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JOINT OVERSIGHT HEARING
UTILITIES AND COMMERCE COMMITTEE
AND NATURAL RESOURCES COMMITTEE
BRADFORD, CHESBRO, Chairs

March 17, 2014
Upon adjournment of Utilities and Commerce (2:00PM)
State Capitol, Room 437

Review of the Self Generation Incentive Program Evaluation

Background Paper

I. BACKGROUND

The Self Generation Incentive Program (SGIP) has been in place for 13 years. SGIP provides incentives for installation of eligible generation technologies that are located at a customer's site and sized no larger than what is needed to meet on-site energy needs. The program has changed over time in terms of eligible technologies, levels of incentives, performance requirements, warranty requirements, and other eligibility criteria.

Between 2001 and 2012, SGIP paid out $1.135 billion to 2,316 projects totaling 592 megawatts (MW). The average project award is $778,000, based on an incentive rate of $1.95/watt. The largest awards have gone to fuel cells using biogas, with an average award of $2.42 million at $4.49/watt.

The authority to collect funds to pay SGIP incentives expires on December 31, 2014. The program may continue to pay incentives until January 1, 2016. Any unallocated funds remaining after January 1, 2016 must be returned to ratepayers.

In the current session, two bills have been introduced to authorize additional ratepayer charges and extend administration of SGIP – AB 1499 (Skinner) for one year ($83 million) and AB 1624 (Gordon) for six years ($498 million). Both bills have been double-referred to the Utilities and Commerce and Natural Resources Committees and are expected to be heard in April.

II. PROGRAM HISTORY

On August 31, 2000, the final day of the 1999-2000 Legislative Session, AB 970 (Ducheny) was gutted and amended. The bill included a variety of provisions quickly cobbled together in an effort to respond to the emerging energy crisis in San Diego, where San Diego Gas and Electric was the first utility to expose its customers to unfrozen rates under California's ill-fated experiment with electric industry restructuring. Because the crisis was misunderstood at the time to be the result of a physical supply shortage, AB 970's primary focus was to increase electric generation supply, and most of the bill's provisions were related to expediting the siting of power plants.

Buried on page 20 of the 22-page bill was a single sentence requiring the Public Utilities Commission (PUC) to adopt *"(d)ifferential incentives for renewable or super clean distributed generation resources"* within 180 days of the effective date of the bill. Aside from the objective to *"reduce demand for electricity and reduce load during peak demand periods,"* no further definitions or instructions were included in AB 970. The bill required the "reasonable costs" of the PUC's action to be included in the distribution revenue requirement of PUC-regulated utilities. This provision was not even mentioned in the Senate or Assembly bill analyses.

Pursuant to this provision of AB 970, the PUC established the SGIP in 2001, offering customer rebates for renewable and "super clean" distributed generation resources. SGIP has been extended and/or modified by at least six bills since then. Over the last 13 years, the SGIP has offered rebates for installation of solar, wind, fuel cell, and certain renewable and fossil fuel combustion resources meeting specified emissions and efficiency standards.

A 2005 report commissioned by the PUC to study the cost-effectiveness of SGIP concluded that the program is marginally cost-effective for participants (i.e., recipients of funding), but is not cost-effective to non-participants (i.e., ratepayers who pay for it). Because SGIP is funded from distribution rates, its costs are disproportionately borne by residential ratepayers. However, historically only larger projects have been eligible for SGIP, so residential ratepayers haven't been able to access the incentives.

With the enactment of the California Solar Initiative (CSI) through PUC order and SB 1 (Murray) in 2006, photovoltaic (PV) systems were no longer eligible for SGIP incentives. PV incentives were provided instead under the CSI. Severing solar from SGIP left a much smaller program for wind, fuel cells and combustion projects which was to continue until 2008. In 2006, AB 2778 (Lieber) extended SGIP for wind and fuel cells until 2012, but excluded combustion projects.

