

Self-Generation Incentive Program  
Semi-Annual Renewable Fuel Use Report No. 9  
For the Six-Month Period Ending December 31, 2006

## 1. Purpose of this Report

The purpose of this report is to provide the Energy Division of the California Public Utilities Commission (CPUC) with updated information on fuel use and installed costs of renewable fuel use<sup>1</sup> projects implemented under the Self-Generation Incentive Program. The report identifies the compliance of renewable fuel use projects in meeting renewable fuel use provisions (i.e., having non-renewable fuels comprise no more than twenty-five percent of their annual fuel consumption on an energy input basis). In addition, the report provides cost comparisons between Level 3 and Level 3-R projects to identify if Level 3-R project costs have fallen below Level 3 projects.<sup>2</sup> This information is provided to the Energy Division to assist staff in making recommendations to the Commission concerning modifications to the renewable project aspects of the Program. This report complies with Decision 02-09-051 (September 19, 2002) that requires the Program Administrators to provide updated information on completed renewable fuel use projects on a six-month basis.<sup>3</sup> The six-month reporting period for this report extends from July 1, 2006, to December 31, 2006 and includes analysis of all projects installed since the SGIP's inception.

## 2. Summary of Operational Projects

During the six-month reporting period, there was growth in new renewable fuel use projects, with six new projects becoming operational. Addition of the six new projects and an old project<sup>4</sup> brings the total to 30 renewable fuel use projects operational in the Program as of December 31, 2006.

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<sup>1</sup> The phrase "renewable fuel use" for this report refers to SGIP facilities using renewable resources other than wind or solar and typically means facilities using renewable gas obtained from landfills, wastewater treatment plants and dairy digester systems.

<sup>2</sup> The reason for this comparison is a concern that as Level 3-R projects are exempt from waste heat recovery requirements, they could have lower project costs than Level 3 projects and could result in fuel switching.

<sup>3</sup> Ordering Paragraph 7 of Decision 02-09-051 states:

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

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

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

<sup>4</sup> PG&E 0833 had not been counted as a renewable fuel use project before because it was identified as a Level 3-N project in the program application. However, based on the information from inspection reports, we treat it as a renewable fuel use project and will confirm this treatment with the Program Administrators.

- Three of the six new projects coming on line during the reporting period are Level 3-R PG&E SGIP projects; two are Level 3-R<sup>5</sup> SCE SGIP projects; and the remaining project is a Level 2 PG&E SGIP project.
- Three of the six new projects use landfill gas and the remaining three projects utilize digester gas. All of the six new projects use internal combustion engines.
- Based on information from the inspection reports, four projects are designed to operate on 100% renewable fuels and the remaining two project use a blend of 80% digester gas and 20% natural gas.

Table1 gives the summary of all the renewable projects by technology:

**Table 1: Renewable Fuel Use Monitoring Information**

<b>Technology</b>	<b>No. Projects</b>	<b>Total Rebated Capacity (kW)</b>
Fuel Cell - Ren. Fuel	2	750
Microturbine - Ren. Fuel	17	3,094
IC Engine - Ren. Fuel	11	7,161
Totals:	30	11,005

These 30 operating renewable fuel projects represent over 11 megawatts of installed generating capacity, and IC engines represent the majority (approximately 65%) of the prime mover technologies used by renewable fuel use projects in the Program.

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<sup>5</sup> According to the program applications, SCE PY04 -158 &SCE PY04 -159 were identified as Level 3-N projects. However, inspection reports confirm that these are Level 3-R projects.

