP had been advised by the customer that “the engine was down and will be offline for some time due to relocating caused from the High-Speed Rail right of way.”
- **SCG-SGIP-2012-0156.** This 1,500 kW IC engine utilizes a combination of food processing waste digester gas and natural gas. The system became operational in September 2015 and is therefore required to comply with SGIP renewable fuel use requirements. The PBI performance data provider (PDP) indicated that they have had an outstanding communication issue with this site beginning in June 2018. In March of 2019, this project was decommissioned.

A summary of the 19 blended RFU requirement projects with active warranties during this reporting period is presented in Table 3-3. Table 3-4 shows the history of compliance of all blended biogas projects that have ever been required to comply with SGIP renewable fuel use requirements. Of the 19 blended RFU requirement projects with active warranties, only one was not found to be in-compliance. For that out-of-compliance project, this was the first year that the project was required to meet compliance. Over the course of the program’s RFU compliance, there have been eight projects which were found in compliance some years and out of compliance other years. There were an additional four projects which were never found to meet compliance requirements.



**TABLE 3-3: FUEL USE COMPLIANCE OF BLENDED ON-SITE RFU REQUIREMENT PROJECTS**

| PA       | SGIP Reservation No. | Tech     | Renewable Fuel Type  | Capacity (kW) | Operational Date* | Annual Nat. Gas Energy Flow (MMBtu)† | Renewable Fuel Use | In Compliance?                |
|----------|----------------------|----------|----------------------|---------------|-------------------|--------------------------------------|--------------------|-------------------------------|
| PG&E     | PGE-SGIP-2012-2061   | ICE      | DG - WWTP            | 3800          | 10/31/2013        | 30,708                               | 81%                | Yes                           |
| SCE      | SCE-SGIP-2011-0348   | ICE      | DG - WWTP            | 650           | 6/18/2014         | 9,276                                | 83%                | Yes                           |
| PG&E     | PGE-SGIP-2012-2212   | ICE      | DG - Dairy           | 1000          | 3/5/2015          | N/A                                  | N/A                | System not operational        |
| PG&E     | PGE-SGIP-2011-1966   | ICE      | DG - WWTP            | 1132          | 3/26/2015         | 471                                  | 98%                | Yes                           |
| PG&E     | PGE-SGIP-2011-1987   | ICE      | DG - WWTP            | 1700          | 4/7/2015          | 3,265                                | 83%                | Yes                           |
| SCE      | SCE-SGIP-2012-0450   | ICE      | DG - WWTP            | 1550          | 7/2/2015          | Unk.                                 | Unk.               | Inconclusive; Incomplete Data |
| PG&E     | PGE-SGIP-2012-2112   | ICE      | DG - WWTP            | 190           | 7/3/2015          | Unk.                                 | Unk.               | Data Not Collected by PDP     |
| SoCalGas | SCG-SGIP-2012-0156   | ICE      | DG - Food Processing | 1500          | 9/4/2015          | N/A                                  | N/A                | System Decommissioned         |
| PG&E     | PGE-SGIP-2012-2206   | ICE      | DG - WWTP            | 1266          | 11/13/2015        | Unk.                                 | Unk.               | Data Not Collected by PDP     |
| PG&E     | PGE-SGIP-2013-2484   | MT       | Mult. Fuel Types     | 800           | 8/3/2016          | Unk.                                 | Unk.               | Data Communication Issues     |
| SoCalGas | SCG-SGIP-2014-0205   | FC - CHP | DG - WWTP            | 1400          | 11/15/2016        | 4,898                                | 95%                | Yes                           |
| PG&E     | PGE-SGIP-2014-2788   | MT       | DG - Food Processing | 5.49          | 11/17/2017        | Unk.                                 | Unk.               | Data Not Collected by PDP     |
| SoCalGas | SCG-SGIP-2015-0237   | GT       | DG - WWTP            | 11230         | 3/15/2018         | Unk.                                 | Unk.               | No response from customer     |
| PG&E     | PGE-SGIP-2014-2813   | ICE      | DG - Food Processing | 602           | 10/5/2018         | Unk.                                 | Unk.               | Data Communication Issues     |
| SCE      | SCE-SGIP-2014-1006   | ICE      | Landfill Gas         | 2806.9        | 10/5/2018         | Unk.                                 | Unk.               | Data Not Collected by PDP     |



|      |                    |     |              |       |            |        |      |                              |
|------|--------------------|-----|--------------|-------|------------|--------|------|------------------------------|
| PG&E | PGE-SGIP-2014-2843 | MT  | DG -<br>WWTP | 43.12 | 10/22/2018 | Unk.   | Unk. | Data Communication<br>Issues |
| CSE  | SD-SGIP-2017-1119  | ICE | DG -<br>WWTP | 1200  | 2/19/2019  | 14,586 | 75%  | Yes                          |
| SCE  | SCE-SGIP-2014-0986 | ICE | DG -<br>WWTP | 846   | 3/7/2019   | 977    | 67%  | No                           |
| CSE  | SD-SGIP-2014-0747  | ICE | DG -<br>WWTP | 472.2 | 5/15/2019  | 707    | 77%  | Yes                          |

\* Since assignment of a project’s operational date is subject to individual judgment, the incentive payment date as reported by the PAs is used as a proxy for the operational date for reporting purposes.

† This field represents the natural gas consumption during the 12-month period ending June 30, 2020. A heating value of 1030 BTU/SCF was used.





For this reporting period, the compliance for only eight of the 19 projects were determined. For the remaining projects, the main reason for the inability determine the compliance is either communication issues with the meter systems or the data provider not collecting data. Table 3-5 provides the breakdown of the status of the 19 projects.

**TABLE 3-5: BREAKDOWN OF STATUS FOR THE RFUR REQUIREMENT PROJECTS**

| <b>Category</b>                                   | <b>No. of Projects</b> |
|---|------------------------|
| Received Data. Compliant                          | 7                      |
| Data not collected by data provider               | 4                      |
| Data Communication Issues                         | 3                      |
| System Offline or Decommissioned                  | 2                      |
| Received Data. Compliance could not be determined | 1                      |
| No response from Data Provider                    | 1                      |
| Received Data. Not Compliant                      | 1                      |

### **3.3 FUEL USE AT DIRECTED RFU REQUIREMENT PROJECTS**

It is not possible to use the same method in assessing compliance of directed biogas projects as that used for assessing compliance of blended on-site RFU requirement projects. In blended RFU requirement projects using biogas produced on-site, the metered amount of non-renewable fuel is used to determine if it is less than or equal to 25 percent of the total annual energy input to the RFU requirement project (for PY 2001 – PY 2016 projects). However, in directed biogas RFU requirement projects, metering of SGIP systems captures total fuel use only; it provides no information on how much biogas was produced and allocated to the project.

Assessing compliance of directed biogas projects requires information about off-site biogas production, transportation, and subsequent allocation to customers that may or may not be SGIP participants. Specification of the approach used to assess the balance of injections and extractions is dictated by the properties of transactions at the two points. These properties are summarized in Table 3-6. The properties at the extraction point represent a significant departure from conditions encountered for dedicated and blended on-site RFU requirement projects. Specifically, at the extraction point the transaction type is notional rather than physical, and information is obtained from invoices rather than metering. To assess the system’s balance and thereby enable accurate assessment of the role of SGIP specifically in increasing overall biogas production and consumption, complete information for injections and extractions is required.