In 2009, SB 412 (Kehoe) extended SGIP collection through 2011, modified eligibility to include fossil fuel projects that reduce greenhouse gas (GHG) emissions, and required the PUC to administer the program until 2016 (the additional time was allotted to spend a $200+ million surplus accumulated from prior years).

In response to a December 22, 2010 request from SGIP administrators, the program was suspended by a PUC ruling issued February 10, 2011, which froze applications received on or after January 1, 2011. The reason for the suspension was that a rush of awards and applications, mostly from a single vendor, had nearly exhausted both the current budget and the accumulated surplus, leaving less funding than expected for future awards under SB 412. Later in 2011, the PUC adopted a decision implementing SB 412 and reinstated the program. At the same time, the PUC made advanced energy storage systems (AES) eligible for SGIP incentives.

Notwithstanding the issues with the program and the SB 412 agreement to sunset SGIP in 2016, in 2011 AB 1150 (V. Manuel Pérez) allowed the PUC to fund SGIP for an additional three years. Under AB 1150, the PUC may authorize the utilities to collect up to $83 million per year from their customers through December 31, 2014. However, AB 1150 maintained the January 1, 2016 sunset on the program, at which time the PUC must provide repayment of all unallocated funds to reduce ratepayer costs.

III. RECENT PROGRAM EVALUATION

The most recent evaluation of SGIP, "2012 SGIP Impact Evaluation and Program Outlook,"[1] was prepared by Itron under contract and published by the PUC on February 7, 2014. Among the report's key findings are:

- SGIP spent an average of $311 per metric ton of CO2 reductions through 2012.
- Ratepayers paid $33 million in incentives for $7 million in benefits (avoided costs) in 2012.
- Of the completed SGIP projects (excluding PV projects),
    - 52% of the project capacity remains operational.
    - 8% of the project capacity has been decommissioned.
    - 14% of the project capacity is offline.
    - 26% of the project capacity has no information available on the condition of the project.
- Assuming build-out of the queue of pending SGIP projects and continuation of the current program guidelines and rules, GHG emission reductions and peak demand reductions will grow.
- There is insufficient independent information to quantify market transformation impacts.

In addition to the evaluation by Itron, the PUC published a SGIP Budget Report[2] on March 8, 2013. This report reviews SGIP participation, spending patterns by eligible technologies, and the use of carryover funding from prior years, and makes recommendations on potential adjustments to the SGIP budget.

IV. PROGRAM OBJECTIVES AND PERFORMANCE

As the committees prepare to consider proposals to extend SGIP, members may wish to consider how the program is performing with respect to the four PUC goals, whether these four goals are

the right goals, and what adjustments may be necessary if members determine that a further commitment of ratepayer funds to the program is justified.

According to the PUC,[3] the four goals of SGIP are:

- Reduce peak demand
- Reduce GHG emissions
- Promote system reliability
- Contribute to market transformation of distributed energy resources

A. <u>Peak demand reduction</u> – Key takeaway: Costs exceed estimated benefits 4.7 to 1.

According to the SGIP evaluation report, in 2012, ratepayers paid $33 million in incentives for $7 million in benefits known as avoided costs.