**Table 2: Renewable Fuel Use Monitoring Information**

Project ID No.	Program Administrator/ Funding Level	Technology/ Fuel Type	Capacity (kW)	Operational Date <sup>6</sup>	Annual Natural Gas Energy Flow (MM Btu)	Renewable Fuel Use (% of Total Energy Input)	Meets Program Renewable Fuel Use Requirements?
0007-01	SDREO/ Level 3 <sup>7</sup>	Microturbines/ Digester Biogas	88	8/30/2002	0	0% <sup>8</sup>	N/A
PY02-055	SCE/ Level 3-R	Microturbines/ Landfill gas	420	4/18/2003	0	100%	Yes
PY01-031	SCE/ Level 3 <sup>6</sup>	Engine/ Landfill gas	970	9/29/2003	0	100%	N/A
110	PG&E/ Level 3 <sup>6</sup>	Engine/ Digester gas & Nat. Gas	900	10/23/2003	TBD <sup>9</sup>	TBD <sup>8</sup>	N/A
PY02-074	SCE/ Level 3-R	Microturbines/ Landfill gas	300	2/12/2004	0	100%	Yes
0026-01	SDREO/ Level 3 <sup>6</sup>	Microturbines/ Digester gas	120	4/23/2004	0	100%	N/A
514	PG&E/ Level 3-R	Microturbines/ Digester gas	90	5/19/2004	0	100%	Yes
0023-01	SDREO/ Level 3 <sup>6</sup>	Microturbines/ Digester gas	360	9/3/2004	0	100%	N/A
379	PG&E/ Level 3-R	Microturbines/ Landfill gas	280	1/14/2005	0	100%	Yes
PY03-092	SCE/ Level 1	Fuel Cell/ Digester gas	500	3/11/2005	912 <sup>10</sup>	91% <sup>11</sup>	Yes
640	PG&E/ Level 3-R	Microturbines/ Landfill gas	70	4/14/2005	0	100%	Yes
641	PG&E/ Level 3-R	Microturbines/ Landfill gas	70	4/14/2005	0	100%	Yes
PY03-045	SCE/ Level 1	Fuel Cell/ Digester gas	250	4/19/2005	0	100%	Yes
PY03-008	SCE/ Level 3-R	Microturbines/ Landfill gas	70	5/11/2005	0	100%	Yes
PY03-017	SCE/ Level 3-R	Engine/ Digester gas	500	5/11/2005	1179 <sup>9</sup>	93.12% <sup>10</sup>	Yes
842A	PG&E/ Level 3-R	Microturbines/ Digester gas	60	5/27/2005	0	100%	Yes
747	PG&E/ Level 3-R	Microturbines/ Digester gas	60	7/18/2005	0	100%	Yes
PY03-038	SCE/ Level 3-R	Microturbines/ Landfill gas	250	7/12/2005	0	100%	Yes
483	PG&E/ Level 3-R	IC Engines/ Digester gas	300	1/13/2006	0	100%	Yes

<sup>6</sup> Since assignment of a project's operational date is subject to individual judgment, the incentive payment date as reported by the Program Administrators is used as a proxy for the operational date for reporting purposes.

<sup>7</sup> These projects were approved and funded prior to the effective date of Decision 02-09-051; therefore they do not fall under the classification of, or need to meet the requirements of, Incentive Level 3-R projects.

<sup>8</sup> This project was not operational for all of 2006, but is set up as a dedicated renewable fuel use project.

<sup>9</sup> This is a level 3 project which has been identified by the inspection report and by the operator to use digester gas as its primary fuel. Data has been collected natural gas use at this facility, but needed electricity information has been requested but is unavailable at this date.

<sup>10</sup> This number represents the average natural gas (MM Btu) used by the cogeneration system on an annual basis. Information necessary to calculate the natural gas usage was not received from the data provider for the time period from July 2006 to December 2006. The first six months of gas use was used to estimate the full year of natural gas use.

<sup>11</sup> Percentage of renewable fuel used by the cogeneration system on an annual basis.

**Table 2 (continued): Renewable Fuel Use Monitoring Information**

Project ID No.	Program Administrator/ Funding Level	Technology/ Fuel Type	Capacity (kW)	Operational Date <sup>12</sup>	Annual Natural Gas Energy Flow (MM Btu)	Renewable Fuel Use (% of Total Energy Input)	Meets Program Renewable Fuel Use Requirements?
313	PG&E/ Level 3-R	Microturbines/ Digester gas	300	3/16/2006	0	100%	Yes
1297	PG&E/ Level 3-R	Microturbines/ Digester Gas	280	4/7/2006	0	100%	Yes
856	PG&E/ Level 3-R	Microturbines/ Landfill gas	210	5/5/2006	0	100%	Yes
658	PG&E/ Level 3-R	IC Engines/ Digester gas	160	5/22/2006	0	100%	Yes
833	PG&E/ Level 3-N <sup>13</sup>	Microturbines/ Digester gas	70	9/1/2005	TBD <sup>14</sup>	TBD	N/A
1222	PG&E/ Level 3-R	IC Engines/ Landfill gas	970	3/24/2006	0	100%	Yes
1308	PG&E/ Level 3-R	IC Engines/ Biogas	400	11/17/2006	0	100%	Yes
1316	PG&E/ Level 3-R	IC Engines/ Landfill gas	970	10/2/2006	0	100%	Yes
1505	PG&E/ Level 2	IC Engines/ Landfill gas	970	11/24/2006	0	100%	Yes
PY04-158	PG&E/ Level 3-R <sup>13</sup>	IC Engines/ Digester Gas	296	11/15/2005	TBD <sup>15</sup>	80% <sup>16</sup>	Yes
PY04-159	PG&E/ Level 3-R <sup>13</sup>	IC Engines/ Digester Gas	704	11/15/2005	TBD <sup>15</sup>	80% <sup>16</sup>	Yes