**TABLE 3-6: PROPERTIES OF DIRECTED BIOGAS INJECTION AND EXTRACTION**

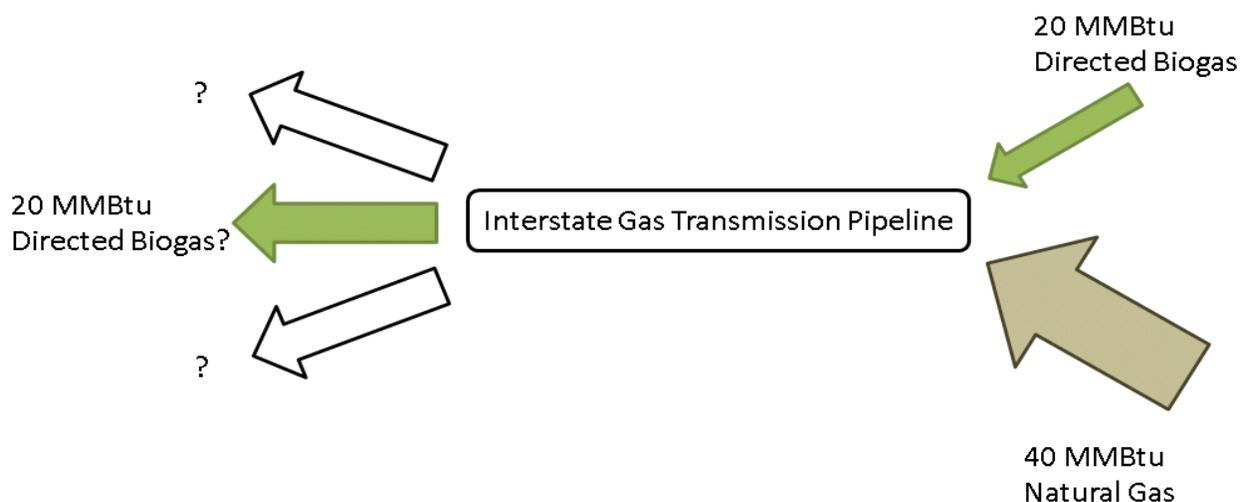
| Property                   | At Injection | At Extraction |
|----------------------------|--------------|---------------|
| Carrier for renewable fuel | Biogas       | Natural Gas   |
| Transaction type           | Physical     | Notional      |
| Information source         | Metering     | Invoices      |

The properties of directed biogas injection and extraction have a direct bearing on information needed to assess renewable fuel use compliance of directed biogas projects. On April 14, 2011, the SGIP PAs and their consultant AESC developed protocols for the audit of directed biogas usage. The audit protocol establishes data and verification requirements and is separated into three elements:

1. **Transfer of Ownership**
2. **Transportation Path and Energy Accounting**
3. **Gas Fuel Consumption**

The transportation path and energy accounting is notional rather than physical. Figure 3-1 is a representative example of the types of issues encountered during verification of the transportation path.

**FIGURE 3-1: REPRESENTATIVE EXAMPLE OF GAS TRANSPORTATION ACCOUNTING ISSUE**



In Figure 3-1, a gas marketer enters into contract with an interstate gas transmission pipeline for the transport of 20 MMBtu of directed biogas and 40 MMBtu of non-renewable natural gas. Assuming no fuel losses or imbalances, the same amount of gas exits the pipeline. Most interstate pipelines or gas hubs have various points at which gas can be delivered. In some cases, the only information regarding directed



biogas allocations is guidance from the gas marketer. In this sense, compliance determinations rely on accurate information provided by program participants.

A similar situation occurs with out-of-state physical storage. If a storage vessel contains both directed biogas and non-renewable natural gas, the green attributes of any withdrawal are completely up to the discretion of the gas marketer. In this sense, the verification process is not truly independent. A hypothetical scenario where a gas marketer sells the same green gas attributed to SGIP projects to another entity outside of California is possible. Compliance determinations made in this report rely on the good faith of documentation provided by gas marketers and renewable fuel supply affidavits submitted to the SGIP PAs. The complete directed biogas audit protocol is included as Appendix B.

When gas marketers procure directed biogas for SGIP projects, they do not purchase renewable fuel for each project and transport it to California under separate contracts. Instead they pool SGIP projects into fleets and procure the amount of biogas required to meet the fleet's monthly biogas requirements. The nature of these transactions requires that compliance determinations be made at the fleet level and not at the individual project level.<sup>17</sup>

### **3.3.1 Fuel Use of Directed Biogas Fleet #1**

As of June 30, 2020, directed biogas fleet #1 consists of 41 electric-only fuel cell projects completed between 2010 and 2013. All 41 projects in fleet #1 completed their directed biogas term before the start of this reporting period and were no longer required to comply with the SGIP's renewable fuel use requirements. A list of the 41 projects included in directed biogas fleet #1 is shown in Table 3-7.

### **3.3.2 Fuel Use of Directed Biogas Fleet #2**

As of June 30, 2020, directed biogas fleet #2 consists of ten fuel cell projects completed between November 2010 and February 2012. All ten projects in fleet #2 completed their directed biogas term before the start of this reporting period and were no longer required to comply with the SGIP's renewable fuel use requirements. A list of the ten projects included in directed biogas fleet #2 is shown in Table 3-7.

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<sup>17</sup> A fleet of directed biogas projects is simply a group of projects whose compliance is determined together. The composition of a directed biogas fleet is determined by how the gas marketer procures biogas for a group of projects.

### **3.3.3 Fuel Use of Directed Biogas Fleet #3**

As of June 30, 2020, directed biogas fleet #3 consists of seven fuel cell projects completed between March 2011 and December 2011. All but one completed their directed biogas term before the start of the remaining period and were no longer required to comply with the SGIP's renewable fuel use requirements. The one project was from PY2011, and therefore required to procure DBG for a period of ten years instead of five years. A list of these seven projects is shown in Table 3-7.

### **3.3.4 Fuel Use of Directed Biogas Fleet #4**

As of June 30, 2020, directed biogas fleet #4 consists of two fuel cell projects completed in December 2011. Due to mechanical failures and difficulties procuring directed biogas during previous reporting periods, these projects had their biogas terms delayed, and consequently both were still subject to evaluation during this reporting period. Based on the compliance protocols described in this report, the compliance determination for the SGIP projects in directed biogas fleet #4 was inconclusive during this reporting period. Insufficient documentation supporting the purchase of biogas was provided for this evaluation period, therefore no compliance determination could be made. A list of these two projects is shown in Table 3-7.

### **3.3.5 Fuel Use of Other Directed Biogas Projects**

There are four projects that are not part of large fleets like those discussed previously. Instead, their biogas procurements and usages are managed by smaller gas schedulers. As of June 30, 2020, all four projects have completed their biogas terms and thus are not required to comply with the SGIP's renewable fuel use requirements. A list of the 64 directed biogas RFU requirement projects is presented in Table 3-7.