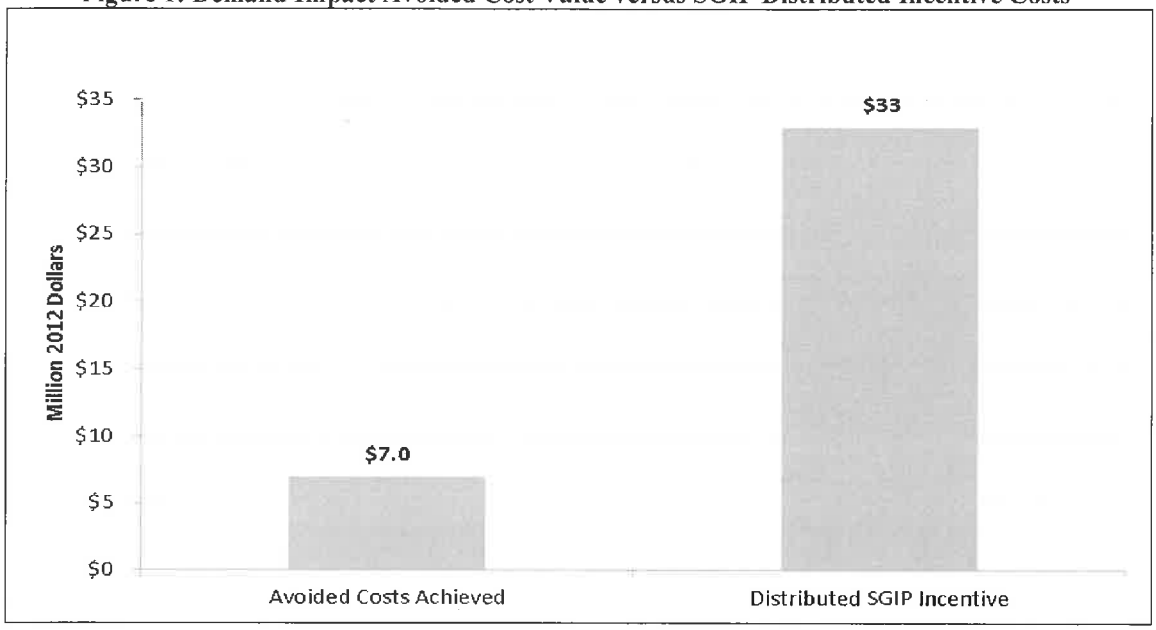
The phrase "avoided cost" refers to the sum of benefits received when otherwise applicable costs are avoided due to the installation and operation of the specified on site generation technology. The avoided costs are the avoided generation (capacity), energy, transmission and distribution capacity, ancillary services, the cost of meeting the Renewable Portfolio Standard, and GHG emissions. The avoided costs are then compared to the cost of the program, which is generally what was paid to achieve those avoided costs. These costs can include the program administration, the sum of the incentive payments, and other costs.

It is typical for avoided costs to be calculated in different ways for different programs. In the SGIP evaluation report, the benefits are based on "estimated demand response" benefits and several different ways of characterizing it are presented, including California Independent System Operator (CAISO) peak hour, CAISO Top 200 hours of peak demand, and peak demand based on the peak schedules in the customers rate schedule.

According to supplemental information provided to the committees by the PUC, the avoided cost benefits are based on an estimate of output: during the top 200 hours SGIP projects averaged between 103 and 134 megawatt-hours (MWh) of peak demand impact and a "very rough ballpark estimate of the energy impact over the top 200 hours could be obtained by multiplying the average peak hour demand impact by 200 hours."

Further, Itron's cost-benefit calculation excludes $10 million in SGIP incentives (funded by customers of investor-owned gas utilities) that were paid to customers who are served by customers of municipal electric utilities (who are not IOU ratepayers).[4]

Figure 1: Demand Impact Avoided Cost Value versus SGIP Distributed Incentive Costs[5]



According to supplemental information provided to the committees by the PUC, no (zero) battery projects were measured for the 2012 impacts assessment (due to a lack of metered data for storage projects in 2012).

B. <u>GHG emissions reduction</u> – Key takeaway: SGIP projects have not consistently produced verifiable emission reductions and GHG reduction costs far exceed the costs of GHG reduction measures related to AB 32.

As a GHG reduction measure, SGIP would appear to fail the cost-effectiveness test. Many of the projects funded have not produced emission reductions. Of the projects that do produce emission reductions, some only achieve reductions based on a debatable analysis of their actual impact. In most cases, the reductions have come at a very high cost – an average of $311 per metric ton according to the 2012 SGIP evaluation report.

