

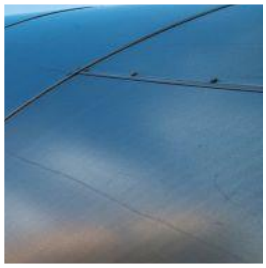


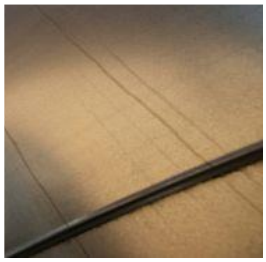

SELF-GENERATION INCENTIVE PROGRAM: RENEWABLE FUEL USE REPORT NO. 27

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GLOSSARY

Abbreviations and Acronyms

Term	Definition
ADG	Anaerobic Digester Gas
CEC	California Energy Commission
CHP	Combined Heat and Power
CSE	Center for Sustainable Energy
CO_2	Carbon dioxide
CO_2eq	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
RFUR	Renewable Fuel Use Requirement
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
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 *Flaring and Venting*.
Combined Heat and Power (CHP)	A system that produces both electricity and useful heat simultaneously; sometimes referred to as "cogeneration."
CO_2 Equivalent (CO_{2eq})	When reporting emission impacts from different types of greenhouse gases, total GHG emissions are reported in terms of tons of CO_2 equivalent so that direct comparisons can be made. To calculate CO_{2eq}, the global warming potential of a gas as compared to that of CO_2 is used as the conversion factor (e.g., the global warming potential (GWP) of methane is 21 times that of CO_2). Thus, the CO_{2eq} 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 particular 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 with a particular confidence level is intended to give the assurance that, if the statistical model is correct, then taken over all the data that might have been obtained, the procedure for constructing the interval would deliver a confidence interval that included the true value of the parameter 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 ***prior*** legal code, law or regulation requiring capture and flaring of the biogas. In this event an SGIP project ***cannot*** be credited with GHG emission reductions due to capture of **methane** in the biogas. A project cannot take credit for a prior action required by legal code, law or regulation. See also: *Venting (of Biogas)*.

Term	Definition
Greenhouse Gas (GHG) Emissions	For the purposes of this analysis GHG emissions refer specifically to those of CO_2 and methane, expressed as CO_{2eq}.
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: *Directed Biogas*.
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 ***prior*** 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 **methane** in the biogas. A project cannot take credit for a prior action required by legal code, law or regulation. See also: *Flaring (of Biogas).*

1 INTRODUCTION AND EXECUTIVE SUMMARY

The purpose of renewable fuel use reports (RFURs) 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 Renewable Fuel Use (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[1] Program Administrators (PAs) to provide updated information every six months[2] on completed SGIP projects using renewable fuel.[3] CPUC Rulemaking 12-11-005 (November 8, 2012) reduced the frequency of the filing requirement for the RFURs 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.[4] 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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1 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), formerly known as the California Center for Sustainable Energy (CCSE), in San Diego Gas and Electric (SDG&E) territory.

2 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."

3 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.

4 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 30th of the year the report is delivered. Furthermore… the cost analysis performed in the RFUR is no longer required."

Due to an ongoing interest in the potential for renewable fuel use projects to reduce greenhouse gas (GHG) emissions,[5] 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 RFUR Report No. 27 are taken from the most recent SGIP Impact Evaluation Report, completed in 2016 for calendar years 2014-2015.

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 Itron 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.

RFU Report No. 27 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, 2017, through June 30, 2018. 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. 27 presents information on the renewable fuel usage from the 156 renewable fuel projects rebated by the SGIP as of June 30, 2018. The report leverages information found in the SGIP Statewide Project Database, the Inspection Reports prepared by third-party consultants, and metered data (electrical generation, fuel consumption, and other biogas usage documentation) provided to Itron

[5] 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 pursuant to the SGIP 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.

through data requests to each project's Performance Data Provider (PDP) or the Performance Based Incentive (PBI) data transfer process.

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 156 RFU projects rebated by the SGIP as of June 30, 2017, 92 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 2016) are required to comply with minimum renewable fuel usage requirements. Namely, these projects are required to consume a minimum of 75% of their energy input on an annual energy basis from renewable sources. Of the 156 RFU projects discussed in this report, 148 received incentives at a renewable level and are therefore required to comply with the SGIP's minimum renewable fuel use requirements. 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 Program Year (PY) 2017, all fueled projects must procure a minimum amount of biogas (10% for PY 2017 projects). As of June 30, 2018, no PY 2017 fueled projects have been issued upfront incentives, therefore none of the projects included in this report are subject to PY 2017 biogas consumption requirements.

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 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 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. These data are provided by PDPs for projects 30 kW or larger subject to PBI rules. 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.

1.3 SUMMARY OF RFU REPORT NO. 27 FINDINGS

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

- As of June 30, 2018, there were 156 RFU facilities deployed under the SGIP, representing approximately 96 MW of rebated capacity. One hundred forty-eight of these facilities received higher renewable incentives and represented approximately 92.2 MW of rebated capacity. The remaining eight other RFU projects which did not receive renewable incentives represented approximately 3.8 MW of rebated capacity.
- Of the 148 projects that received higher renewable incentives, 53 (about 36 percent by project count) operated solely from on-site renewable fuels. Of these 53 projects:
  - 13 projects are assumed to be in compliance with renewable fuel use requirements,
  - 38 projects were out of warranty and as such were no longer subject to reporting and compliance requirements,
  - Two projects were found to be not applicable with respect to the requirements as they had not yet been operational for a full year.
- Of the remaining 95 dual-fuel facilities (having both renewable and non-renewable fuel supplies) receiving higher renewable incentives:
  - One blended on-site biogas project had not yet been operational for a full year and was not evaluated as it is not yet subject to compliance requirements,
  - Seven blended on-site biogas projects and three directed biogas projects were found to be in compliance with renewable fuel use requirements based on the methodologies described in this report,
  - Four blended on-site biogas projects and three directed biogas projects could not have their compliance determined until additional data are received,
  - Nineteen blended on-site biogas projects were out of warranty and as such were no longer subject to reporting and compliance requirements,
  - Fifty-eight 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 33 percent of the rebated capacity (31.6 MW) of RFU facilities deployed through June 30, 2018 was powered by directed biogas. The remaining 66 percent (64.4 MW) was fueled primarily by on-site biogas with a few projects fueled by syngas.[6]

[6] 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

- Prime movers used at RFU facilities include fuel cells, gas turbines, microturbines, and internal combustion engines. IC engines are the dominant prime mover technology with 33 MW (about 34 percent) of the approximately 96 MW of rebated capacity. Electric-only fuel cells provide 24.7 MW (about 26 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 manner in which the biogas would have been treated in 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 flare biogas (e.g., landfill gas operations).

  - In general, the 2014-2015 SGIP Impacts Evaluation Report[7] showed that RFU facilities for which biogas flaring was the baseline condition decreased GHG emissions by around 0.31 - 0.46 metric tons of carbon dioxide equivalent (CO_2eq) per MWh of generated electricity.
  - The GHG emission reduction potential of RFU facilities for which biogas venting was the baseline condition is around 4.46 - 4.79 metric tons of CO_2eq per MWh of generated electricity; an order of magnitude greater in GHG emission reduction potential.
  - The 2014-2015 SGIP Impact Evaluation Report found that during 2015, SGIP RFU facilities reduced GHG emissions by almost 120 thousand metric tons of CO_2eq.

