California Self-Generation Incentive Program Evaluation

Brenda Gettig, Itron, Inc.
Patrick Lilly, Itron, Inc.
Alan Fields, Itron, Inc.
Kurt Scheuermann, Itron, Inc.
Lori Kudo, Itron, Inc.
Pierre Landry, Southern California Edison

ABSTRACT

The California Self-Generation Incentive Program started in mid-2001 to pay incentives for the installation of eligible generation systems. These currently include photovoltaic, wind, fuel cells, microturbines, and internal combustion engines that generate electricity for all or a portion of a customer's electric load. The program is run jointly by a statewide working group comprised of members from the California Public Utilities Commission (CPUC), the California Energy Commission (CEC), representatives from each of California's four investor owned utilities (IOUs), and the San Diego Regional Energy Office (SDREO). Initially authorized to operate through 2004 with an annual funding allocation of $125 million, the program is performing successfully, and the California State Legislature has recently extended the program for an additional three years.[1]

This paper presents the key findings from recently published process and impact evaluations. In particular, the paper discusses how the program developed a successful outreach and delivery mechanism through third-party vendors and manufacturers of distributed generation equipment, which has helped develop and sustain this emerging market. In addition, an assessment was performed to compare the effectiveness of the two administrative approaches included in the program's design: three of the IOU areas are administered by a utility, and the fourth area is administered by a non-utility organization. Other interesting insights offered by the evaluation results include levels of customer awareness of distributed generation technologies and their benefits and impacts on system peak by photovoltaic and cogeneration technologies.

Overview

This paper presents the key results from a series of evaluations conducted in 2003 of the California Self-Generation Incentive Program. First, a brief description of the program is presented, followed by the objectives of the evaluations. Next, key findings from the evaluations are presented. Finally, a set of recommendations resulting from the evaluations are provided.

Program Description

The Self-Generation Incentive Program was adopted on March 27, 2001 by the CPUC under Decision 01-03-073. It is offered throughout most of California, specifically within the

[1] See AB1685.

service areas of Southern California Edison (SCE), Pacific Gas & Electric (PG&E), Southern California Gas Company (SoCalGas), and San Diego Gas & Electric (SDG&E). PG&E, SCE, and SoCalGas administer the program in their respective service territories. Within the SDG&E service territory, the program is administered through SDREO under the auspices of SDG&E.

The program pays incentives for eligible distributed generation technologies (microturbines, small gas turbines, wind turbines, photovoltaics, fuel cells, and internal combustion engines) installed at a customer's site that provide electricity for a portion or all of that customer's electric load. Systems can be up to 1,500 kW in generating capacity, although the maximum incentive basis is 1,000 kW. Table 1 summarizes the incentives and eligible technologies for the program.

Table 1. Summary of Self-Generation Incentive Program Incentive Levels

Incentive Category	Maximum Incentive Offered ($/watt)	Maximum Incentive as a % of Eligible Project Cost	Minimum System Size (kW)	Maximum System Size Incentivized (kW)	Eligible Generation Technologies
Level 1	$4.50	50%	30	1,000	▪ Photovoltaics ▪ Fuel Cells[1] ▪ Wind Turbines
Level 2	$2.50	40%	None	1,000	▪ Fuel Cells[2]
Level 3-R	$1.50	40%	None	1,000	▪ Microturbines[1] ▪ Internal combustion engines and small gas turbines[1]
Level 3-N	$1.00	30%	None	1,000	▪ Microturbines[2, 3] ▪ Internal combustion engines and small gas turbines[2, 4]

1 Operating on renewable fuel.
2 Operating on non-renewable fuel.
3 Using sufficient waste heat recovery and meeting reliability criteria.
4 Both utilizing sufficient waste heat recovery and meeting reliability criteria.

From the start of the program through January 2003, 34 projects were completed and brought online. Over half of the 34 projects are photovoltaic systems (called Level 1 projects by the program) and over one-third are cogeneration systems running on nonrenewable fuel (called Level 3N projects by the program). These 34 projects have a total rated capacity of nearly 8 MW, and most of this capacity (68%) is from Level 3N systems.

In addition to these completed projects, 340 projects were in process at the end of the second program year. These projects are made up of roughly half photovoltaic systems and half cogeneration systems running on nonrenewable fuel. These 340 in-process projects have a total rated capacity of approximately 105 MW, most of which (69%) is from Level 3N systems.

Overview of Evaluations

The second-year evaluation of the Self-Generation Incentive Program included a process evaluation, an impact evaluation, and an assessment of administrative approaches.