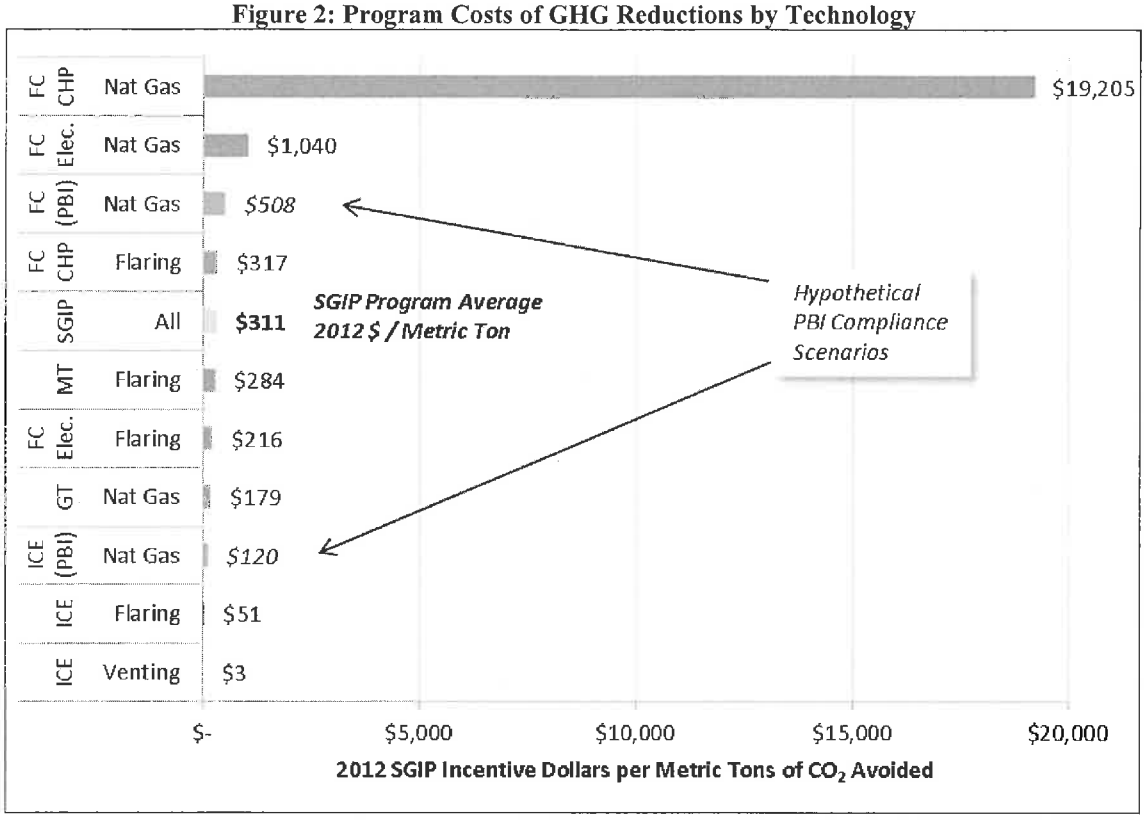
For comparison, here are costs per metric ton provided by the Air Resources Board for measures adopted pursuant to AB 32:

1. Offset credit: $8-8.46 (prices on Intercontinental Exchange Spot Market).
2. Allowance: $11.48 (price for 2014 vintage allowance at February 2014 auction).
3. Low-carbon fuel standard credit: $48.
4. 33% RPS: $24.
5. Energy efficiency: -$109.
6. Refrigerant management: -$2.

The funds now dedicated to SGIP could achieve far greater GHG reductions if spent on efficiency or any number of other measures, or focused on self-generation projects with high

GHG reduction potential, such as the conversion of open dairy lagoons to methane-capturing digester/generation projects.