- Potential for GHG emission reductions from RFU facilities may also be affected by the use of 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.

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. While some of these instances of non-compliance are due to projects occasionally falling below the minimum renewable fuel limit, some projects were consistently out of compliance. This report found no instances of biogas projects being out of compliance with SGIP renewable fuel use requirements.

under low to zero oxygen conditions causing the volatilization of carbon in the biomass and producing a mixture of carbon-hydrogen gases including methane, propane, ethane, and more complex gases.

7 The 2014-15 SGIP Impacts Evaluation Report is the most recent public source of SGIP GHG emission information.

While no projects were 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, data availability issues originate during the PBI setup process. In all cases, PDPs did not set up appropriate metering to capture the appropriate energy inputs required for compliance determinations. For directed biogas projects, compliance issues are 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 five years. After this five-year 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 five-year terms and will likely continue operating on 100% 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**

   With the adoption of a PBI payment mechanism for systems 30 kW or larger, the PAs have greatly improved the availability of metered data in the SGIP. All SGIP 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.[8] The PAs should ensure that PDPs submit both renewable and non-renewable fuel data as part of their PBI payment process, and that these two fuel streams be clearly identified. This would allow the PAs to easily understand which projects are falling out of compliance with minimum renewable fuel use requirements on a near-real-time basis.

   During this reporting period, Itron had to work with individual PDPs to obtain raw metered data from metering equipment to make compliance determinations. In some cases, these data were not sufficient to make compliance determinations. For one project, the PDP indicated to Itron that the PA or their consultant instructed them to combine natural gas and biogas fuel data into a single variable for reporting. This combination nullifies the benefits of PBI data reporting.

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 2015, biogas projects contributed over 120 thousand metric tons of CO_2eq GHG reductions. Almost

[8] 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)."*

45% of these reductions came from directed biogas projects. As these projects complete their biogas procurement periods, their contributions to GHG reductions will reduce dramatically. To ensure continued program-wide GHG reductions, we recommend that the PAs identify ways to increase adoption of self-generation technologies at dairies, landfills, waste water 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.

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.[9] In this report, assessment of compliance with the SGIP's minimum renewable fuel use requirements is restricted to the subset of projects actually subject to those requirements (i.e., Renewable Fuel Use Requirement (RFUR) projects) by virtue of their participation year, project type designation, and warranty status.[10] All RFUR projects are also RFU projects; however, not all RFU projects are RFUR projects. This distinction is responsible for differences in project counts in this report's tables. Differences between RFU and RFUR projects are summarized in Table 2-1. Similarly, Table 2-2 reports only on RFUR projects whereas Table A-1 lists all RFU projects, including those not subject to the SGIP's minimum renewable fuel use requirements ("Other RFU projects"). RFUR projects are, among other things, required to comply with SGIP renewable fuel use requirements. Other RFU projects are not.

2.1 DIRECTED BIOGAS PROJECTS

In CPUC Decision 09-09-048 (September 24, 2009), eligibility for RFUR 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 renewable fuel use projects, directed biogas projects are eligible for higher incentives (relative to non-renewable projects) under the SGIP, and subject to the fuel use requirements of RFUR 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% energy consumption) for five years, after which they are allowed to operate on 100% non-renewable fuel.

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9 https://www.socalgas.com/for-your-business/power-generation/self-generation-forms

10 The SGIP requires such projects to limit use of non-renewable fuel to 25 percent on an annual fuel energy input basis. This requirement is based on FERC definitions of qualifying small power production facilities from the original Public Utility Regulatory Policy Act (PURPA) of 1978; Subpart B; section 292.204 (Criteria for qualifying small power production facilities).

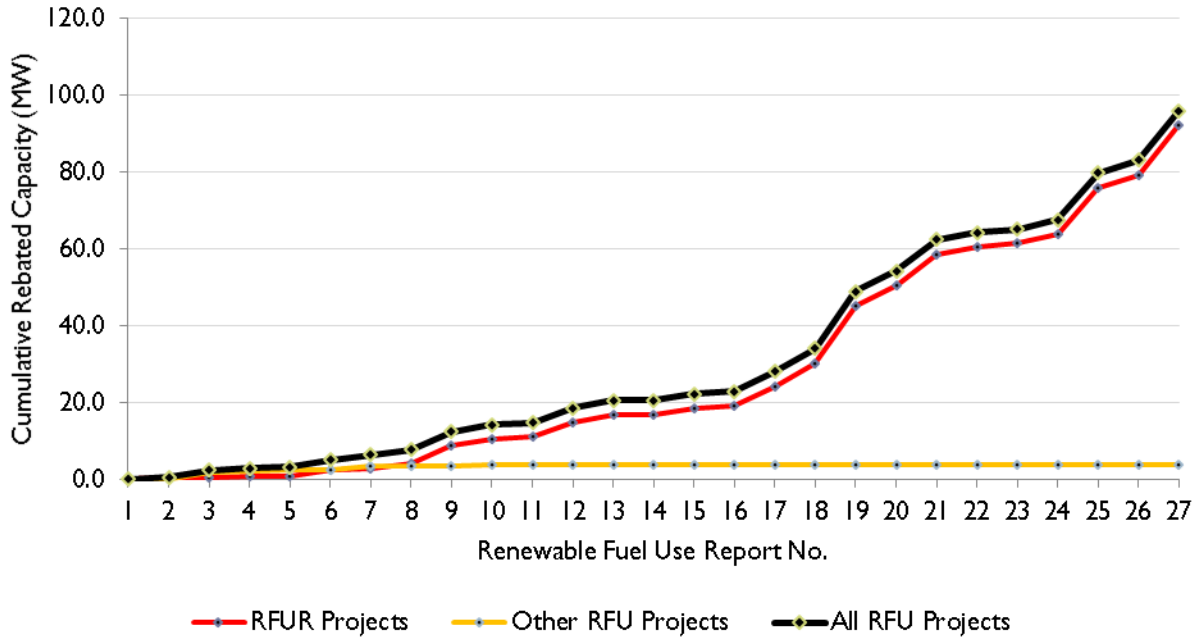
TABLE 2-1: SUMMARY OF RFU VS. RFUR DIFFERENCES

Parameter	RFU	
	Other RFU	RFU Requirement[11]
Allowed level of annual renewable fuel use	0 – 100%	75 – 100%
Heat recovery	Required	Not Required
Incentive level	Same as non-renewable projects	Higher than non-renewable projects
No. of projects	8	148
Rebated capacity (MW)	3.8	92.2