### 3. Renewable Fuel Use at Renewable Fuel Use Projects

As shown in Table 2, 24 of the 30 renewable fuel use projects have 100% dedicated use of renewable fuel (i.e., there is no connecting natural gas or other non-renewable fuel supply to the facility). Of the remaining six projects:

- Two projects (SCE PY03-092 and SCE PY03-017) use natural gas for back-up and piloting purposes. In these instances, natural gas use is estimated to be less than 25% of the total fuel used annually. For SCE PY03-017 natural gas usage will be monitored based on the data sent by data provider. A natural gas metering system has been installed by SCE to monitor natural gas usage at SCE PY03-092.

<sup>12</sup> Since assignment of a project's operational date is subject to individual judgment, the incentive payment date as reported by the Program Administrators is used as a proxy for the operational date for reporting purposes.

<sup>13</sup> Based on the information from inspection reports we treat it as a renewable fuel use project and will confirm this treatment with Program Administrators

<sup>14</sup> Information necessary to calculate estimates of natural gas energy use and renewable fuel use has not yet been compiled or analyzed. However, because this is a Level 3 project (vs. 3-R), this information is not required to assess compliance with the Program's renewable fuel use requirements.

<sup>15</sup> Information necessary to calculate estimates of natural gas energy use has not yet been compiled or analyzed. These projects will be monitored to determine if they meet the renewable fuel provisions

<sup>16</sup> As per the inspection reports, these projects are reported to be using 80% of their annual fuel consumption from digester gas. These projects will be monitored to determine if they meet the renewable fuel provisions

- Two projects are Level 3-N projects and the information necessary to calculate estimates of natural gas energy use and renewable fuel use has not been compiled or analyzed. However, because these are Level 3 project (vs. 3-R), this information is not required to assess compliance with the Program's renewable fuel use requirements.
- For the remaining two projects, natural gas is blended with digester gas from a wastewater treatment facility. As per the inspection reports, the projects are reported to be using 80% of their annual fuel consumption from digester gas. Itron will investigate the need for installation of natural gas meters to verify that the consumption remains below the requisite 25% of annual fuel use on an energy input basis, and provide a recommendation to the SGIP Working Group.

In light of the information collected to date, we conclude that at least 24 of the 30 operating renewable fuel use projects implemented under the Program are in compliance with the renewable fuel use provisions.

#### 4. Cost Comparison between Level 3 and Level 3-R Projects

Concerns were expressed in CPUC Decision 02-09-051 that Level 3-R project costs could fall below Level 3 costs due to Level 3-R projects being exempt from waste heat recovery requirements. As a result, Level 3-R projects could potentially be receiving a greater than necessary incentive level which could lead to fuel switching. To address this concern, the CPUC directed the Program Administrators to monitor Level 3 and Level 3-R project costs.

Table 3 is a summary of eligible installed costs for Level 1, Level 3 and Level 3-R projects operational as of December 31, 2006. The table shows various project costs on a dollar per watt basis, including minimum, maximum and average values for each incentive level. The data so far show that Level 3-R project costs actually tend to be higher, not lower, than Level 3 project costs. Consequently, the data indicate the Level 3-R exemption from waste heat requirements has not lowered the costs such that they are lower than Level 3 costs. The details for microturbines, IC engines, and fuel cells are presented below.