The primary objective of the process evaluation was to assess the effectiveness of the program by evaluating certain criteria that were established during the first-year evaluation and relate to the original goals established by the CPUC at program initiation. The process evaluation entailed a large-scale data collection effort, including in-depth interviews and surveys with all program administrators and working group members, 108 participating host customers, 62 participating third-party suppliers, 300 nonparticipating host customers sampled from the general population, 164 nonparticipating customers and suppliers sampled from attendee lists for program workshops, and engineers from three engineering firms who provided on-site verification and auditing of installed systems. In addition, extensive data were collected from the program applications and marketing records and compiled into a tracking database.

The primary objective of the impact evaluation was to summarize electrical energy production and demand reduction attributed to the program. The impact evaluation used available metered data collected from systems installed through the program that were operational in the first half of 2002. However, metered data were not available for all online systems. Therefore, the impacts for those systems without available data were estimated.

The primary objective of the comparative assessment was to examine the relative effectiveness of the program's two administrative approaches. Specifically, in three of the IOU areas, the IOU administers the program. In the fourth area, the program is administered by SDREO under the auspices of the IOU. The evaluation entailed reviewing related documents and reports, interviewing program administrators and other key personnel (approximately 20 individuals), and analyzing data from the program tracking database.

It is worth noting that the data collected for each evaluation covers a slightly different period. Data for the process evaluation were collected for the period, including program start through January 2003. Data for the impact evaluation were collected for systems that were online and operational in mid-2002. Data for the comparative assessment were collected for the period of program start through May 2003.

Key Findings

Results from these three evaluations are extensive and published in reports available from the CPUC. This paper presents selected key findings. In particular, the paper discusses the outreach and delivery strategy, the relative effectiveness of the two administrative approaches, customer awareness, and energy and demand impacts from installed systems.

Outreach and Delivery through Third Parties

This area of the program was assessed using interview responses from program applicants. The program relies on third-party outreach to customers, a strategy that has been successful in recruiting participants. Participant host customers interviewed during the process evaluation reported, in many cases, that they learned of the program from a third party and, once involved, relied on a third party to interpret the program requirements and mediate with the utility. In addition, third party suppliers interviewed during the process evalution reported that the program has helped them to develop the industry by providing financial incentives. Further, many suppliers reported that the program administrators were not outreaching to customers.

The program administrators held numerous informational workshops promoting distributed generation and the Self-Generation Incentive Program to potential host customers and to third-party vendors likely to market the program to their existing customers. The program administrators primarily focused their marketing efforts for these workshops on third-party vendors and developed marketing materials for distribution at conferences, trade shows, and other events sponsored by members of the energy service industry.

The results of these efforts proved successful. Evaluation results show that the majority of participant host customers entered the program due to the intervention of a third-party vendor or energy service company (ESCO). Moreover, customers who allowed their third party to manage a turnkey project in which the customer had little or no involvement with the utility reported high satisfaction with the program.

Relative Effectiveness of Administrative Approaches

This assessment evaluated the two administrative approaches to the Self-Generation Incentive Program, i.e., one in which the utility directly administers the program and one in which the utility contracts to a regional energy office to administer the program under the utility's supervision and funding. Due to the current design and funding mechanism established for the program, a true non-utility administrative approach is not feasible and thus was not considered in this comparative review.

The general approach for this evaluation consisted of defining the specific comparative assessment evaluation criteria and then analyzing data from program activity to date. More specifically, data were collected from existing information, interviews with key players, and results from the impact and process evaluations. Then, criteria were developed to measure the effectiveness of the two selected administrative approaches. In addition, each administrative approach was characterized with a general description of the organizational structure, staff and resource availability, including the goals and vision and/or mission statements of the organization. Further, information was used to assess the effectiveness of each administrator type, relative to the effectiveness criteria that were developed for this assessment. Data from the program-tracking database and from the results of the second-year process and impacts evaluations were used to measure these criteria for both administrative approaches.

In considering the results, it is important to remember that the program has performed quite well in its first two years, with 463 active or completed projects representing a total rated system capacity of roughly 148 MW as of the end of May 2003. Moreover, each administrator has met program objectives and administrative costs have remained well below the limit of 5% of total program costs required by Decision 01-03-073. Furthermore, it is important to recognize that each utility and non-utility administrator, including SDG&E, has contributed to a successful and cooperative administration effort through the statewide program working group to deliver a consistent, high quality program.

When considering organizational structure, it was found that large organizations might have an administrative advantage because they have access to additional resources and use of economies of scale. However, when considering the alignment of an organization's mission and goals with state energy policies and program objectives, it was found that a single-purpose organization such as SDREO, exclusively in the business of disseminating information and promoting efficient technologies, has business interests that are more truly aligned with the goals of the program.