2.2 PROJECT CAPACITIES, FUEL TYPES, AND PRIME MOVER TECHNOLOGIES

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

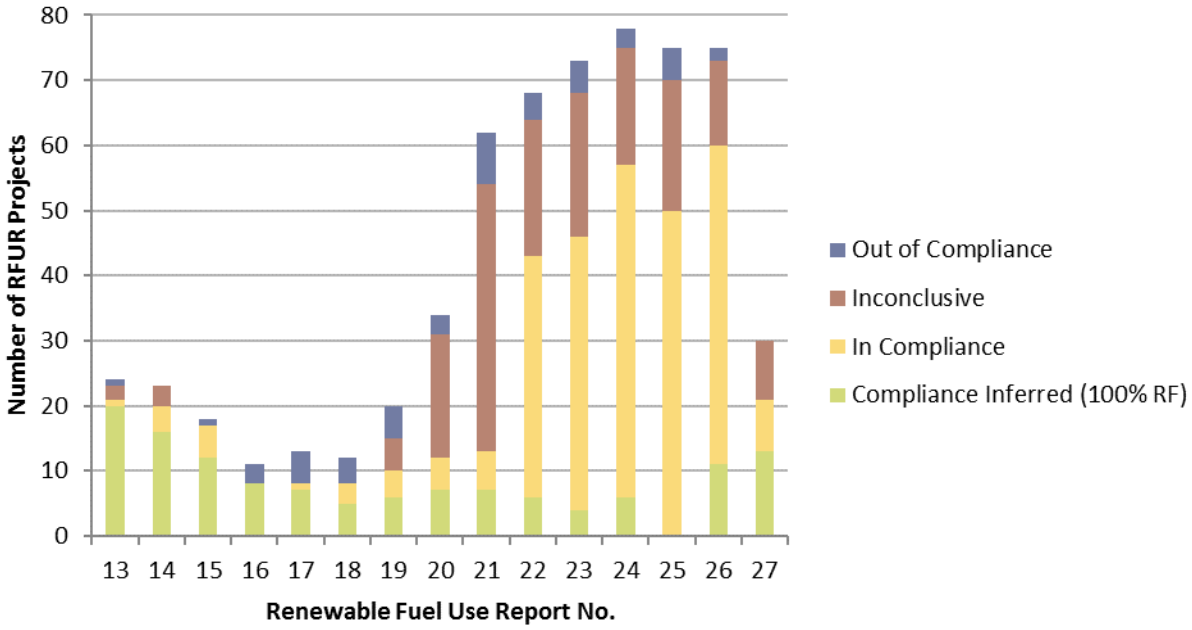
FIGURE 2-1: PROJECT CAPACITY TREND (RFU REPORTS 1-27)



[11] Beginning with Program Year 2017, all fuel-consuming technologies are required to consume a minimum amount of renewable fuel (10% for PY 2017 projects).

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: RFUR PROJECT COMPLIANCE HISTORY



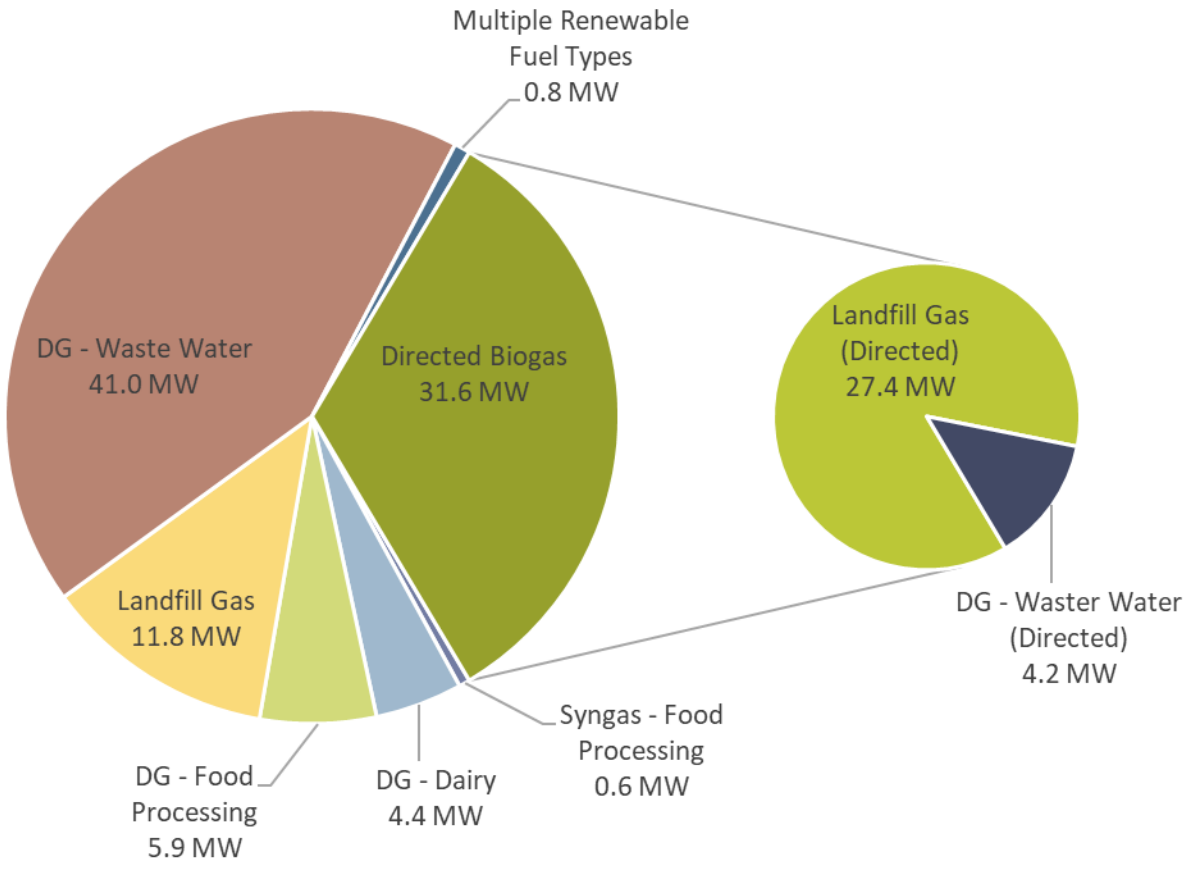
* During RFU Report 25, compliance with renewable fuel use requirements was not inferred for dedicated biogas projects.

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, 2018, 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.[12] Note that this does not account for directed biogas projects that complete their five-year compliance

[12] The biogas source of directed biogas projects is not always known. Historically, the primary source of SGIP directed biogas has been landfill gas.

period and continue operating on natural gas. Dairy digesters provide the smallest contribution to total rebated RFU project capacity.