**TABLE 3-7: FUEL USE COMPLIANCE OF DIRECTED BIOGAS RFU REQUIREMENT PROJECTS**

| PA   | SGIP Reservation Number | DBG Fleet # | Tech | Capacity (kW) | Operational Date* | DBG Flow Start Date** | Compliance End Date | Annual Natural Gas Energy Flow (MMBtu)† | Renewable Fuel Use (% of Total Energy Input) | Meets Program Renewable Fuel Use Requirements? |
|------|-------------------------|-------------|------|---------------|-------------------|-----------------------|---------------------|---|--|--|
| SCG  | SCG-SGIP-2010-0012      | Fleet #1    | FC   | 1,000         | 01/24/2011        | 10/01/2010            | 9/30/2015           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1853      | Fleet #1    | FC   | 600           | 05/24/2011        | 12/01/2010            | 11/30/2015          | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCE  | SCE-SGIP-2010-0012      | Fleet #1    | FC   | 300           | 08/08/2011        | 12/01/2010            | 11/30/2015          | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1885      | Fleet #1    | FC   | 300           | 05/31/2011        | 01/01/2011            | 12/31/2015          | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1849      | Fleet #1    | FC   | 500           | 05/09/2011        | 02/01/2011            | 1/31/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1856      | Fleet #1    | FC   | 300           | 05/09/2011        | 02/01/2011            | 1/31/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1882      | Fleet #1    | FC   | 400           | 05/24/2011        | 02/01/2011            | 1/31/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1886      | Fleet #1    | FC   | 300           | 05/24/2011        | 02/01/2011            | 1/31/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCE  | SCE-SGIP-2010-0009      | Fleet #1    | FC   | 300           | 08/08/2011        | 03/01/2011            | 2/29/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCG  | SCG-SGIP-2010-0005      | Fleet #1    | FC   | 100           | 09/20/2011        | 03/01/2011            | 2/29/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1851      | Fleet #1    | FC   | 300           | 06/29/2011        | 04/01/2011            | 3/31/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCG  | SCG-SGIP=2010-0011      | Fleet #1    | FC   | 900           | 09/21/2011        | 05/01/2011            | 4/30/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1850      | Fleet #1    | FC   | 420           | 09/07/2011        | 06/01/2011            | 5/31/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1892      | Fleet #1    | FC   | 210           | 09/07/2011        | 06/01/2011            | 5/31/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |



| PA   | SGIP Reservation Number | DBG Fleet # | Tech | Capacity (kW) | Operational Date* | DBG Flow Start Date** | Compliance End Date | Annual Natural Gas Energy Flow (MMBtu)† | Renewable Fuel Use (% of Total Energy Input) | Meets Program Renewable Fuel Use Requirements? |
|------|-------------------------|-------------|------|---------------|-------------------|-----------------------|---------------------|---|--|--|
| PG&E | PGE-SGIP-2010-1893      | Fleet #1    | FC   | 210           | 09/07/2011        | 06/01/2011            | 5/31/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCE  | SCE-SGIP-2010-0014      | Fleet #1    | FC   | 420           | 11/15/2011        | 06/01/2011            | 5/31/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1855      | Fleet #1    | FC   | 300           | 09/29/2011        | 07/01/2011            | 6/30/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCG  | SCG-SGIP-2010-0019      | Fleet #1    | FC   | 420           | 12/15/2011        | 07/01/2011            | 6/30/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCG  | SCG-SGIP-2010-0018      | Fleet #1    | FC   | 420           | 12/15/2011        | 08/01/2011            | 7/31/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCG  | SCG-SGIP-2010-0020      | Fleet #1    | FC   | 420           | 12/15/2011        | 09/01/2011            | 8/31/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCG  | SCG-SGIP-2010-0015      | Fleet #1    | FC   | 420           | 12/16/2011        | 09/01/2011            | 8/31/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| CSE  | SD-SGIP-2009-0375       | Fleet #1    | FC   | 300           | 12/21/2011        | 10/01/2011            | 9/30/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1852      | Fleet #1    | FC   | 400           | 12/29/2011        | 10/01/2011            | 9/30/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1857      | Fleet #1    | FC   | 300           | 12/29/2011        | 10/01/2011            | 9/30/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1858      | Fleet #1    | FC   | 300           | 12/29/2011        | 10/01/2011            | 9/30/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1868      | Fleet #1    | FC   | 400           | 12/29/2011        | 10/01/2011            | 9/30/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1869      | Fleet #1    | FC   | 600           | 12/29/2011        | 10/01/2011            | 9/30/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1876      | Fleet #1    | FC   | 200           | 12/29/2011        | 10/01/2011            | 9/30/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1877      | Fleet #1    | FC   | 200           | 12/29/2011        | 10/01/2011            | 9/30/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |



| PA   | SGIP Reservation Number | DBG Fleet # | Tech | Capacity (kW) | Operational Date* | DBG Flow Start Date** | Compliance End Date | Annual Natural Gas Energy Flow (MMBtu)† | Renewable Fuel Use (% of Total Energy Input) | Meets Program Renewable Fuel Use Requirements? |
|------|-------------------------|-------------|------|---------------|-------------------|-----------------------|---------------------|---|--|--|
| CSE  | SD-SGIP-2010-0374       | Fleet #1    | FC   | 210           | 02/27/2012        | 12/01/2011            | 11/30/2016          | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| CSE  | SD-SGIP-2010-0376       | Fleet #1    | FC   | 210           | 02/27/2012        | 12/01/2011            | 11/30/2016          | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1860      | Fleet #1    | FC   | 800           | 02/28/2012        | 12/01/2011            | 11/30/2016          | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCE  | SCE-SGIP-2010-0011      | Fleet #1    | FC   | 210           | 03/28/2012        | 12/01/2011            | 11/30/2016          | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCE  | SCE-SGIP-2010-0028      | Fleet #1    | FC   | 600           | 03/28/2012        | 12/01/2011            | 11/30/2016          | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCE  | SCE-SGIP-2010-0039      | Fleet #1    | FC   | 315           | 08/08/2012        | 04/01/2012            | 3/31/2017           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCE  | SCE-SGIP-2010-0038      | Fleet #1    | FC   | 630           | 10/04/2012        | 05/01/2012            | 4/30/2017           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCE  | SCE-SGIP-2010-0037      | Fleet #1    | FC   | 1,050         | 12/24/2012        | 06/01/2012            | 5/31/2017           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCE  | SCE-SGIP-2010-0041      | Fleet #1    | FC   | 840           | 12/24/2012        | 07/01/2012            | 6/30/2017           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCE  | SCE-SGIP-2010-0024      | Fleet #1    | FC   | 1,050         | 03/29/2013        | 10/01/2012            | 9/30/2017           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCG  | SCG-SGIP-2010-0033      | Fleet #1    | FC   | 105           | 06/19/2013        | 03/01/2013            | 2/28/2018           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCG  | SCG-SGIP-2010-0034      | Fleet #1    | FC   | 210           | 06/20/2013        | 03/01/2013            | 2/28/2018           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2009-1810      | Fleet #2    | FC   | 400           | 11/10/2010        | 09/01/2010            | 8/31/2015           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2009-1811      | Fleet #2    | FC   | 400           | 11/10/2010        | 09/01/2010            | 8/31/2015           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2009-1812      | Fleet #2    | FC   | 400           | 11/10/2010        | 09/01/2010            | 8/31/2015           | No Longer Required                      | No Longer Required                           | No Longer Required                             |