Figure 2: Program Costs of GHG Reductions by Technology



C. <u>Project reliability</u> – Key takeaway: Project reliability is an area for further investigation.

Actual reliability of installed projects is largely unknown, but survey information suggests that a large percentage of SGIP-funded projects are either no longer operating or are operating at less than their installed capacity. A PUC investigation[6] on combined heat and power (CHP) performance in 2010 found that CHP projects experienced increased time spent not operating, reductions in output when operating, and decreases in electrical efficiency and thermal heat recovery over time. The investigation further found that unexpected levels of maintenance and economic complexity have dampened participant satisfaction. It is unclear whether the current reliability of SGIP projects are the same, better, or worse than what was reported in 2010. The 2012 SGIP evaluation report could not find operational information on 26% of the projects and another 22% of the projects either were decommissioned or offline.

The performance issues documented in the SGIP evaluation report calls into question whether the 10-year warranty required by the PUC is a useful or effective means of ensuring project reliability. The committees may want to consider whether performance guarantees, backed by insurance or bonds would better ensure that projects operate for their expected useful life.

According to supplemental information provided to the committees, AES projects began receiving SGIP incentives as early as 2009. There are currently more than 700 pending applications for SGIP incentives for AES projects. According to the PUC:

> The PUC hasn't provided a formal definition of AES. According to the staff that worked on the implementation of SB 412, there was concern that adopting a formal definition of AES in the 2011 decision could prevent certain types of storage from participating in the program. Instead, the program developed minimum operating criteria, such as the ability for the AES to discharge its rated capacity for two hours, and the minimum 63.5% round-trip efficiency requirement.

SGIP eligibility does not require AES projects to be located where these benefits could accrue to ratepayers nor does it require that AES be operated in a manner that will offset peak electric demand.

When AES is installed in conjunction with a PV project, the consultant report found that:

> A common misconception about AES in combination with PV is that the storage would primarily charge from the PV system. In fact, the storage system would charge from the PV system only when the PV system's output exceeds customer load (and when charging the PV output is a more profitable alternative to net energy metering (NEM), which is already an attractive option for the customer). The AES system would instead primarily charge from the grid off-peak and discharge on-peak to supplement the PV system's on-peak output.

The report also states that:

> The major challenges in using batteries for electrical storage are to make them both affordable and long-lived. Commercially-available battery systems are not adequate for long-term (>10 years) use. Manufacture of batteries requires handling a variety of chemicals and may pose safety and environmental issues.

SGIP does not appear to have any safety requirements specific to batteries (although some safety measures could be required by interconnection rules or local enforcement of fire and electrical codes). The PUC is currently examining whether current statute allows storage systems to qualify for NEM, whether energy storage can interconnect under NEM rules, and whether there are safety considerations that are needed if they are allowed to qualify.

D. <u>Market transformation</u> – Key takeaway: The California market cannot play a significant or measurable role in market transformation.

Although "market transformation" is not mentioned in the SGIP statute, much less defined, the PUC states that it is one of the four principal goals of the program. In practice, market transformation seems to be the unmeasurable X factor to support the claim that SGIP benefits

justify its costs to ratepayers. The concept of market transformation permeates many of the PUC's energy efficiency, distributed generation, and energy storage initiatives.

It is unclear whether the PUC has defined how it will measure when and whether the market has been transformed in any of these initiatives, including the SGIP program. The most specific description of SGIP market transformation appears in the PUC initial SGIP staff proposal,[7] which states the following:

> *SGIP should complement the structure of and be coordinated with existing ratepayer supported programs, especially the California Solar Initiative, which is aimed at transforming the market for renewable distributed generation by driving down prices and increasing performance of (distributed energy resources).*

and:

> *Market Transformation Objectives – Technologies that may not be cost-effective today, but have the potential to be cost-effective in the near future, can be supported along the path toward cost-effectiveness through incentives. By facilitating greater deployment of these technologies, SGIP may help these technologies achieve economies-of-scale, which can drive down costs. However, SGIP is likely to only be a small part of the global market for these technologies, and* ***[PUC] staff does not expect that the California market can play a significant (or measurable) role in market transformation.*** (emphasis added)

The PUC provided the following data on the average installed cost per watt. However, the PUC cautioned that this information is self-reported by the developers and it is unclear whether these numbers accurately reflect true installation costs.