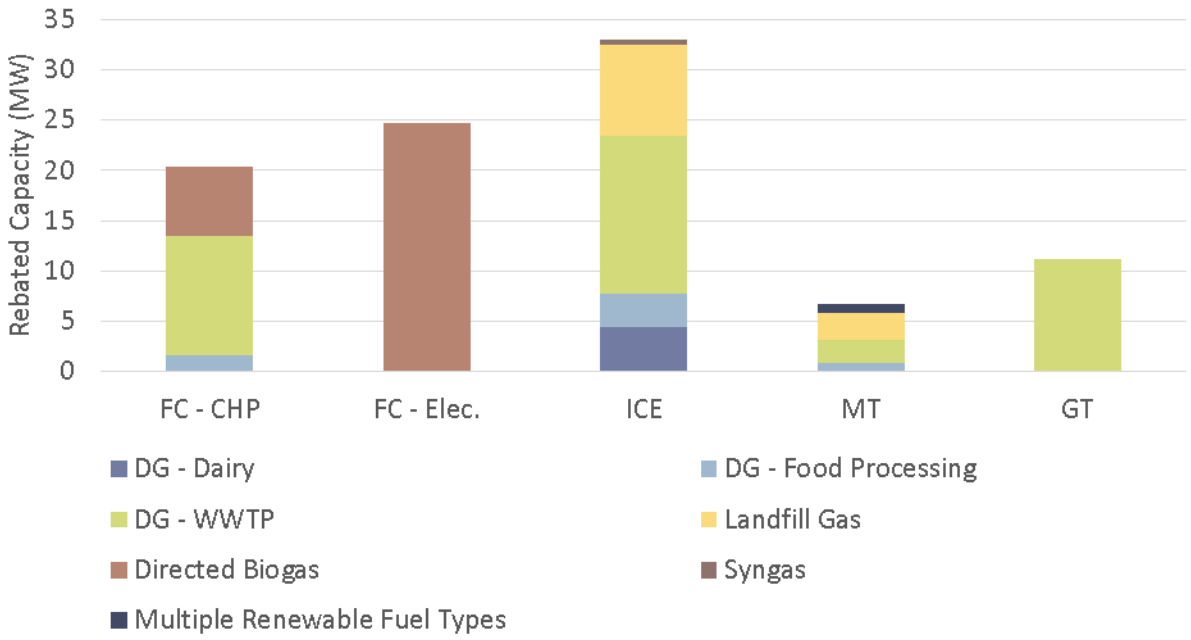
FIGURE 2-3: RENEWABLE FUEL USE PROJECT REBATED CAPACITY BY FUEL TYPE



* 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 30 percent of rebated RFU capacity.

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



2.3 SUMMARY OF COMPLETED RFUR PROJECTS

There were three new RFUR projects completed during the RFU Report No. 27 twelve-month reporting period. Two recently completed projects used IC engines, and ones used a gas turbine. All are fueled by on-site biogas sources. A total of 148 RFUR projects had been completed as of June 30, 2018. A list of all SGIP projects utilizing renewable fuel (RFUR and Other RFU) is included as Appendix A.

The 148 completed RFUR projects represent approximately 92.2 MW of rebated generating capacity. The prime mover technologies used by these projects are summarized in Table 2-2. Fuel cells alone (both FC-CHP and FC-Elec) account for about 48 percent of RFUR rebated capacity, with IC engines, gas turbines, and microturbines making up the remaining 52 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.

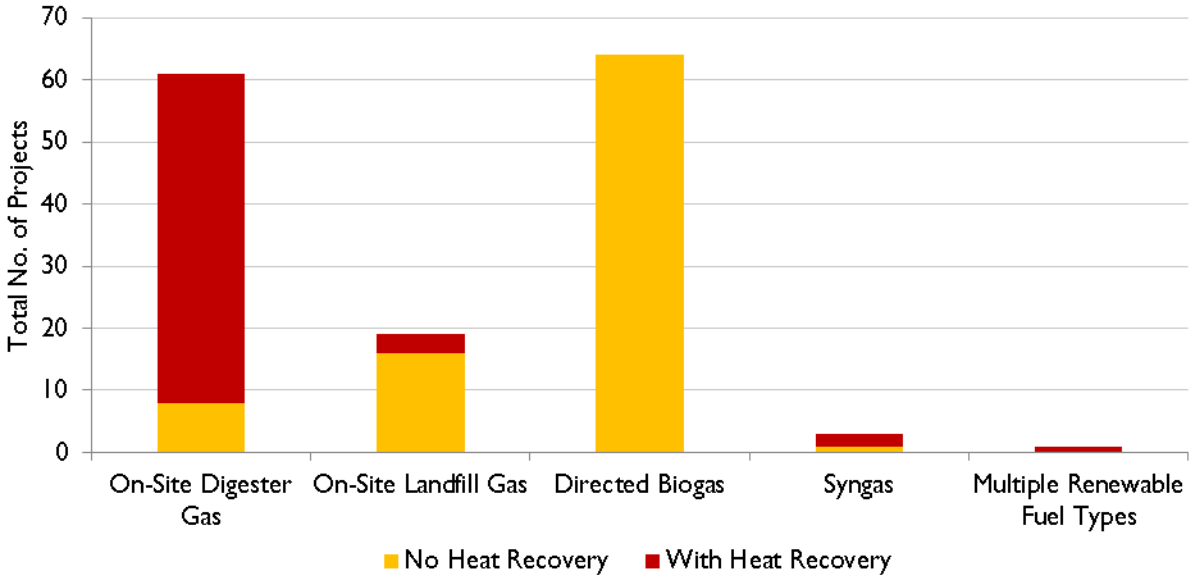
TABLE 2-2: SUMMARY OF PRIME MOVERS FOR RFUR PROJECTS

Prime Mover	Number of Projects	Total Rebated Capacity (kW)	Arithmetic Average Rebated Capacity per Project (kW)
FC - CHP	21	19,410	924
FC - Elec.	58	24,660	425
ICE	44	31,095	707
MT	24	5,800	242
GT	1	11,230	11,230
All	148	92,195	623

FC – CHP = CHP Fuel Cell, FC – Elec. = Electric-Only Fuel Cell, ICE = Internal combustion (IC) engine, MT = Microturbine, GT = Gas Turbine

Many RFUR 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 RFUR PROJECTS

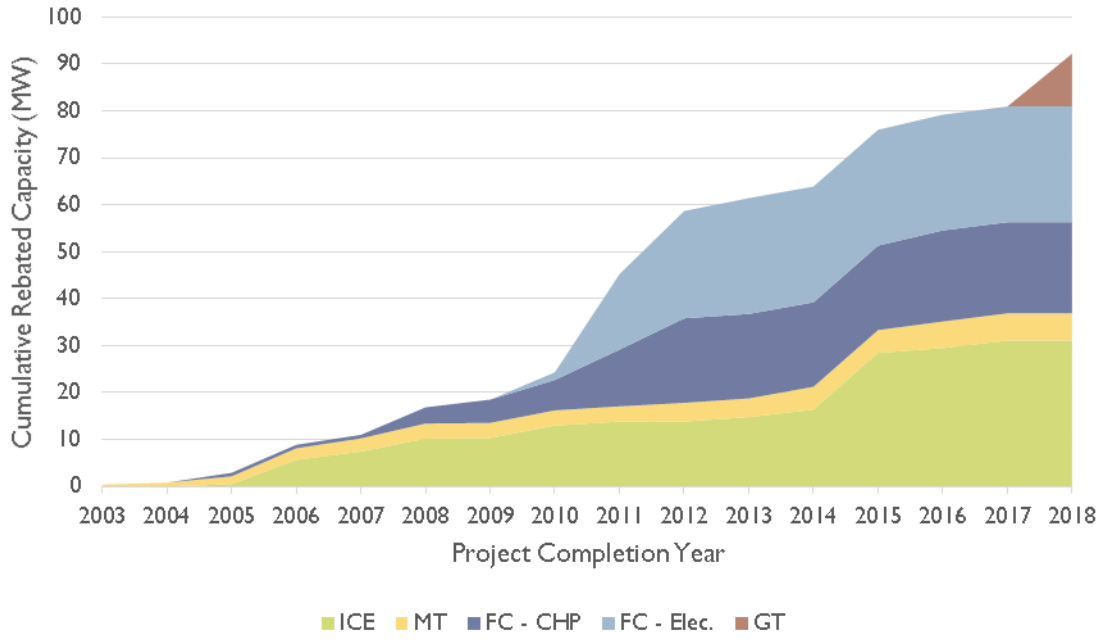


Verification inspection reports obtained from PAs and information from secondary sources such as direct contact with the participant, technical journals, industry periodicals, and news articles indicate that 56 of the 148 RFUR projects recover waste heat. The majority (all but 8) of the 61 on-site digester 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 19 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.[13] 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 RFUR 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 RFUR 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 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 RFUR CAPACITY BY TECHNOLOGY AND PROJECT COMPLETION YEAR



[13] 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 RFUR PROJECTS – COMPLIANCE DETERMINATION

RFUR projects completed on or before PY 2016 are allowed to use a maximum of 25 percent non-renewable fuel; the remaining 75-100 percent must be renewable fuel. The period during which RFUR 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 - PY16 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" RFUR 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 RFUR facilities located where biogas is produced that use a blend of biogas and non-renewable fuel (e.g., natural gas); and
- "Directed" RFUR facilities, located somewhere other than where biogas is produced and not necessarily directly receiving any of the biogas.