| PA   | SGIP Reservation Number | DBG Fleet # | Tech | Capacity (kW) | Operational Date* | DBG Flow Start Date** | Compliance End Date | Annual Natural Gas Energy Flow (MMBtu)† | Renewable Fuel Use (% of Total Energy Input) | Meets Program Renewable Fuel Use Requirements? |
|------|-------------------------|-------------|------|---------------|-------------------|-----------------------|---------------------|---|--|--|
| PG&E | PGE-SGIP-2009-1802      | Fleet #2    | FC   | 400           | 12/22/2010        | 10/01/2010            | 9/30/2015           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| CSE  | SD-SGIP-2010-0369       | Fleet #2    | FC   | 400           | 12/31/2010        | 10/01/2010            | 9/30/2015           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| CSE  | SD-SGIP-2010-0370       | Fleet #2    | FC   | 400           | 12/31/2010        | 10/01/2010            | 9/30/2015           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCE  | SCE-SGIP-2010-0004      | Fleet #2    | FC   | 800           | 03/23/2011        | 10/01/2010            | 9/30/2015           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1859      | Fleet #2    | FC   | 500           | 03/11/2011        | 12/01/2010            | 11/30/2015          | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1874      | Fleet #2    | FC   | 500           | 09/07/2011        | 03/01/2011            | 2/29/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1926      | Fleet #2    | FC   | 400           | 02/28/2012        | 12/01/2011            | 11/30/2016          | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1871      | Fleet #3    | FC   | 300           | 03/14/2011        | 11/1/2010             | 10/31/2015          | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCE  | SCE-SGIP-2010-0022      | Fleet #3    | FC   | 400           | 08/08/2011        | 11/1/2010             | 10/31/2015          | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| SCE  | SCE-SGIP-2010-0023      | Fleet #3    | FC   | 400           | 08/08/2011        | 11/1/2010             | 10/31/2015          | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1878      | Fleet #3    | FC   | 500           | 06/29/2011        | 06/01/2011            | 5/31/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1929      | Fleet #3    | FC   | 420           | 12/29/2011        | 09/01/2011            | 8/31/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2011-1950      | Fleet #3    | FC   | 500           | 04/11/2012        | 9/1/2011              | 8/31/2021           | Unknown                                 | Unknown                                      | Unknown  |
| SCE  | SCE-SGIP-2010-0035      | Fleet #3    | FC   | 1,110         | 12/17/2012        | 10/1/2011             | 9/30/2016           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| CSE  | SD-SGIP-2009-0361       | Fleet #4    | FC   | 1,400         | 12/21/2011        | 07/01/2012            | 4/30/2019           | No Longer Required                      | No Longer Required                           | No Longer Required                             |



| PA   | SGIP Reservation Number | DBG Fleet # | Tech | Capacity (kW) | Operational Date* | DBG Flow Start Date** | Compliance End Date | Annual Natural Gas Energy Flow (MMBtu)† | Renewable Fuel Use (% of Total Energy Input) | Meets Program Renewable Fuel Use Requirements? |
|------|-------------------------|-------------|------|---------------|-------------------|-----------------------|---------------------|---|--|--|
| CSE  | SD-SGIP-2009-0363       | Fleet #4    | FC   | 2,800         | 12/21/2011        | 07/01/2012            | 4/30/2019           | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2009-1805      | Other       | FC   | 200           | 01/18/2011        | 01/18/2011            | 01/17/2016          | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| CSE  | SD-SGIP-2010-0398       | Other       | FC   | 420           | 05/01/2012        | 05/01/2012            | 04/30/2017          | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| CSE  | SD-SGIP-2010-0399       | Other       | FC   | 630           | 05/01/2012        | 05/01/2012            | 04/30/2017          | No Longer Required                      | No Longer Required                           | No Longer Required                             |
| PG&E | PGE-SGIP-2010-1914      | Other       | FC   | 420           | 05/29/2013        | 05/29/2013            | 5/28/2018           | No Longer Required                      | No Longer Required                           | No Longer Required                             |

\* Since assignment of a project’s operational date is subject to individual judgment, the incentive payment date as reported by the PAs is used as a proxy for the operational date for reporting purposes.

\*\* This field represents the date the project began consuming directed biogas.

† This field represents the natural gas consumption during the 12-month period ending June 30, 2020. A heating value of 1030 BTU/SCF was used.

## 4 GREENHOUSE GAS EMISSIONS

Information regarding GHG emission impacts is presented in this section. The GHG emission information presented here is derived from data used to prepare the 2018-2019 SGIP Impacts Evaluation Report (the most recent public source of SGIP RFU project performance data). Additionally, key factors that could influence GHG emission impacts from renewable fuel projects in the future are discussed.

Table 4-1 presents capacity-weighted average GHG emission results for renewable projects developed for the most recent (2018-2019) SGIP Impact Evaluation Report. GHG emission impacts are calculated as the difference between SGIP emissions and the total baseline emissions. Results in Table 4-1 suggest one important observation: The baseline assumed for the biogas (i.e., whether the biogas would have been vented to the atmosphere or flared) is the most influential determinant of GHG emission impacts. This is due to the global warming potential of methane (CH<sub>4</sub>) vented directly into the atmosphere, which is much higher than the global warming potential of CO<sub>2</sub> resulting from the flaring of CH<sub>4</sub>.

**TABLE 4-1: SUMMARY OF GHG EMISSION IMPACTS FROM SGIP RENEWABLY FUELED PROJECTS IN 2019**

| Baseline Biogas Assumption | Prime Mover Technology     | Average GHG Impact Rate (Metric Tons CO <sub>2</sub> eq / MWh) |
|----------------------------|----------------------------|--|
| Flare                      | CHP fuel cell              | -0.25  |
|                            | Electric-only fuel cell    | -0.13  |
|                            | Gas Turbine                | -0.29  |
|                            | Internal combustion engine | -0.28  |
|                            | Microturbine               | -0.28  |
| Vent                       | Internal combustion engine | -4.74  |

Requirements regarding venting and flaring of biogas projects are governed by a variety of regulations in California. At the local level, venting and flaring at the different types of biogas facilities is regulated by California’s 35 air quality agencies.<sup>18</sup> At the state level, the California Air Resources Board (CARB) provides guidelines for control of methane and other volatile organic compounds from biogas facilities.<sup>19</sup> At the

<sup>18</sup> An overview of California’s air quality districts is available at: <http://www.capcoa.org>

<sup>19</sup> In June of 2007, CARB approved the Landfill Methane Capture Strategy.

See <http://www.arb.ca.gov/cc/landfills/landfills.htm> for additional information.



federal level, New Source Performance Standards and Emission Guidelines regulate methane capture and use.<sup>20</sup>

The baseline assumption (i.e., flaring versus venting) made for biogas used in SGIP systems is the factor exerting the greatest influence over estimates of GHG impacts. Biogas projects for which a venting baseline is assumed achieve significantly greater GHG reductions per unit of electricity generated than those for which a flaring baseline is assumed. Additional information on the GHG impact methodology and findings are available in the 2018-2019 SGIP Impact Evaluation Report.

Another important factor affecting GHG emissions from biogas projects are the finite biogas contracts associated with directed biogas projects. Directed biogas projects represent a significant share of online (not decommissioned or offline) SGIP biogas project capacity. These directed biogas projects are a significant driver behind the SGIP's historical GHG reductions. However, all but one DBG projects have now completed their biogas contracts. This means that going forward, these projects will now operate on non-renewable fuel and will not realize the GHG reductions associated with biogas which has adversely affected program's overall GHG impacts.

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<sup>20</sup> EPA's Landfill Methane Outreach Program provides background information on control of methane at the federal level. See: <http://www.epa.gov/lmop/>



## APPENDIX A LIST OF ALL SGIP PROJECTS UTILIZING RENEWABLE FUEL

All SGIP projects supplied with renewable fuel are listed in Table A-1. Renewable Fuel Use (RFU) requirement projects subject to renewable fuel use requirements and exempt from heat recovery requirements are identified in the column titled “RFUR Project”. Only a portion of these projects (about 65 percent by count) are also equipped with a non-renewable fuel supply. These projects are identified in the “Non-Renewable Fuel Supply” column.