Completed SGIP Applications, Average Installed Cost per Watt	
Type	Average Cost per Watt ($/watt)
Advanced Energy Storage	5.65
Fuel Cell Combined Heat and Power	9.85
Fuel Cell Electric	10.78
Gas Turbine	2.75
Internal Combustion	2.70
Microturbine	3.46
Pressure Reduction Turbine	4.47
Wind Turbine	4.28

As for whether SGIP is complementary to the CSI program with regard to driving down prices, the PUC provided the following closer look at the average installed cost of electric-only fuel cells using natural gas.

Average Cost per Watt for Installed Electric-Only Fuel Cells using Natural Gas		
Program Year	Number of Applications	Average Cost per Watt ($/watt)
2004	2	11
2007	1	10
2009	3	9
2010	30	10
2011	13	12
2012	21	12
Total	**70**	**11**

V. ADDITIONAL OBJECTIVES

A. Reduce ratepayer costs – Key takeaway: Statutory requirement to reduce ratepayer costs not being met.

Although it is not among the four goals outlined by the PUC, reducing ratepayer costs is in fact an explicit objective in the statute (Section 379.6(a)(1) of the Public Utilities Code). It seems self-evident that the program has not decreased ratepayer costs.

Information provided in the SGIP evaluation report indicates that projects are located where vendors and customers want them, which is not necessarily where they could provide ratepayer benefits, i.e., where there is high peak demand coincident with the project's ability to reduce the sites need for electricity from the grid, relieve transmission congestion, or other ratepayer benefits.

According to information provided by the PUC, SGIP projects are not required to schedule their operations. This means that for purposes of reliability or grid management, grid operators cannot know whether or not the customer's load will be relying on the SGIP project or the grid. This means that ratepayers must pay for reserves to be available in the event that unscheduled demand occurs.

SGIP operators will maximize the benefits of the project to meet their needs. For example, the report points out that fluctuations in electricity and natural gas prices impact operation of CHP systems. The difference between the cost of a purchased kilowatt-hour (kWh) of electricity and the cost of natural gas to generate a kWh is known as spark spread. With a high spark spread, CHP system owners may lower their overall costs by buying natural gas to run their systems. When spark spread is low, CHP owners may decide to curtail operation of the CHP system and instead purchase electricity from the utility to meet electrical demands and natural gas to meet on-site thermal energy needs. While this is understandable and smart from a business perspective, the operator's decision may cause increased load on the electric grid when gas prices are higher and thereby increase energy costs for ratepayers who are not participating in the SGIP program.

The PUC and stakeholders should be asked to provide a clearer accounting of the economic impact on the ratepayers that fund the program and explain the exclusion of ratepayer cost reduction as a goal of the program.

B. <u>Improve air quality</u> – Key takeaway: Like GHGs, criteria pollutant emission performance appears inconsistent and current data is not readily available.

AB 2778 required the California Energy Commission (CEC), in consultation with the PUC and ARB, to evaluate the costs and benefits of providing ratepayer subsidies for renewable and fossil fuel distributed generation, including recommendations for eligibility and subsidy levels. The evaluation was included in the CEC's 2008 energy report. According to the report, "(SGIP) installations have net emissions of air quality pollutants including (volatile organic compounds), (oxides of nitrogen/NOx), and (carbon monoxide)."

The report showed small increases in emissions for non-renewable micro-turbines and gas turbines, and significant increases in emissions for internal combustion engines. The combined increases in GHG emissions attributable to non-renewable combustion cogeneration projects offset all of the GHG benefits achieved by photovoltaics funded by SGIP prior to the CSI. In contrast, projects using renewable fuels, including combustion, showed emissions benefits across the board.