Fuel supply and contract status for RFUR projects are summarized in Table 3-1. Thirty-three of the total 148 RFUR projects had active warranty status or completed their directed biogas procurement term during this reporting period. One hundred fifteen RFUR projects had an expired warranty status or completed their directed biogas procurement term before the beginning of this reporting period. Of the 33 RFUR projects with active warranties, three had not yet completed one year of operation. Of the remaining 30, 13 operated solely on renewable fuel. During the RFU Report No. 25 period, 11 of these projects were verified by an on-site fuel supply system inspection to ensure no non-renewable fuel is consumed.

TABLE 3-1: SUMMARY OF FUEL SUPPLIES AND WARRANTY STATUS FOR RFUR PROJECTS

	Warranty/Renewable Fuel Use Requirement Status					
	Active*		Expired		Total	
Fuel Supply	No. Projects (n)	Rebated Capacity (kW)	No. Projects (n)	Rebated Capacity (kW)	No. Projects (n)	Rebated Capacity (kW)
Dedicated	13	7,030	38	15,228	51	22,258
Blended	11	11,849	19	13,688	30	25,537
Directed	6**	5,985	58	25,585	64	31,570
Total	**30**	**26,709**	**115**	**54,256**	**145**	**79,365**

* Only active projects that have been operational for one full year are required to comply with SGIP renewable fuel use requirements

** Projects with directed biogas were considered active even if their warranty expired or their directed biogas procurement term concluded during the compliance period. This was so that RFU Reports could show the complete compliance history of directed biogas projects.

3.1 FUEL USE AT DEDICATED ON-SITE RFUR PROJECTS

Table 3-2 on the following page summarizes compliance determinations for dedicated RFUR projects. Dedicated RFUR 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 RFUR projects 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 RFUR 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
PG&E	PGE-SGIP-2016-3030	ICE	DG - Dairy	1000	8/21/2017	TBD	Not Yet Required
PG&E	PGE-SGIP-2016-3048	ICE	DG - Dairy	600	10/18/2017	TBD	Not Yet 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.

3.2 FUEL USE AT BLENDED ON-SITE RFUR PROJECTS

Unlike dedicated RFUR sites, whose compliance is assumed, blended RFUR 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. Most blended RFUR 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. In order to make a renewable fuel use compliance determination, it is 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%, and for the FC project it was 37%. 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 in order 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 RFUR Projects in Compliance

During this reporting period seven blended RFUR projects were found to be in compliance with SGIP renewable fuel use requirements.

- **PGE-SGIP-2012-2061.** This 950 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 89 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 waste water treatment plant. The system utilizes a combination of waste water 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 86 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 86 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 99 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 with waste heat recovery came online in November 2016. The system is fueled by digester gas produced on-site at a waste water treatment plant. Metered electrical generation and natural gas consumption data were available for the entire current reporting period and indicated that renewable fuel use during this period made up approximately 92 percent of the total fuel input. Thus, the project was in compliance with SGIP renewable fuel use provisions for this reporting period.
- **SCE-SGIP-2012-0450.** This 1,550 kW IC engine utilizes a combination of waste water 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 from two onsite gas meters were provided by the PDP, however both meters were downstream of the natural gas interconnection, so it was not possible to distinguish the natural gas from the biogas with the data provided. Instead, natural gas consumption data were sought from and provided by the utility, and these data showed that 99% of the total fuel input was biogas. Therefore, this project was in compliance with SGIP renewable fuel use requirements.
- **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 only power output is metered at this site and not gas consumption.

Monthly natural gas consumption data were instead obtained from the utility, which revealed that no natural gas was delivered to this project during the reporting period. Thus 100% of the total fuel consumed was biogas, and the project was in compliance with SGIP renewable fuel use requirements.

3.2.2 Blended On-Site RFUR Project Compliance Status Inconclusive

Four 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 waste water 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 waste water 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-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 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 data provider supplied data from four onsite gas meters. However, the data provider was unable to identify the type of gas being measured by each meter. Thus, the biogas consumed could not be differentiated from the natural gas consumed at this project, and no compliance determination could be made.

A summary of the 11 blended RFUR 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.

TABLE 3-3: FUEL USE COMPLIANCE OF BLENDED ON-SITE RFUR PROJECTS

PA	SGIP Reservation No.	Tech	Renewable Fuel Type	Capacity (kW)	Operational Date*	Annual Natural Gas Energy Flow (MMBtu)†	Renewable Fuel Use	In Compliance?
PG&E	PGE-SGIP-2012-2061	ICE	DG - WWTP	3,800	10/31/2013	16,135	89%	Yes
SCE	SCE-SGIP-2011-0348	ICE	DG - WWTP	650	6/18/2014	8,078	84%	Yes
PG&E	PGE-SGIP-2012-1966	ICE	DG - WWTP	1,132	3/26/2015	1,554	99%	Yes
PG&E	PGE-SGIP-2012-1987	ICE	DG - WWTP	1,700	4/7/2015	23,294	85%	Yes
SCG	SCG-SGIP-2014-0205	FC – CHP	DG - WWTP	1,400	11/15/2016	6,496	91%	Yes
PG&E	PGE-SGIP-2013-2484	MT	Multiple Types	800	8/3/2016	Unknown	Unknown	Inconclusive; Data Not Reported
PG&E	PGE-SGIP-2012-2212	ICE	DG - Dairy	1,000	3/5/2015	Unknown	Unknown	Inconclusive; Data Not Reported
SCE	SCE-SGIP-2012-0450	ICE	DG - WWTP	1,550	7/2/2015	35,285	99%	Yes
PG&E	PGE-SGIP-2012-2112	ICE	DG - WWTP	190	7/3/2015	Unknown	Unknown	Inconclusive; Data Not Reported
SCG	SCG-SGIP-2012-0156	ICE	DG - Food Processing	1,500	9/4/2015	0	100%	Yes
PG&E	PGE-SGIP-2012-2206	ICE	DG - WWTP	977	11/13/2015	Unknown	Unknown	Inconclusive; Data Not Reported

* 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, 2018. The basis is the lower heating value (LHV) of the fuel.