In the area of cost-effectiveness, the average result of the utility administrative approach was found to be more effective when compared to the non-utility result, as measured by percentage of administrative costs per total program budget (average 1.55% to 2.00%), administrative cost per application (average $8,590 to $15,494), and administrative cost per kW of rated system capacity (average $37 to $77). Utilities on the average were able to process applications and bring systems online with fewer administrative dollars; however, not every utility administrator performed better than the non-utility administrator. Results for utilities were often in a wide range, and the non-utility result in many cases fell somewhere within that range. Two contributing reasons for a lower cost-effectiveness result in the SDG&E service area include 1) a high level of interest and program activity during the first program year due to the effects of the higher retail electric rates and energy crisis, which then dropped off during the second program year, and 2) ramp-up of SDREO staff in the second year in response to this strong early program activity despite the drop off of program activity. In contrast, the utilities on average had more program activity during the second program year. In addition, the average result for the utility administrative approach showed a higher percentage of completed projects with clean technologies (average 71% to 27%) and a higher percentage of kW online from completed projects of clean technologies (average 34% to 29%) as compared to the result for the non-utility administrative approach.

On the other hand, when looking at administrative cost per kW of California ISO peak demand impact for the first nine to twelve months of the program, the result for the non-utility administrative approach was roughly 20% less than the average result for the utility administrative approach ($398 to an average $476). Another area in which results suggest the non-utility administrative approach was more effective is marketing outreach and support. Results showed the non-utility approach reached a higher number of potential host customers in their service area through workshops as compared to the average result for the utility approach (0.99 to an average 0.42 per 1,000 eligible accounts in service area). Further, comments from some of the suppliers who had worked with both types of administrative approaches indicated a preference for working with a non-utility, while others were ambiguous between the two approaches.[2]

Overall, the results of this comparative assessment suggest that both utility and non-utility approaches can effectively administer the Self-Generation Incentive Program, and each has demonstrated certain program administration attributes to a greater degree.

Customer Awareness

Awareness of the program and self-generation opportunities among customers remains relatively low. Supplier and host customer interviews confirmed that third-party suppliers are the dominant source of information on the program for participant host customers. However, nonparticipants reported that they were just as likely to hear about the program from utility representatives or Internet searches as they were from third-party suppliers. In fact, the dominant sources of program information identified by nonparticipants were newspaper or magazine

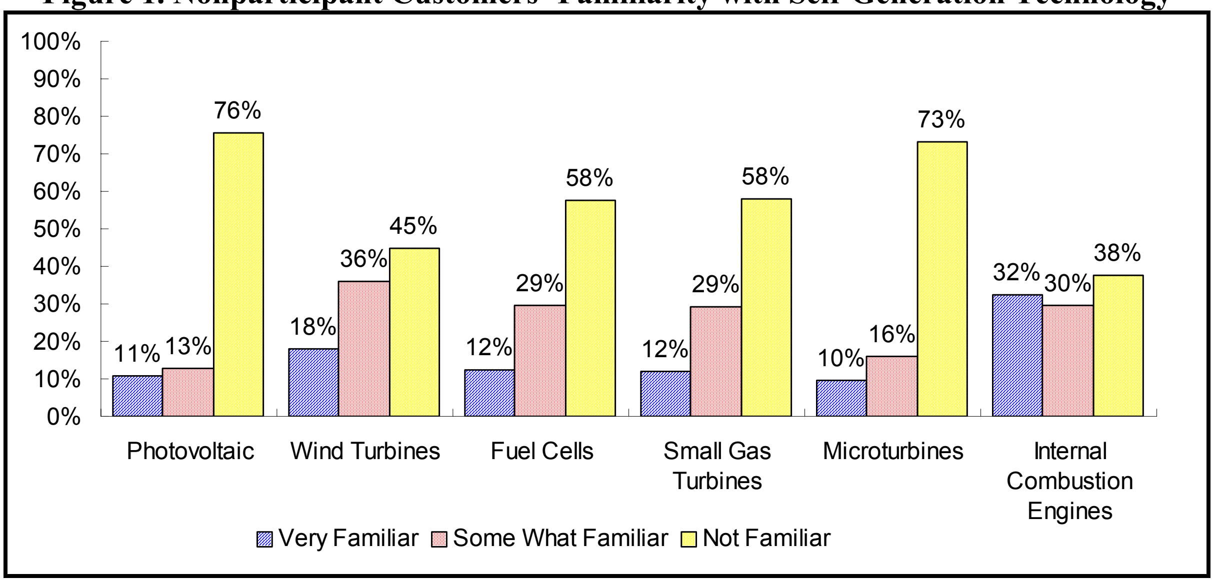
---

[2] Six suppliers representing 62 projects were interviewed for their experience with both utility administrators and the non-utility administrator. Of these, two made statements to the effect that they preferred the non-utility administrator.

articles. This finding suggests that third parties are much more influential in the decision to participate than utility representatives or other sources of information.