**Table 3: Summary of Eligible Installed Costs for Operational Projects (\$/Watt)<sup>17</sup>**

Technology	Incentive Level	No. Projects	\$/Watt Eligible Installed Costs				Size-Weighted Average
			Minimum	Maximum	Median	Average	
Fuel Cell - Ren. Fuel	1	2	\$9.41	\$9.85	\$9.63	\$9.63	\$9.70
Fuel Cell - Nonren. Fuel	2	9	\$6.04	\$19.00	\$7.10	\$9.33	\$7.89
<b>All Fuel Cells</b>		<b>11</b>	\$6.04	\$19.00	\$8.15	\$9.38	\$8.12
Microturbine - Ren. Fuel	3-R	17	\$1.23	\$9.01	\$3.75	\$4.20	\$3.45
Microturbine - Nonren. Fuel	3	94	\$0.70	\$6.39	\$3.17	\$3.20	\$2.52
<b>All Microturbines</b>		<b>111</b>	\$0.70	\$9.01	\$3.32	\$3.35	\$2.62
IC Engine - Ren. Fuel	3-R	11	\$1.21	\$4.38	\$2.73	\$2.76	\$2.79
IC Engine - Nonren. Fuel	3	172	\$0.85	\$6.53	\$2.23	\$2.34	\$2.22
<b>All IC Engines</b>		<b>183</b>	\$0.85	\$6.53	\$2.29	\$2.37	\$2.25

### Level 3 and 3-R Microturbine Project Cost Comparison:

There were 94 microturbines powered by non-renewable fuels and 17 microturbines operating with renewable fuels during the reporting period. For Level 3 microturbines using non-renewable fuels, the average project cost was \$3.20 per watt. For Level 3-R microturbine projects using renewable fuels, the average project cost was \$4.20 per watt, \$1 per watt higher than non-renewable powered microturbines. Comparison of median project cost values between the Level 3 and Level 3-R microturbine projects also indicate that most renewable fueled microturbine projects had higher installed costs than their non-renewable fueled counterparts.

### Level 3 and 3-R Internal Combustion Engine Cost Comparison:

There were 172 internal combustion (IC) engines using non-renewable fuels during the reporting period and only eleven IC engines powered by renewable fuels. For Level 3 IC engines using non-renewable fuels, the average project cost was \$2.34 per watt. For Level 3-R IC engines operating off of renewable fuel, the average project cost was \$2.76 per watt, \$0.42 per watt higher than non-renewable powered microturbines. Comparison of median project cost values between the Level 3 and Level 3-R microturbine projects also indicate that most renewable fueled microturbine projects had higher installed costs than their non-renewable fueled counterparts.

### Level 3 and 3-R Fuel Cell Project Cost Comparison:

Besides the cost of waste heat recovery equipment, gas clean up costs may account for much of the differential between Level 3 and Level 3-R fuel cell project costs. As noted in Renewable

<sup>17</sup> Eligible installed system cost data was obtained from the Program tracking system files provided to Itron by the Program Administrators on a monthly basis. Operational projects are defined as projects for which an incentive check has been issued.

Fuel Use Report Number 8, it is difficult to draw sound conclusions about incremental gas clean up costs for fuel cells due to the small number of operating systems. In particular, there are only eleven operating fuel cell systems, nine using non-renewable fuels and two using renewable fuels. However, there is a significant range in the non-renewable fuel cell costs per watt (\$6.04 vs. \$19.00), making the *mean* of \$9.33 an unreliable indicator of the typical cost. Given the skewed distribution, the *median value* of \$7.10 may be a better indicator of the typical cost.

In general, the incremental cost of gas clean up equipment on renewable fuel cells should be approximately represented by the difference in the average cost of a non-renewable fuel powered fuel cell and a renewable fuel powered fuel cell. Due to the sensitivity of fuel cells to contaminants in the gas stream, gas clean up costs for fuel cells powered by renewable fuels, which contain sulfur, halide and other contaminants, should be higher than gas clean up costs for fuel cells operating off of cleaner fuels such as natural gas.

If the *minimum* project cost of a fuel cell operating off of non-renewable fuel is used instead of the *average*, then the difference between non-renewable and renewable powered fuel cells is on the order of \$3.37 per watt.

Comparisons between renewable and non-renewable microturbines and IC engine projects are more robust given the larger sample sizes. Based on the average costs per watt, the incremental costs for gas clean up is approximately \$1.00 per watt on microturbines and \$0.42 per watt on IC engines.

In summary, comparison of the installed costs between renewable and non-renewable fueled generation systems operational as of December 31, 2006, confirms that most non-renewable generators are less capital intensive than their renewable-fueled counterparts. It appears that the difference may be due mainly to increased gas clean up required on the renewable powered systems, which more than offsets the cost of the waste heat utilization equipment.