TABLE 3-4: HISTORY OF BLENDED BIOGAS PROJECT COMPLIANCE

SGIP Reservation No.	RFU Report No.																		
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
SCE-SGIP-2003-0092	??	Yes	??	Yes	Yes	No	Yes	Yes												
SCE-SGIP-2003-0017		Yes	Yes	Yes																
SCE-SGIP-2004-0158				??	??	??	??													
SCE-SGIP-2004-0159				??	??	??	??													
PGE-SGIP-2005-1313					Yes	Yes	Yes	Yes												
SCE-SGIP-2006-0062							Yes	Yes	No	No	Yes	No	Yes	No						
PGE-SGIP-2006-1490							Yes	Yes	No	No	No	Yes	Yes	Yes						
SCG-SGIP-2006-0036								No	No	No	No	No	Yes	Yes	Yes					
PGE-SGIP-2007-1749										Yes	Yes	Yes	Yes							
SCG-SGIP-2008-0003										No	No	No	No	No	No	No				
SCG-SGIP-2006-0012										No	No	No	No	Yes	No	Yes				
SD-SGIP-2007-0351											Yes	Yes	Yes	Yes						
SCE-SGIP-2010-0334												??	??	??	??	??	??			
SCE-SGIP-2010-0002												No	No	No	Yes	Yes	??			
SCE-SGIP-2009-0003														No	No	No	??	??		
SD-SGIP-2009-0362														No	Yes	Yes	??	Yes		
SCE-SGIP-2009-0013															No	No	No	??		
PGE-SGIP-2010-1867																Yes	No	No	No	
SCG-SGIP-2010-0026																No	No	No	No	
PGE-SGIP-2012-2061																	??	Yes	Yes	Yes
SCE-SGIP-2011-0348																		??	Yes	Yes
PGE-SGIP-2012-2212																			??	??
PGE-SGIP-2012-1966																			Yes	Yes
PGE-SGIP-2012-1987																			Yes	Yes
SCE-SGIP-2012-0450																			??	Yes
PGE-SGIP-2012-2112																			??	??
SCG-SGIP-2012-0156																			??	Yes
PGE-SGIP-2012-2206																			??	??
PGE-SGIP-2013-2484																				??
SCG-SGIP-2014-0205																				Yes

* Yes = In Compliance. No = Out of Compliance. ?? = Compliance Could Not be Determined.

3.3 FUEL USE AT DIRECTED RFUR 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 RFUR projects. In blended RFUR 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 RFUR project (for PY 2001 – PY 2016 projects). However, in directed biogas RFUR 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 3-5. The properties at the extraction point represent a significant departure from conditions encountered to date for dedicated and blended on-site RFUR 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 3-5: PROPERTIES OF DIRECTED BIOGAS INJECTION AND EXTRACTION

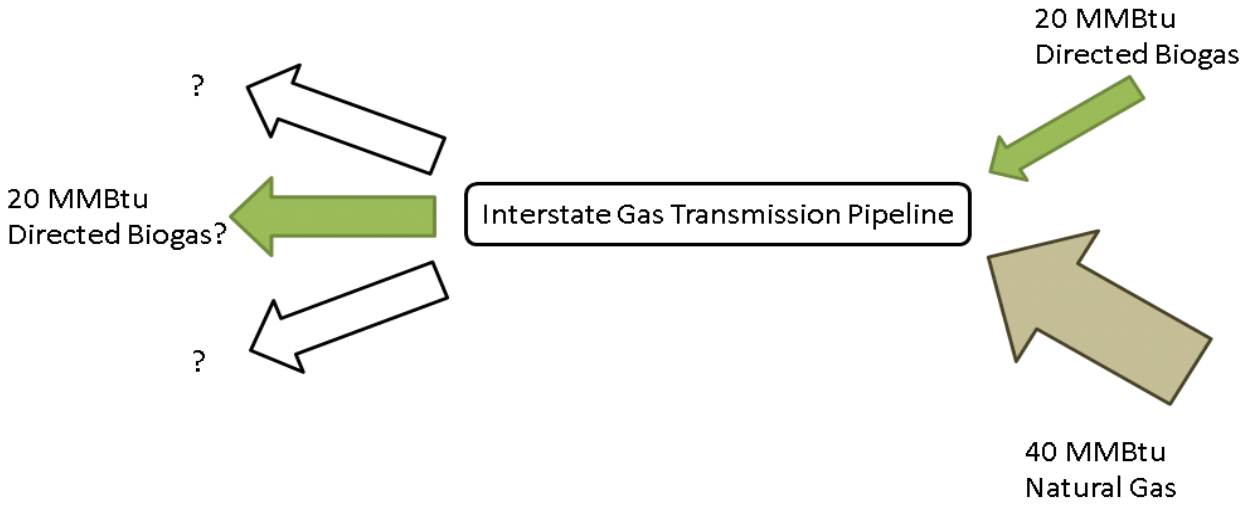
Property	At Injection	At Extraction
Carrier for renewable fuel	Biogas	Natural Gas
Transaction type	Physical	Notional
Information source	Metering	Invoices

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 and 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.[14]

3.3.1 Fuel Use of Directed Biogas Fleet #1

As of June 30, 2018, directed biogas fleet #1 consists of 41 electric-only fuel cell projects completed between 2010 and 2013. All 41 of these systems have been operational for at least one calendar year and are required to comply with the SGIP's renewable fuel use requirements. Of the 41 projects in fleet #1, 38 completed their directed biogas term before the start of this reporting period. For the remaining three projects in fleet #1, their directed biogas terms elapsed during the current evaluation period. For this fleet, no documentation supporting the purchase of biogas was provided for this evaluation period. However, program rules allow for biogas that is purchased and transported to California but not used during one evaluation period to be pooled and subsequently applied to satisfy biogas requirements in future periods. Based on the data and documentation provided, it was determined that fleet #1 had sufficient biogas pooled from earlier evaluation periods to meet its requirements for the current period. Thus, its three sites still subject to biogas use requirements were found to be in compliance.

A list of the 41 projects included in directed biogas fleet #1 is shown in Table 3-6.

3.3.2 Fuel Use of Directed Biogas Fleet #2

As of June 30, 2018, directed biogas fleet #2 consists of ten fuel cell projects completed between November 2010 and February 2012. All ten of these systems have been operational for at least one calendar year. However, 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 3-6.

3.3.3 Fuel Use of Directed Biogas Fleet #3

As of June 30, 2018, directed biogas fleet #3 consists of seven fuel cell projects completed between March 2011 and December 2011. All seven of these systems have been operational for at least one calendar year. However, all seven had 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. A list of these seven projects is shown in Table 3-6.

[14] 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.

3.3.4 Fuel Use of Directed Biogas Fleet #4

As of June 30, 2018, directed biogas fleet #4 consists of two fuel cell projects completed on December 2011. Due to mechanical failure in 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. While metered consumption records indicated that both sites met the 75% renewable requirement during calendar year 2017, the provided documentation did not extend into calendar year 2018 and thus did not cover the entirety of the reporting period. Hence no compliance determination could be made. A list of these two projects is shown in Table 3-6.

3.3.5 Fuel Use of Other Directed Biogas Projects

As of June 30, 2018, the renewable fuel use compliance of one fuel cell project cannot be determined. 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. All four of these systems have been operational for at least one calendar year, however three projects have completed their biogas terms and thus are not required to comply with the SGIP's renewable fuel use requirements. The data and documentation required to evaluate the renewable fuel use compliance of the remaining project were not made available in time for this report. Consequently, compliance status of this project cannot be determined until the required data and documentation are available. While invoice documents were made available for this site, and while those data showed that the project met the 75% renewable requirement, the compliance could not be determined because no invoice documentation was submitted to verify the purchase of biogas from the biogas producer.