**TABLE A-1: SGIP PROJECTS UTILIZING RENEWABLE FUEL**

| SGIP Reservation No. | PA  | Tech | Renewable Fuel Type           | Size (kW) | Operational Date* | RFUR Project | Non-Renewable Fuel Supply |
|----------------------|-----|------|-------------------------------|-----------|-------------------|--------------|---------------------------|
| PGE-SGIP-2016-3004   | PGE | ICE  | DG - WWTP                     | 477.1     | 4/23/2020         | Yes          | Yes                       |
| PGE-SGIP-2017-3340   | PGE | ICE  | DG - Dairy                    | 73.4      | 4/2/2020          | Yes          | Yes                       |
| SD-SGIP-2014-0747    | CSE | ICE  | DG - WWTP                     | 472.2     | 5/15/2019         | Yes          | Yes                       |
| SCG-SGIP-2015-0237   | SCG | GT   | DG - WWTP                     | 11230     | 3/15/2018         | Yes          | Yes                       |
| SCE-SGIP-2014-0986   | SCE | ICE  | DG - WWTP                     | 846       | 3/7/2019          | Yes          | Yes                       |
| PGE-SGIP-2013-2484   | PGE | MT   | Multiple Renewable Fuel Types | 800       | 8/3/2016          | Yes          | Yes                       |
| PGE-SGIP-2012-2206   | PGE | ICE  | DG - WWTP                     | 1266      | 11/13/2015        | Yes          | Yes                       |
| PGE-SGIP-2014-2813   | PGE | ICE  | DG - Food Processing          | 602       | 10/5/2018         | Yes          | Yes                       |
| SD-SGIP-2017-1119    | CSE | ICE  | DG - WWTP                     | 1200      | 2/19/2019         | Yes          | Yes                       |
| SCG-SGIP-2012-0156   | SCG | ICE  | DG - Food Processing          | 1500      | 9/4/2015          | Yes          | Yes                       |
| PGE-SGIP-2016-3030   | PGE | ICE  | DG - Dairy                    | 1000      | 8/21/2017         | Yes          | No                        |
| SCG-SGIP-2012-0158   | SCG | MT   | DG - WWTP                     | 150       | 1/19/2017         | Yes          | No                        |
| PGE-SGIP-2014-2832   | PGE | ICE  | DG - Dairy                    | 800       | 11/29/2016        | Yes          | No                        |
| SCE-SGIP-2012-0413   | SCE | MT   | DG - Food Processing          | 750       | 2/26/2014         | Yes          | No                        |
| PGE-SGIP-2012-2110   | PGE | ICE  | DG - Food Processing          | 800       | 7/25/2014         | Yes          | No                        |
| PGE-SGIP-2016-3048   | PGE | ICE  | DG - Dairy                    | 600       | 10/18/2017        | Yes          | No                        |
| PGE-SGIP-2015-2852   | PGE | ICE  | Syngas - Food Processing      | 480       | 12/18/2015        | Yes          | No                        |
| PGE-SGIP-2014-2843   | PGE | MT   | DG - WWTP                     | 43.12     | 10/22/2018        | Yes          | Yes                       |
| PGE-SGIP-2012-2112   | PGE | ICE  | DG - WWTP                     | 190       | 7/3/2015          | Yes          | Yes                       |
| PGE-SGIP-2014-2854   | PGE | ICE  | Syngas - Food Processing      | 160       | 11/13/2015        | Yes          | No                        |
| PGE-SGIP-2012-2415   | PGE | MT   | Landfill Gas                  | 65        | 7/31/2014         | Yes          | No                        |
| PGE-SGIP-2012-2052   | PGE | ICE  | Landfill Gas                  | 2852      | 12/21/2015        | Yes          | No                        |
| PGE-SGIP-2011-1987   | PGE | ICE  | DG - WWTP                     | 1700      | 4/7/2015          | Yes          | Yes                       |
| PGE-SGIP-2014-2597   | PGE | ICE  | Landfill Gas                  | 220       | 6/28/2016         | Yes          | No                        |
| PGE-SGIP-2014-2541   | PGE | ICE  | Syngas - Food Processing      | 160       | 9/11/2015         | Yes          | No                        |



| SGIP Reservation No. | PA  | Tech       | Renewable Fuel Type     | Size (kW) | Operational Date* | RFUR Project | Non-Renewable Fuel Supply |
|----------------------|-----|------------|-------------------------|-----------|-------------------|--------------|---------------------------|
| SCE-SGIP-2014-1006   | SCE | ICE        | Landfill Gas            | 2806.9    | 10/5/2018         | Yes          | Yes                       |
| PGE-SGIP-2011-1966   | PGE | ICE        | DG - WWTP               | 1132      | 3/26/2015         | Yes          | Yes                       |
| PGE-SGIP-2014-2788   | PGE | MT         | DG - Food Processing    | 5.49      | 11/17/2017        | Yes          | Yes                       |
| PGE-SGIP-2011-2050   | PGE | ICE        | DG - Food Processing    | 1000      | 4/7/2017          | Yes          | No                        |
| SCE-SGIP-2011-0348   | SCE | ICE        | DG - WWTP               | 650       | 6/18/2014         | Yes          | Yes                       |
| PGE-SGIP-2012-2061   | PGE | ICE        | DG - WWTP               | 3800      | 10/31/2013        | Yes          | Yes                       |
| SCE-SGIP-2012-0450   | SCE | ICE        | DG - WWTP               | 1550      | 7/2/2015          | Yes          | Yes                       |
| SCE-SGIP-2014-0937   | SCE | ICE        | DG - Dairy              | 800       | 10/24/2017        | Yes          | No                        |
| SCE-SGIP-2012-0433   | SCE | ICE        | DG - WWTP               | 627       | 4/21/2015         | Yes          | No                        |
| SD-SGIP-2012-0486    | CSE | ICE        | DG - WWTP               | 145       | 11/26/2014        | Yes          | No                        |
| PGE-SGIP-2012-2432   | PGE | MT         | Landfill Gas            | 65        | 9/12/2014         | Yes          | No                        |
| SCG-SGIP-2014-0205   | SCG | FC - CHP   | DG - WWTP               | 1400      | 11/15/2016        | Yes          | Yes                       |
| PGE-SGIP-2011-2049   | PGE | ICE        | DG - Food Processing    | 1000      | 4/7/2017          | Yes          | No                        |
| PGE-SGIP-2012-2212   | PGE | ICE        | DG - Dairy              | 1000      | 3/5/2015          | Yes          | Yes                       |
| SCG-SGIP-2010-0034   | SCG | FC - Elec. | TBD (Directed)          | 210       | 6/20/2013         | Yes          | Yes                       |
| SCG-SGIP-2010-0033   | SCG | FC - Elec. | TBD (Directed)          | 105       | 6/19/2013         | Yes          | Yes                       |
| PGE-SGIP-2010-1914   | PGE | FC - Elec. | TBD (Directed)          | 420       | 5/29/2013         | Yes          | Yes                       |
| SCE-SGIP-2010-0024   | SCE | FC - Elec. | TBD (Directed)          | 1050      | 3/29/2013         | Yes          | Yes                       |
| SCE-SGIP-2010-0037   | SCE | FC - Elec. | TBD (Directed)          | 1050      | 12/24/2012        | Yes          | Yes                       |
| SCE-SGIP-2010-0041   | SCE | FC - Elec. | TBD (Directed)          | 840       | 12/24/2012        | Yes          | Yes                       |
| SCG-SGIP-2010-0026   | SCG | FC - CHP   | DG - WWTP               | 2800      | 12/21/2012        | Yes          | Yes                       |
| SCE-SGIP-2010-0035   | SCE | FC - CHP   | TBD (Directed)          | 1110      | 12/17/2012        | Yes          | Yes                       |
| PGE-SGIP-2010-1867   | PGE | FC - CHP   | DG - WWTP               | 1400      | 11/29/2012        | Yes          | Yes                       |
| SCE-SGIP-2010-0038   | SCE | FC - Elec. | TBD (Directed)          | 630       | 10/4/2012         | Yes          | Yes                       |
| SCE-SGIP-2010-0039   | SCE | FC - Elec. | TBD (Directed)          | 315       | 8/8/2012          | Yes          | Yes                       |
| SCE-SGIP-2007-0006   | SCE | MT         | Landfill Gas            | 750       | 6/12/2012         | Yes          | No                        |
| SD-SGIP-2010-0398    | CSE | FC - Elec. | TBD (Directed)          | 420       | 5/1/2012          | Yes          | Yes                       |
| SD-SGIP-2010-0399    | CSE | FC - Elec. | TBD (Directed)          | 630       | 5/1/2012          | Yes          | Yes                       |
| PGE-SGIP-2011-1950   | PGE | FC - Elec. | Landfill Gas (Directed) | 500       | 4/11/2012         | Yes          | Yes                       |
| SCE-SGIP-2009-0013   | SCE | FC - CHP   | DG - WWTP               | 600       | 3/28/2012         | Yes          | Yes                       |
| SCE-SGIP-2010-0011   | SCE | FC - Elec. | TBD (Directed)          | 210       | 3/28/2012         | Yes          | Yes                       |
| SCE-SGIP-2010-0028   | SCE | FC - Elec. | TBD (Directed)          | 600       | 3/28/2012         | Yes          | Yes                       |
| PGE-SGIP-2010-1860   | PGE | FC - Elec. | TBD (Directed)          | 800       | 2/28/2012         | Yes          | Yes                       |
| PGE-SGIP-2010-1926   | PGE | FC - Elec. | Landfill Gas (Directed) | 400       | 2/28/2012         | Yes          | Yes                       |
| SD-SGIP-2010-0374    | CSE | FC - Elec. | TBD (Directed)          | 210       | 2/27/2012         | Yes          | Yes                       |
| SD-SGIP-2010-0376    | CSE | FC - Elec. | TBD (Directed)          | 210       | 2/27/2012         | Yes          | Yes                       |
| PGE-SGIP-2010-1852   | PGE | FC - Elec. | TBD (Directed)          | 400       | 12/29/2011        | Yes          | Yes                       |