In general, new distributed generation turbines appear somewhat less efficient than recently-built central-station power plants in terms of direct electrical efficiency. However, distributed generators in CHP installations, where waste heat is recovered and put to use in a way that saves natural gas, overall efficiency improves significantly. Actual efficiency varies widely by system. The best systems can achieve efficiencies between 80 and 90 percent. Minimum efficiency required for SGIP eligibility is 60 percent [total energy output (electricity plus heat) divided by fuel input].

The oxides of nitrogen (NOx) emission limit in the statute (0.07 lbs/MWhr) approaches NOx emission levels achieved by new central-station power plants, although the central-station plants also must obtain offsets from other stationary sources to mitigate the NOx they do emit. However, this 0.07 NOx limit is based on emission standards adopted by ARB more than 10 years ago and the limit was placed in the SGIP statute in 2003 as an incentive for early compliance with the ARB standards. More than 10 years later, ARB's 2007 limit is now in effect, so this provision reflects the standard for distributed generation subject to ARB certification, rather than a step forward.

C. <u>Diversity and competitive contracting</u> – Key takeaway: Needs improvement.

According to information provided by the PUC to the committee, SGIP does not collect information on the diversity (women, minority, or disabled-veteran) of project applicants with respect to ownership, executive and management, or labor workforce.

In May 2012, the PUC awarded a sole source contract to the California Center for Sustainable Energy (CCSE) as part of the "Decision Providing Guidance on 2013-14 Energy Efficiency Portfolios and 2012 Marketing, Education and Outreach (D.12-05-015).

The Assembly Utilities & Commerce Committee raised concerns that the PUC did not provide an opportunity for other qualified entities, specifically Minority, Women, and Disabled Veteran Business Enterprises (WMDVBE), to bid for this contract through a competitive solicitation.

In July 2012, PUC President Peevey responded and stated that:

> *"As program implementer, CCSE will subcontract marketing, advertising, outreach and creative development work to private firms giving preference to WMDVBE under GO 156 rules just as a utility would if they were implementing the program."*

In response to a request for supplemental information the PUC informed the committee that in 2001 the PUC designated the San Diego Regional Energy Office to administer the SGIP in SDG&E territory. San Diego Regional Energy Office later became the California Center for Sustainable Energy (CCSE).

According to a recent survey by the Kapor Center for Social Impact, using 2011 census data, 71 percent of U.S. tech workers are non-Hispanic white; 15 percent are Asian American; 7 percent are Latino; and 6 percent are African American.

It is critically important that all segments of California's population have an opportunity to create businesses and work in new, clean-technology businesses. The advanced energy economy should be no different.

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[1] 2012 SGIP Impact Evaluation and Program Outlook, http://www.cpuc.ca.gov/NR/rdonlyres/25A04DD8-56B0-40BB-8891-A3E29B790551/0/SGIP2012ImpactReport_20140206.pdf

[2] Self Generation Incentive Program Budget Report, March 8, 2013, http://www.cpuc.ca.gov/NR/rdonlyres/F015F57C-5D39-4BC0-A7E8-72599448DBE0/0/SGIP_Budget_Report_Final.pdf

[3] CPUC Decision, D1109015, http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/143459.PDF, September 8, 2011

[4] 2012 SGIP Impact Evaluation and Program Outlook Page 5-12

[5] 2012 SGIP Impact Evaluation and Program Outlook, pages 5-13 and 6-17

[6] SGIP Incentive Program, Combined Heat and Power Performance Investigationhttp://www.cpuc.ca.gov/NR/rdonlyres/594FEE2F-B37A-4F9D-B04A-B38A4DFBF689/0/SGIP_CHP_Performance_Investigation_FINAL_2010_04_01.pdf, April 2010,

[7] SGIP Staff Proposal, http://docs.cpuc.ca.gov/PublishedDocs/EFILE/RULINGS/124214.PDF, page 20, September 2010