A list of the 64 directed biogas RFUR projects is presented in Table 3-6.

TABLE 3-6: FUEL USE COMPLIANCE OF DIRECTED BIOGAS RFUR 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	13,835	75%	Yes
SCG	SCG-SGIP-2010-0033	Fleet #1	FC	105	06/19/2013	03/01/2013	2/28/2018	6,344	75%	Yes
SCG	SCG-SGIP-2010-0034	Fleet #1	FC	210	06/20/2013	03/01/2013	2/28/2018	6,344	75%	Yes
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	8/31/2016	No Longer Required	No Longer Required	No Longer Required
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	Unknown	Unknown	Inconclusive; Data Not Reported

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	Unknown	Unknown	Inconclusive; Data Not Reported
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	14,482	82%	Inconclusive; Data Not Reported

* 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, 2018. The basis is the higher heating value (HHV) of the fuel.

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 2014-15 SGIP Impacts Evaluation Report (the most recent public source of SGIP performance data).[15] 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 developed for the most recent (2014-15) 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_4) vented directly into the atmosphere, which is much higher than the global warming potential of CO_2 resulting from the flaring of CH_4.

TABLE 4-1: SUMMARY OF GHG EMISSION IMPACTS FROM SGIP BIOGAS PROJECTS IN 2015

Baseline Biogas Assumption	Prime Mover Technology	Average GHG Impact Rate (Metric Tons CO_{2eq} / MWh)
Flare	CHP fuel cell	-0.33
	Electric-only fuel cell	-0.31
	Internal combustion engine	-0.44
	Microturbine	-0.42
Vent	Internal combustion engine	-4.46

Simplifying assumptions underlying the above results include:

- Heat recovered from RFUR projects was used to satisfy a heating load that otherwise would have been satisfied using biogas (e.g., in a boiler)[16]
- A single representative electrical conversion efficiency was assumed for each technology based on metered data:

[15] http://www.cpuc.ca.gov/NR/rdonlyres/AC8308C0-7905-4ED8-933E-387991841F87/0/2013_SelfGen_Impact_Rpt_201504.pdf

[16] Heat recovered from non-RFUR projects utilizing renewable fuel was assumed to displace natural gas. There are very few such projects. The first Program Year of the SGIP (2001) was the only one in which renewable-fueled systems were required to recover heat and meet system efficiency requirements of Public Utilities Code Section 218.5 (now Section 216.6).

- CHP fuel cell: 38%
- Electric-only fuel cell: 52%
- Internal combustion engine: 32%
- Microturbine: 22%

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.[17] At the state level, the California Air Resources Board (CARB) provides guidelines for control of methane and other volatile organic compounds from biogas facilities.[18] At the federal level, New Source Performance Standards and Emission Guidelines regulate methane capture and use.[19]

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 2014-2015 SGIP Impact Evaluation Report. An updated 2016-2017 SGIP Impact Evaluation Report is expected during Q4 2018.

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. As of RFU Report # 27, all but three directed biogas projects have 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. We expect this to adversely impact the program's overall GHG impacts.

[17] An overview of California's air quality districts is available at: http://www.capcoa.org

[18] In June of 2007, CARB approved the Landfill Methane Capture Strategy. See http://www.arb.ca.gov/cc/landfills/landfills.htm for additional information.

[19] 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 Requirement (RFUR) 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
SCG-SGIP-2015-0237	SCG	GT	DG - WWTP	11,230	3/15/2018	Yes	Yes
PGE-SGIP-2016-3048	PGE	ICE	DG - Dairy	600	10/18/2017	Yes	No
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	PG&E	ICE	DG - Dairy	800	11/29/2016	Yes	No
SCG-SGIP-2014-0205	SCG	FC – CHP	DG - WWTP	1,400	11/15/2016	Yes	Yes
PGE-SGIP-2013-2484	PG&E	MT	Multiple	800	8/3/2016	Yes	Yes
PGE-SGIP-2014-2597	PG&E	ICE	Landfill Gas	220	6/28/2016	Yes	No
PGE-SGIP-2012-2052	PG&E	ICE	Landfill Gas	2,852	12/21/2015	Yes	No
PGE-SGIP-2015-2852	PG&E	ICE	Syngas - Food Processing	297	12/18/2015	Yes	No
PGE-SGIP-2012-2206	PG&E	ICE	DG - WWTP	977	11/13/2015	Yes	Yes
PGE-SGIP-2014-2854	PG&E	ICE	Syngas - Food Processing	160	11/13/2015	Yes	No
PGE-SGIP-2014-2541	PG&E	ICE	Syngas - Food Processing	99	9/11/2015	Yes	No
SCG-SGIP-2012-0156	SCG	ICE	DG - Food Processing	1,500	9/4/2015	Yes	Yes
PGE-SGIP-2012-2112	PG&E	ICE	DG - WWTP	190	7/3/2015	Yes	Yes
SCE-SGIP-2012-0450	SCE	ICE	DG - WWTP	1,550	7/2/2015	Yes	Yes
SCE-SGIP-2012-0433	SCE	ICE	DG - WWTP	627	4/21/2015	Yes	No
PGE-SGIP-2012-1987	PG&E	ICE	DG - WWTP	1,700	4/7/2015	Yes	Yes
PGE-SGIP-2012-1966	PG&E	ICE	DG - WWTP	1,132	3/26/2015	Yes	Yes
PGE-SGIP-2012-2212	PG&E	ICE	DG - Dairy	1,000	3/5/2015	Yes	Yes
SD-SGIP-2012-0486	CSE	ICE	DG - WWTP	145	11/26/2014	Yes	No
PGE-SGIP-2012-2432	PG&E	MT	Landfill Gas	65	9/12/2014	Yes	No
PGE-SGIP-2012-2415	PG&E	MT	Landfill Gas	65	7/31/2014	Yes	No
PGE-SGIP-2012-2110	PG&E	ICE	DG - Food Processing	800	7/25/2014	Yes	No
SCE-SGIP-2011-0348	SCE	ICE	DG - WWTP	650	6/18/2014	Yes	Yes
SCE-SGIP-2012-0413	SCE	MT	DG - Food Processing	750	2/26/2014	Yes	No