| SGIP Reservation No. | PA  | Tech       | Renewable Fuel Type     | Size (kW) | Operational Date* | RFUR Project | Non-Renewable Fuel Supply |
|----------------------|-----|------------|-------------------------|-----------|-------------------|--------------|---------------------------|
| PGE-SGIP-2010-1857   | PGE | FC - Elec. | TBD (Directed)          | 300       | 12/29/2011        | Yes          | Yes                       |
| PGE-SGIP-2010-1858   | PGE | FC - Elec. | Landfill Gas (Directed) | 300       | 12/29/2011        | Yes          | Yes                       |
| PGE-SGIP-2010-1868   | PGE | FC - Elec. | TBD (Directed)          | 400       | 12/29/2011        | Yes          | Yes                       |
| PGE-SGIP-2010-1869   | PGE | FC - Elec. | TBD (Directed)          | 600       | 12/29/2011        | Yes          | Yes                       |
| PGE-SGIP-2010-1876   | PGE | FC - Elec. | TBD (Directed)          | 200       | 12/29/2011        | Yes          | Yes                       |
| PGE-SGIP-2010-1877   | PGE | FC - Elec. | TBD (Directed)          | 200       | 12/29/2011        | Yes          | Yes                       |
| PGE-SGIP-2010-1929   | PGE | FC - Elec. | Landfill Gas (Directed) | 420       | 12/29/2011        | Yes          | Yes                       |
| SD-SGIP-2009-0361    | CSE | FC - CHP   | DG - WWTP (Directed)    | 1400      | 12/21/2011        | Yes          | Yes                       |
| SD-SGIP-2009-0362    | CSE | FC - CHP   | DG - WWTP               | 300       | 12/21/2011        | Yes          | Yes                       |
| SD-SGIP-2009-0363    | CSE | FC - CHP   | DG - WWTP (Directed)    | 2800      | 12/21/2011        | Yes          | Yes                       |
| SD-SGIP-2010-0375    | CSE | FC - Elec. | TBD (Directed)          | 300       | 12/21/2011        | Yes          | Yes                       |
| SCG-SGIP-2010-0015   | SCG | FC - Elec. | Landfill Gas (Directed) | 420       | 12/16/2011        | Yes          | Yes                       |
| SCG-SGIP-2010-0018   | SCG | FC - Elec. | Landfill Gas (Directed) | 420       | 12/15/2011        | Yes          | Yes                       |
| SCG-SGIP-2010-0019   | SCG | FC - Elec. | Landfill Gas (Directed) | 420       | 12/15/2011        | Yes          | Yes                       |
| SCG-SGIP-2010-0020   | SCG | FC - Elec. | Landfill Gas (Directed) | 420       | 12/15/2011        | Yes          | Yes                       |
| SCE-SGIP-2010-0014   | SCE | FC - Elec. | TBD (Directed)          | 420       | 11/15/2011        | Yes          | Yes                       |
| SCG-SGIP-2007-0036   | SCG | ICE        | DG - WWTP               | 340       | 11/1/2011         | Yes          | No                        |
| PGE-SGIP-2010-1855   | PGE | FC - Elec. | Landfill Gas (Directed) | 300       | 9/29/2011         | Yes          | Yes                       |
| SCE-SGIP-2007-0017   | SCE | ICE        | DG - WWTP               | 364       | 9/27/2011         | Yes          | No                        |
| SCG-SGIP-2010-0011   | SCG | FC - Elec. | Landfill Gas (Directed) | 900       | 9/21/2011         | Yes          | Yes                       |
| SCG-SGIP-2010-0005   | SCG | FC - Elec. | Landfill Gas (Directed) | 100       | 9/20/2011         | Yes          | Yes                       |
| PGE-SGIP-2010-1850   | PGE | FC - Elec. | Landfill Gas (Directed) | 420       | 9/7/2011          | Yes          | Yes                       |
| PGE-SGIP-2010-1874   | PGE | FC - Elec. | Landfill Gas (Directed) | 500       | 9/7/2011          | Yes          | Yes                       |
| PGE-SGIP-2010-1892   | PGE | FC - Elec. | Landfill Gas (Directed) | 210       | 9/7/2011          | Yes          | Yes                       |
| PGE-SGIP-2010-1893   | PGE | FC - Elec. | Landfill Gas (Directed) | 210       | 9/7/2011          | Yes          | Yes                       |
| SCE-SGIP-2009-0003   | SCE | FC - CHP   | DG - WWTP               | 300       | 8/30/2011         | Yes          | Yes                       |
| SCE-SGIP-2010-0009   | SCE | FC - Elec. | Landfill Gas (Directed) | 300       | 8/8/2011          | Yes          | Yes                       |
| SCE-SGIP-2010-0012   | SCE | FC - Elec. | Landfill Gas (Directed) | 300       | 8/8/2011          | Yes          | Yes                       |
| SCE-SGIP-2010-0022   | SCE | FC - Elec. | Landfill Gas (Directed) | 400       | 8/8/2011          | Yes          | Yes                       |
| SCE-SGIP-2010-0023   | SCE | FC - Elec. | Landfill Gas (Directed) | 400       | 8/8/2011          | Yes          | Yes                       |
| SCG-SGIP-2007-0013   | SCG | ICE        | DG - WWTP               | 150       | 7/13/2011         | Yes          | No                        |
| PGE-SGIP-2010-1851   | PGE | FC - Elec. | Landfill Gas (Directed) | 300       | 6/29/2011         | Yes          | Yes                       |
| PGE-SGIP-2010-1878   | PGE | FC - Elec. | Landfill Gas (Directed) | 500       | 6/29/2011         | Yes          | Yes                       |
| PGE-SGIP-2010-1885   | PGE | FC - Elec. | Landfill Gas (Directed) | 300       | 5/31/2011         | Yes          | Yes                       |
| PGE-SGIP-2010-1853   | PGE | FC - Elec. | Landfill Gas (Directed) | 600       | 5/24/2011         | Yes          | Yes                       |
| PGE-SGIP-2010-1882   | PGE | FC - Elec. | Landfill Gas (Directed) | 400       | 5/24/2011         | Yes          | Yes                       |
| PGE-SGIP-2010-1886   | PGE | FC - Elec. | Landfill Gas (Directed) | 300       | 5/24/2011         | Yes          | Yes                       |