One way of gauging customer awareness relative to the program is to assess the awareness of nonparticipant potential host customers from the general population. Results from the second-year process evaluation suggest that roughly 64% of nonparticipant customers are aware that they can generate their own power. However, this is roughly the same result found in the first-year process evaluation, indicating that no significant change occurred during the year in customer awareness. In addition, awareness of self-generation programs (specifically the Self-Generation Incentive Program and the CEC Buydown Program) was low and had not changed significantly from the first-year evaluation's results. Furthermore, when asked to describe their familiarity with self-generation technology, most nonparticipant customers reported being "not at all familiar" with photovoltaic, fuel cell, microturbine, and small gas turbine technologies, and more than one-third responded similarly for wind turbines and internal combustion engines. These results are presented in Figure 1.

Figure 1. Nonparticipant Customers' Familiarity with Self-Generation Technology



These results suggest that the program is not having an effect on awareness of distributed generation technology and/or related programs in the general public. It is worth noting, however, that when the program administrators commenced marketing efforts to promote awareness of distributed generation and the Self-Generation Incentive Program, they explored a variety of channels intended to promote awareness within the general population. These channels included mass mailings and radio and television advertisements. However, since response rates from these efforts were quite low, the program administrators sought to better target marketing efforts toward existing customer networks. As a result, they focused their attention on educating third parties such as ESCOs and other contractors and vendors likely to provide services to potential host customers, i.e., managing the application and/or project development process. The third parties, in turn, marketed the program to their customers. These efforts produced greater success in promoting awareness of distributed generation and the Self-Generation Incentive Program, as discussed above.

In summary, the findings suggest that progress toward increasing customer awareness of distributed generation technology and programs is not significant. However, the result is not surprising since most marketing efforts have been targeted at third parties, and this effort has been successful in soliciting participation.

Energy and Demand Impacts from Online Systems

During 2002, the ISO system peak reached a maximum value of 42,352 MW on July 10. At that time, there were 30 projects from the Self-Generation Incentive Program in operation. Table 2 shows the metered and estimated online capacity and impact at peak demand for these 30 projects. As shown, the total generation capacity was 8.3 MW; however, the total impact on ISO peak demand was estimated at 6.7 MW. Level 3 internal combustion engine and microturbine systems account for 82% of this impact.

Table 2. 2002 ISO System Peak Demand Impacts

Basis	**Online Systems** (n)	**Online Capacity** (kW)	**Peak Demand Impact** (kW_P)
Level 1 PV	**11**	**1,130**	**790**
Metered	3	248	173
Estimated	8	882	616
Level 2 Fuel Cell	**2**	**400**	**400**
Metered	0	0	0
Estimated	2	400	400
Level 3 IC Engines / Microturbines	17	**6,752**	**5,472**
Metered	6	1,377	1,118
Estimated	11	5,375	4,354
Total Estimated Impact	**30**	**8,282**	**6,662**

Systems installed through the Self-Generation Incentive Program generated over 32 million kWh in 2002. Table 3 shows the estimated energy impacts by quarter. As shown, Level 3 internal combustion engine and microturbine systems account for 86% of this energy production.

It is worth noting that the incentive, by design, does not tie directly to system peak but is meant to address the upfront cost of equipment installation. One way to ensure peak load reduction would be to redesign the incentive payment structure with a pay-for-performance arrangement. However, this alternative has been discussed at length—first during the CPUC proceedings resulting in D.01-03-073, and later by the program working group without acceptance. Most parties stated that sufficient financial incentives are already in place with the current retail rate structure to ensure that systems funded by the program will operate during the peak demand periods.

Table 3. Energy Impacts by Quarter

Basis	Q1-2002	Q2-2002	Q3-2002	Q4-2002	Total
Level 1 PV	**59,899**	**461,814**	**679,860**	**646,822**	**1,848,394**
Metered	0	10,603	179,554	343,315	533,472
Estimated	59,899	451,211	500,306	303,507	1,314,923
Level 2 Fuel Cell	**410,400**	**528,580**	**839,040**	**839,420**	**2,617,440**
Metered	0	0	0	0	0
Estimated	410,400	528,580	839,040	839,420	2,617,440
Level 3 IC Engines /Microturbines	**2,476,239**	**4,795,801**	**7,402,374**	**13,002,985**	**27,677,399**
Metered	458,909	1,065,162	1,458,229	2,145,189	5,127,489
Estimated	2,017,330	3,730,639	5,944,146	10,857,796	22,549,911
Total	**2,946,538**	**5,786,195**	**8,921,274**	**14,489,227**	**32,143,233**

Program Recommendations

As a result of the second-year process evaluation, recommendations were made in the areas of program design, implementation, and marketing. While they are not all presented here, the primary recommendations included the following.