SGIP Reservation No.	PA	Tech	Renewable Fuel Type	Size (kW)	Operational Date*	RFUR Project	Non-Renewable Fuel Supply
PGE-SGIP-2012-2061	PG&E	ICE	DG - WWTP	950	10/31/2013	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	PG&E	FC – Elec.	TBD (Directed)	420	5/29/2013	Yes	Yes
SCE-SGIP-2010-0024	SCE	FC – Elec.	TBD (Directed)	1,050	3/29/2013	Yes	Yes
SCE-SGIP-2010-0037	SCE	FC – Elec.	TBD (Directed)	1,050	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	2,800	12/21/2012	Yes	Yes
SCE-SGIP-2010-0035	SCE	FC – CHP	TBD (Directed)	1,110	12/17/2012	Yes	Yes
PGE-SGIP-2010-1867	PG&E	FC – CHP	DG - WWTP	1,400	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	PG&E	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	PG&E	FC – Elec.	TBD (Directed)	800	2/28/2012	Yes	Yes
PGE-SGIP-2010-1926	PG&E	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	PG&E	FC – Elec.	TBD (Directed)	400	12/29/2011	Yes	Yes
PGE-SGIP-2010-1857	PG&E	FC – Elec.	TBD (Directed)	300	12/29/2011	Yes	Yes
PGE-SGIP-2010-1858	PG&E	FC – Elec.	Landfill Gas (Directed)	300	12/29/2011	Yes	Yes
PGE-SGIP-2010-1868	PG&E	FC – Elec.	TBD (Directed)	400	12/29/2011	Yes	Yes
PGE-SGIP-2010-1869	PG&E	FC – Elec.	TBD (Directed)	600	12/29/2011	Yes	Yes
PGE-SGIP-2010-1876	PG&E	FC – Elec.	TBD (Directed)	200	12/29/2011	Yes	Yes
PGE-SGIP-2010-1877	PG&E	FC – Elec.	TBD (Directed)	200	12/29/2011	Yes	Yes
PGE-SGIP-2010-1929	PG&E	FC – Elec.	Landfill Gas (Directed)	420	12/29/2011	Yes	Yes
SD-SGIP-2009-0361	CSE	FC – CHP	DG - WWTP (Directed)	1,400	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)	2,800	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

SGIP Reservation No.	PA	Tech	Renewable Fuel Type	Size (kW)	Operational Date*	RFUR Project	Non-Renewable Fuel Supply
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	PG&E	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	PG&E	FC – Elec.	Landfill Gas (Directed)	420	9/7/2011	Yes	Yes
PGE-SGIP-2010-1874	PG&E	FC – Elec.	Landfill Gas (Directed)	500	9/7/2011	Yes	Yes
PGE-SGIP-2010-1892	PG&E	FC – Elec.	Landfill Gas (Directed)	210	9/7/2011	Yes	Yes
PGE-SGIP-2010-1893	PG&E	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	PG&E	FC – Elec.	Landfill Gas (Directed)	300	6/29/2011	Yes	Yes
PGE-SGIP-2010-1878	PG&E	FC – Elec.	Landfill Gas (Directed)	500	6/29/2011	Yes	Yes
PGE-SGIP-2010-1885	PG&E	FC – Elec.	Landfill Gas (Directed)	300	5/31/2011	Yes	Yes
PGE-SGIP-2010-1853	PG&E	FC – Elec.	Landfill Gas (Directed)	600	5/24/2011	Yes	Yes
PGE-SGIP-2010-1882	PG&E	FC – Elec.	Landfill Gas (Directed)	400	5/24/2011	Yes	Yes
PGE-SGIP-2010-1886	PG&E	FC – Elec.	Landfill Gas (Directed)	300	5/24/2011	Yes	Yes
PGE-SGIP-2010-1849	PG&E	FC – Elec.	Landfill Gas (Directed)	500	5/9/2011	Yes	Yes
PGE-SGIP-2010-1856	PG&E	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	PG&E	FC – Elec.	Landfill Gas (Directed)	300	3/14/2011	Yes	Yes
PGE-SGIP-2010-1859	PG&E	FC – Elec.	Landfill Gas (Directed)	500	3/11/2011	Yes	Yes
SCG-SGIP-2010-0012	SCG	FC – Elec.	Landfill Gas (Directed)	1,000	1/24/2011	Yes	Yes
PGE-SGIP-2009-1805	PG&E	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	PG&E	ICE	DG - WWTP	1,696	12/24/2010	Yes	No
PGE-SGIP-2007-1761	PG&E	ICE	DG - WWTP	330	12/23/2010	Yes	No
PGE-SGIP-2009-1802	PG&E	FC – Elec.	Landfill Gas (Directed)	400	12/22/2010	Yes	Yes
PGE-SGIP-2009-1810	PG&E	FC – Elec.	Landfill Gas (Directed)	400	11/10/2010	Yes	Yes

SGIP Reservation No.	PA	Tech	Renewable Fuel Type	Size (kW)	Operational Date*	RFUR Project	Non-Renewable Fuel Supply
PGE-SGIP-2009-1811	PG&E	FC – Elec.	Landfill Gas (Directed)	400	11/10/2010	Yes	Yes
PGE-SGIP-2009-1812	PG&E	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	PG&E	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	PG&E	ICE	DG - WWTP	130	11/9/2009	Yes	Yes
SCG-SGIP-2006-0036	SCG	FC – CHP	DG - WWTP	1,200	10/27/2008	Yes	Yes
PGE-SGIP-2006-1498	PG&E	MT	Landfill Gas	210	8/5/2008	Yes	No
PGE-SGIP-2006-1640	PG&E	ICE	DG - WWTP	643	7/29/2008	Yes	No
PGE-SGIP-2006-1490	PG&E	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	1,030	2/21/2008	Yes	No
SCG-SGIP-2005-0082	SCG	ICE	DG - Food Processing	1,080	1/15/2008	Yes	No
PGE-SGIP-2006-1577	PG&E	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	PG&E	MT	DG - Food Processing	70	6/15/2007	Yes	No
PGE-SGIP-2005-1298	PG&E	MT	DG - WWTP	250	6/11/2007	No	Yes
PGE-SGIP-2006-1559	PG&E	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	PG&E	MT	DG - WWTP	240	3/6/2007	Yes	Yes
PGE-SGIP-2003-0298	PG&E	MT	DG - WWTP	30	1/31/2007	Yes	No
PGE-SGIP-2006-1505	PG&E	ICE	Landfill Gas	970	11/24/2006	Yes	No
PGE-SGIP-2005-1308	PG&E	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	PG&E	ICE	Landfill Gas	970	10/2/2006	Yes	No
PGE-SGIP-2005-1222	PG&E	ICE	Landfill Gas	970	7/5/2006	Yes	No
PGE-SGIP-2004-0658	PG&E	ICE	DG - Dairy	160	5/22/2006	Yes	No
PGE-SGIP-2004-0856	PG&E	MT	Landfill Gas	210	5/5/2006	Yes	No
PGE-SGIP-2005-1297	PG&E	MT	DG - WWTP	280	4/7/2006	Yes	No
PGE-SGIP-2003-0313	PG&E	MT	DG - WWTP	300	3/16/2006	Yes	No
PGE-SGIP-2003-0483	PG&E	ICE	DG - Dairy	300	1/13/2006	Yes	No
PGE-SGIP-2004-0833	PG&E	MT	DG - Food Processing	70	11/7/2005	No	Yes

SGIP Reservation No.	PA	Tech	Renewable Fuel Type	Size (kW)	Operational Date*	RFUR Project	Non-Renewable Fuel Supply
PGE-SGIP-2004-0653	PG&E	FC – CHP	DG - Food Processing	1,000	8/9/2005	No	Yes
PGE-SGIP-2004-0747	PG&E	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	PG&E	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	PG&E	MT	Landfill Gas	70	4/14/2005	Yes	No
PGE-SGIP-2004-0641	PG&E	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	PG&E	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	PG&E	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	PG&E	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% of their fuel input as directed biogas. The directed biogas delivered is compared to 75% of the project's fuel consumption. If the amount of directed biogas procured is less than 75% 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% 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% 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% of the project's fuel input will be considered pooled for future use. Once the pool is depleted, it cannot be borrowed against.