| SGIP Reservation No. | PA  | Tech       | Renewable Fuel Type     | Size (kW) | Operational Date* | RFUR Project | Non-Renewable Fuel Supply |
|----------------------|-----|------------|-------------------------|-----------|-------------------|--------------|---------------------------|
| PGE-SGIP-2010-1849   | PGE | FC - Elec. | Landfill Gas (Directed) | 500       | 5/9/2011          | Yes          | Yes                       |
| PGE-SGIP-2010-1856   | PGE | FC - Elec. | Landfill Gas (Directed) | 300       | 5/9/2011          | Yes          | Yes                       |
| SCE-SGIP-2010-0004   | SCE | FC - CHP   | Landfill Gas (Directed) | 800       | 3/23/2011         | Yes          | Yes                       |
| PGE-SGIP-2010-1871   | PGE | FC - Elec. | Landfill Gas (Directed) | 300       | 3/14/2011         | Yes          | Yes                       |
| PGE-SGIP-2010-1859   | PGE | FC - Elec. | Landfill Gas (Directed) | 500       | 3/11/2011         | Yes          | Yes                       |
| SCG-SGIP-2010-0012   | SCG | FC - Elec. | Landfill Gas (Directed) | 1000      | 1/24/2011         | Yes          | Yes                       |
| PGE-SGIP-2009-1805   | PGE | FC - Elec. | Landfill Gas (Directed) | 200       | 1/18/2011         | Yes          | Yes                       |
| SD-SGIP-2010-0369    | CSE | FC - CHP   | Landfill Gas (Directed) | 400       | 12/31/2010        | Yes          | Yes                       |
| SD-SGIP-2010-0370    | CSE | FC - CHP   | Landfill Gas (Directed) | 400       | 12/31/2010        | Yes          | Yes                       |
| PGE-SGIP-2007-1759   | PGE | ICE        | DG - WWTP               | 1696      | 12/24/2010        | Yes          | No                        |
| PGE-SGIP-2007-1761   | PGE | ICE        | DG - WWTP               | 330       | 12/23/2010        | Yes          | No                        |
| PGE-SGIP-2009-1802   | PGE | FC - Elec. | Landfill Gas (Directed) | 400       | 12/22/2010        | Yes          | Yes                       |
| PGE-SGIP-2009-1810   | PGE | FC - Elec. | Landfill Gas (Directed) | 400       | 11/10/2010        | Yes          | Yes                       |
| PGE-SGIP-2009-1811   | PGE | FC - Elec. | Landfill Gas (Directed) | 400       | 11/10/2010        | Yes          | Yes                       |
| PGE-SGIP-2009-1812   | PGE | FC - Elec. | Landfill Gas (Directed) | 400       | 11/10/2010        | Yes          | Yes                       |
| SCE-SGIP-2010-0334   | SCE | FC - CHP   | DG - WWTP               | 250       | 10/31/2010        | Yes          | Yes                       |
| SCE-SGIP-2010-0002   | SCE | FC - CHP   | DG - WWTP               | 500       | 10/31/2010        | Yes          | Yes                       |
| SD-SGIP-2007-0351    | CSE | ICE        | DG - WWTP               | 560       | 4/16/2010         | Yes          | Yes                       |
| PGE-SGIP-2007-1775   | PGE | ICE        | DG - Dairy              | 75        | 2/3/2010          | Yes          | No                        |
| SCG-SGIP-2006-0012   | SCG | FC - CHP   | DG - WWTP               | 900       | 12/18/2009        | Yes          | Yes                       |
| SCG-SGIP-2008-0003   | SCG | FC - CHP   | DG - Food Processing    | 600       | 12/14/2009        | Yes          | Yes                       |
| PGE-SGIP-2007-1749   | PGE | ICE        | DG - WWTP               | 130       | 11/9/2009         | Yes          | Yes                       |
| SCG-SGIP-2006-0036   | SCG | FC - CHP   | DG - WWTP               | 1200      | 10/27/2008        | Yes          | Yes                       |
| PGE-SGIP-2006-1498   | PGE | MT         | Landfill Gas            | 210       | 8/5/2008          | Yes          | No                        |
| PGE-SGIP-2006-1640   | PGE | ICE        | DG - WWTP               | 643       | 7/29/2008         | Yes          | No                        |
| PGE-SGIP-2006-1490   | PGE | FC - CHP   | DG - WWTP               | 600       | 4/24/2008         | Yes          | Yes                       |
| SD-SGIP-2005-0270    | CSE | MT         | Landfill Gas            | 210       | 4/4/2008          | Yes          | No                        |
| SCE-SGIP-2006-0062   | SCE | FC - CHP   | DG - WWTP               | 900       | 3/4/2008          | Yes          | Yes                       |
| SCG-SGIP-2006-0014   | SCG | ICE        | Landfill Gas            | 1030      | 2/21/2008         | Yes          | No                        |
| SCG-SGIP-2005-0082   | SCG | ICE        | DG - Food Processing    | 1080      | 1/15/2008         | Yes          | No                        |
| PGE-SGIP-2006-1577   | PGE | ICE        | DG - Dairy              | 80        | 12/31/2007        | Yes          | No                        |
| SCE-SGIP-2006-0094   | SCE | ICE        | DG - WWTP               | 500       | 11/8/2007         | Yes          | No                        |
| PGE-SGIP-2006-1528   | PGE | MT         | DG - Food Processing    | 70        | 6/15/2007         | Yes          | No                        |
| PGE-SGIP-2005-1298   | PGE | MT         | DG - WWTP               | 250       | 6/11/2007         | No           | Yes                       |
| PGE-SGIP-2006-1559   | PGE | ICE        | DG - WWTP               | 160       | 5/16/2007         | Yes          | No                        |
| SCE-SGIP-2005-0093   | SCE | ICE        | Landfill Gas            | 1030      | 3/16/2007         | Yes          | No                        |
| PGE-SGIP-2005-1313   | PGE | MT         | DG - WWTP               | 240       | 3/6/2007          | Yes          | Yes                       |