Resolve Incentive Structures and Payment Mechanisms

The program incentive structure is presently based on a project cost cap and/or dollar per watt rather than generation system performance. This structure does not reward efficient distributed generation suppliers and thus reduces the effectiveness of the Self-Generation Incentive Program in developing a self-sustaining distributed generation market. At the same time, the present incentive structure creates a need for detailed cost reporting to justify the incentive payment, which burdens both applicants and administrators and, in many cases, delays payment.

The evaluation team recommended developing separate incentive levels for microturbines and internal combustion engines. The market development status, costs, and environmental impacts for these technologies are dissimilar, and it makes sense to incentivize them at different levels. In addition, the differential incentive for Level 3-R projects should be re-assessed in light of the recent data on fuel clean-up costs. Furthermore, the team recommended elimination of the percentage of project cost limit so that all incentives are paid on a dollar per watt basis. This change would simplify the incentive determination for the applicant and alleviate some of the burdensome administrative effort for both applicants and program administrators. It should also help to shorten the processing time of incentive claims, so applicants can be paid in a timelier manner. Finally, it would mitigate the appearance of gaming eligible system costs on the part of suppliers.

Clarify Net Metering Requirements and Improve Meter Installation/Net Meter-Related Billing Processing

This recommendation applies only to Level 1 photovoltaic and wind projects. Some host customers who installed photovoltaic systems indicated they had not received credit for contributions to the grid due to delays in obtaining meters. In addition, some customers who were being credited for their contributions to the grid indicated they were frustrated because they did not understand how credits were being applied. However, the nature of this problem is actually related to the utility and not the program. Therefore, it was recommended that Level 1 applicants with projects involving net metering be advised at the outset of their projects of a more realistic timeframe needed for meter installation. Further, it was suggested that program administrators continue to intervene for their customers by talking to the appropriate representative(s) at their utility regarding the time required for net meter installation and the nature of the problems that have caused delays.

Revise Program Documents to Provide for Site Data upon Request

During the course of the initial program impacts assessment, it became apparent that several operational projects are collecting useful operational data for the program evaluation; however, such data were not being made available to the evaluation team for various reasons. The most common motive for not submitting these data to the evaluation team was the fact that the applicant had not yet received their incentive. This situation greatly reduced the volume of data made available to the PY2002 impacts assessment. Moreover, because of the reasoning involved, it will likely continue to impact third-party metered operational data availability in future year assessments.

Therefore, the evaluation team recommended that the Self-Generation Incentive Program Handbook, the program's contract, and the incentive claim form submittal documents be revised to obligate applicants and their third-party provider(s) to download and transfer electronically raw project operational interval data (i.e., NGO/gross generator kW, thermal energy, photovoltaic environmental data, etc.) upon written request in order to address the evaluation team's need for monitoring data. Further, there should be provisions to allow appropriate and reasonable compensation from the program to the applicant for their cost of setting up necessary controls and procedures to provide the data.

Conclusion

This paper presented a brief overview and key findings from three recent evaluations of the California Self-Generation Incentive Program. The three evaluations showed that the program has been successful in bringing new generation capacity online, including that generated by clean technologies. Although customer awareness of self-generation technologies and opportunities remains low, the program markets to third parties who are effective in recruiting customers to host new projects. Utility administration of the program has been cost-effective on average, although not all utility administrators performed as well as the non-utility administrator during the period evaluated. The vast majority of energy produced by systems completed through the program (86%), as well as the majority of demand reduction (82%), was from systems using internal combustion engines and microturbines. Additional results and recommendations can be found in the complete evaluation reports which are available through the CPUC.

References

Itron, Inc. California Self-Generation Incentives Program Second Year Impacts Evaluation Report. Submitted to Southern California Edison April 2003.

Itron, Inc. Self-Generation Incentive Program Second Year Process Evaluation. Submitted to Southern California Edison April 2003.

Itron, Inc. Self-Generation Incentive Program Administrator Comparative Assessment. Submitted to Southern California Edison September 2003.

California Public Utility Commission. Decision 01-03-073. March 2001.