| SGIP Reservation No. | PA  | Tech     | Renewable Fuel Type  | Size (kW) | Operational Date* | RFUR Project | Non-Renewable Fuel Supply |
|----------------------|-----|----------|----------------------|-----------|-------------------|--------------|---------------------------|
| PGE-SGIP-2003-0298   | PGE | MT       | DG - WWTP            | 30        | 1/31/2007         | Yes          | No                        |
| PGE-SGIP-2006-1505   | PGE | ICE      | Landfill Gas         | 970       | 11/24/2006        | Yes          | No                        |
| PGE-SGIP-2005-1308   | PGE | ICE      | DG - Dairy           | 400       | 11/17/2006        | Yes          | No                        |
| SCE-SGIP-2004-0159   | SCE | ICE      | DG - WWTP            | 704       | 10/26/2006        | Yes          | Yes                       |
| SCE-SGIP-2004-0158   | SCE | ICE      | DG - WWTP            | 704       | 10/25/2006        | Yes          | Yes                       |
| PGE-SGIP-2005-1316   | PGE | ICE      | Landfill Gas         | 970       | 10/2/2006         | Yes          | No                        |
| PGE-SGIP-2005-1222   | PGE | ICE      | Landfill Gas         | 970       | 7/5/2006          | Yes          | No                        |
| PGE-SGIP-2004-0658   | PGE | ICE      | DG - Dairy           | 160       | 5/22/2006         | Yes          | No                        |
| PGE-SGIP-2004-0856   | PGE | MT       | Landfill Gas         | 210       | 5/5/2006          | Yes          | No                        |
| PGE-SGIP-2005-1297   | PGE | MT       | DG - WWTP            | 280       | 4/7/2006          | Yes          | No                        |
| PGE-SGIP-2003-0313   | PGE | MT       | DG - WWTP            | 300       | 3/16/2006         | Yes          | No                        |
| PGE-SGIP-2003-0483   | PGE | ICE      | DG - Dairy           | 300       | 1/13/2006         | Yes          | No                        |
| PGE-SGIP-2004-0833   | PGE | MT       | DG - Food Processing | 70        | 11/7/2005         | No           | Yes                       |
| PGE-SGIP-2004-0653   | PGE | FC - CHP | DG - Food Processing | 1000      | 8/9/2005          | No           | Yes                       |
| PGE-SGIP-2004-0747   | PGE | MT       | DG - WWTP            | 60        | 7/18/2005         | Yes          | No                        |
| SCE-SGIP-2003-0038   | SCE | MT       | DG - WWTP            | 250       | 7/12/2005         | Yes          | No                        |
| PGE-SGIP-2004-0842A  | PGE | MT       | DG - WWTP            | 60        | 5/27/2005         | Yes          | No                        |
| SCE-SGIP-2003-0008   | SCE | MT       | Landfill Gas         | 70        | 5/11/2005         | Yes          | No                        |
| SCE-SGIP-2003-0017   | SCE | ICE      | DG - WWTP            | 500       | 5/11/2005         | Yes          | Yes                       |
| SCE-SGIP-2003-0045   | SCE | FC - CHP | DG - WWTP            | 250       | 4/19/2005         | Yes          | No                        |
| PGE-SGIP-2004-0640   | PGE | MT       | Landfill Gas         | 70        | 4/14/2005         | Yes          | No                        |
| PGE-SGIP-2004-0641   | PGE | MT       | Landfill Gas         | 70        | 4/14/2005         | Yes          | No                        |
| SCE-SGIP-2003-0092   | SCE | FC - CHP | DG - WWTP            | 500       | 3/11/2005         | Yes          | Yes                       |
| PGE-SGIP-2003-0379   | PGE | MT       | Landfill Gas         | 280       | 1/14/2005         | Yes          | No                        |
| SD-SGIP-2001-0023    | CSE | MT       | DG - WWTP            | 360       | 9/3/2004          | No           | No                        |
| PGE-SGIP-2003-0514   | PGE | MT       | DG - WWTP            | 90        | 5/19/2004         | Yes          | No                        |
| SD-SGIP-2001-0026    | CSE | MT       | DG - WWTP            | 120       | 4/23/2004         | No           | No                        |
| SCE-SGIP-2002-0074   | SCE | MT       | Landfill Gas         | 300       | 2/11/2004         | Yes          | No                        |
| PGE-SGIP-2002-0110   | PGE | ICE      | DG - WWTP            | 900       | 10/23/2003        | No           | Yes                       |
| SCE-SGIP-2001-0031   | SCE | ICE      | Landfill Gas         | 991       | 9/29/2003         | No           | No                        |
| SCE-SGIP-2002-0055   | SCE | MT       | Landfill Gas         | 420       | 5/19/2003         | Yes          | No                        |
| SD-SGIP-2001-0007    | CSE | MT       | DG - WWTP            | 84        | 8/30/2002         | No           | No                        |

\* Since assignment of a project's operational date is subject to individual judgment, the incentive payment date as reported by the PAs is used as a proxy for the operational date for reporting purposes.

## APPENDIX B DIRECTED BIOGAS AUDIT PROTOCOL

The properties of directed biogas injection and extraction have a direct bearing on information needed to assess renewable fuel use compliance of directed biogas projects. On April 14, 2011, the SGIP PAs and their consultant AESC developed protocols for the audit of directed biogas usage. The audit protocol establishes data and verification requirements and is separated into three elements:

1. **Transfer of Ownership** – documentation and “linkage” demonstrating transfer of ownership of the directed biogas from source to one or more serial entities and then to the system owner.
2. **Transportation Path and Energy Accounting** – documentation reporting the amount (energy) of directed biogas from the eligible source to one or more serial pipelines and then to the System Owner. The documentation must report verifiable inputs and outputs of each pipeline segment. Imbalances, losses, and fees (paid in gas energy) must be included in the documented reports. Note that because directed biogas “accounting” is lost once it enters a gas distribution system, directed biogas can be notionally accounted for up to the gas utility receipt points (city gates). Note that “pooling” or carryover from unconsumed directed biogas is allowed.
3. **Gas Fuel Consumption** – documentation from the gas utility matching directed biogas receipts and reporting the metered total energy input to a SGIP eligible generator or fleet of SGIP eligible generators.

The data and documentation requirements for each element of the verification process are described in more detail below.

### B.1 TRANSFER OF OWNERSHIP

Acceptable documentation includes invoices or other statements showing transfer of ownership of biogas between the source and the SGIP system owner. If a broker, marketer, or scheduler takes ownership of the gas between the source and the system owner then intermediate documentation showing transfer of ownership is also required.

### B.2 TRANSPORTATION PATH AND ENERGY ACCOUNTING

Documentation from each entity in the transportation path must include:

- Documentation from the source showing the amount of directed biogas being moved onto the pipeline. Any non-renewable gas added at the source must be identified.

- Documentation from the gas transmission system showing:
  - Receipt of directed biogas (from source, storage, or other pipelines)
  - Pipeline losses or fees paid in gas (not carried over)
  - Positive or negative imbalances (carried over)
  - Delivery of directed biogas to either another pipeline, storage facility, or California utility receipt point
- Utility documentation showing the amount of biogas received at all California entry points
- Utility documentation showing the amount of fuel consumed by each SGIP project being supplied the directed biogas

The gas transportation accounting ends at the California entry point (city gate) and does not continue inside the gas company's distribution system.

### **B.3 GAS FUEL CONSUMPTION**

Utility documentation showing the amount of fuel consumed by each SGIP project must be provided.

### **B.4 USAGE DETERMINATION**

SGIP projects are assumed to procure no more than 75 percent of their fuel input as directed biogas. The directed biogas delivered is compared to 75 percent of the project's fuel consumption. If the amount of directed biogas procured is less than 75 percent of the project's fuel consumption, then the project is out of compliance with the SGIP's renewable fuel use requirements. If the amount of directed biogas procured is equal to 75 percent of the project's fuel consumption, then the project is in compliance with the SGIP's renewable fuel use requirements. If the amount of directed biogas procured is greater than 75 percent of the project's fuel consumption, then the project is in compliance with the SGIP's renewable fuel use requirements and the remaining directed biogas over 75 percent of the project's fuel input will be considered pooled for future use. Once the pool is depleted, it cannot be borrowed against.