

**Review of the Incentive Levels and Progress of the
California Solar Initiative-Thermal Program**



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Prepared by:

California Public Utilities Commission

Energy Division, Customer Generation Programs

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as established by AB 2249 (Buchanan, 2012) and in accordance with

Section 9795 of the Government Code.

Table of Contents

Overview	1
Program Review and Evaluation	1
Background and Program Description	2
Incentive Level Adjustments to Increase Participation	5
Current Rebates Not Sufficient to Reach Goals	7
Observations and Analysis	10
Recommendations	14
Conclusion	16
Appendix A – CSI-Thermal Electric-Displacing Program Statistics	17
Appendix B – CSI-Thermal Program Progress Charts (<i>Natural Gas</i>)	18

Key Terms and Acronyms

AB:	Assembly Bill
ALJ:	Administrative Law Judge
CCSE:	California Center for Sustainable Energy
CPUC or Commission:	California Public Utilities Commission
CSI-Thermal:	California Solar Initiative-Thermal Program
D.:	Decision (<i>of the Commission</i>)
ED:	Energy Division
IOU:	Investor-Owned Utility (<i>here</i> PG&E, SCE, SoCalGas, SDG&E)
M&E:	Measurement & Evaluation
M&E Plan:	Measurement & Evaluation Plan
PAs:	Program Administrators
PG&E:	Pacific Gas and Electric
PV:	Photovoltaic solar cells
SCE:	Southern California Edison
SoCalGas:	Southern California Gas Company
SDG&E:	San Diego Gas & Electric
SB:	Senate Bill
SWH:	Solar Water Heating

Overview

The goal of the California Solar Initiative-Thermal Program, established by Assembly Bill (AB) 1470 in 2007, is to promote the installation of solar water heating (SWH) systems, as well as other solar thermal technologies, that displace the use of natural gas, electricity, and propane in homes and businesses.¹ In 2012, AB 2249 (Buchanan) directed the Public Utilities Commission to complete a review of whether the rebate levels established in this program will be sufficient to reach the goal of 200,000 SWH systems by 2017, and to report the results of the review to the Legislature. This document satisfies that direction, and is submitted to the Legislature in accordance with Section 9795 of the Government Code.

Program Review and Evaluation

AB 2249 expanded the definition of technologies eligible to receive CSI-Thermal incentives, and required the Public Utilities Commission to study the sufficiency of program incentives to meet the goals of AB 1470. Specifically, AB 2249 directed:

Not later than February 1, 2014, the commission shall complete a review of whether the rebate levels established by the commission will be sufficient to spur investment to reach the program goal of installing 200,000 solar water heating systems in homes, businesses, and other buildings or facilities receiving natural gas service throughout the state by 2017, and shall report to the Legislature on the results of its review. The report submitted pursuant to this subdivision shall be submitted in compliance with Section 9795 of the Government Code.²

Although the CSI-Thermal Program offers incentives to both natural-gas displacing and electricity-displacing SWH systems, AB 2249 as codified above specifically directed the Commission to report on progress towards the statutorily-defined *natural gas-displacing* goals of the CSI-Thermal Program. The structure of the CSI-Thermal Program for electric-displacing SWH systems, as established by Commission decision in 2010, by its nature cannot be judged against a specific kilowatt-hour (kWh) displacement goal.³ Accordingly, the remainder of this report focuses on the progress and prospects for the natural gas-displacing portion of the CSI-Thermal Program. Unless otherwise noted, all figures and tables present data for CSI-Thermal natural gas-displacing SWH systems, available to the public online.⁴ Summary statistics for electric-displacing SWH systems that have participated in the CSI-Thermal Program are presented in Appendix A.

¹ Sections 2860-2867.4 of the Public Utilities Code (Chapter 9, Article 2) contain the legislative direction for solar water heating system programs at the Public Utilities Commission.

² Codified as Section 2867.1 (b) of the Public Utilities Code.

³ Since incentives for electric-displacing SWH systems are drawn from the incentive budget for photovoltaic systems without a specific set-aside, the CSI-Thermal Program cannot have a stand-alone kWh displacement goal. In essence, the availability of electric-displacing SWH incentives depends on the (largely exogenous) progress of the photovoltaic CSI Program, not on the installation rate of SWH systems.

⁴ Please visit <http://www.gosolarcalifornia.ca.gov/solarwater/> under 'For More Information'.

In addition to this report's evaluation of rebate (or incentive)⁵ levels to satisfy this statutory obligation, Commission staff have prepared and will soon release a Measurement & Evaluation (M&E) Plan for the CSI-Thermal Program that sets forth a schedule and description of the program evaluation studies to be conducted over the life of the program. This plan describes upcoming in-depth studies of the impact and effectiveness of the CSI-Thermal Program in achieving its goals. One of the studies envisioned includes an examination of the cost effectiveness of solar thermal technology in various applications and for different market sectors. Commission staff members expect that these more in-depth studies will begin to be contracted in 2014, with deliverables beginning possibly by late 2014.

One of the reasons for the relatively late launch of the M&E effort is that the CSI-Thermal Program itself has been slow to pick up speed – as noted in this report – and there has been a desire to wait for more program data prior to conducting extensive evaluation activities. At this point, however, several years into the program, with multiple sub-programs launched as well as some program adjustments adopted, it makes sense to begin the formal evaluation process. This report, conducted by Energy Division staff, can be seen as a prelude to that effort.

Background and Program Description

Known as the Solar Water Heating and Efficiency Act of 2007, AB 1470 authorized the creation of a \$250 million incentive program to promote the installation of 200,000 SWH systems that displace the use of natural gas in California homes and businesses by 2017. Of this amount, \$180 million is allocated for general market incentives, and \$25 million is allocated for low income incentives. In addition, Senate Bill 1 (Stats. 2006, Ch. 132) earmarked up to \$100.8 million in funds from the general market CSI photovoltaic program for solar thermal projects. Monies collected under AB 1470 from gas ratepayers fund incentives to SWH systems that displace natural gas usage, while funds collected through the CSI photovoltaic program from electric ratepayers fund electric displacing SWH systems.

Decision (D.)10-01-022 of the California Public Utilities Commission (CPUC) implemented the CSI-Thermal Program in the service territories of California's four large investor-owned electric and gas utilities (IOUs). In May 2010, the single family sub-program was launched, followed by the multi-family and commercial sub-program in October 2010. The program operates in the following territories: Pacific Gas and Electric Company (PG&E), San Diego Gas and Electric Company (SDG&E)⁶, Southern California Edison (SCE) and Southern California Gas Company (SoCalGas).

⁵ The Public Utilities Code refers to CSI-Thermal payments as 'rebates', though the CPUC typically refers to them as 'incentives'. To limit confusion, this report generally refers to them as 'incentives'.

⁶ The CSI-Thermal Program is administered by the California Center for Sustainable Energy (CCSE) in the territory of San Diego Gas & Electric Company.

The CSI-Thermal Program is designed to significantly increase the adoption of SWH technologies in the California marketplace, reduce the installed cost of SWH systems, and increase customer awareness so that a robust, competitive and self-sustaining SWH industry exists in California after the CSI-Thermal budget has been spent. The CSI-Thermal Program will run until December 31, 2017 or until program funds are exhausted, whichever occurs first.

The Commission has made several other notable program design decisions under its authority to implement AB 1470 and subsequent legislation. Several program design details are worth noting here for general context:

- Program goals have been articulated by the Commission in terms of natural gas energy displaced, not the total number of systems installed.⁷ Specifically, the CSI-Thermal Program seeks to displace 585 million therms⁸ over the lifetime of installed SWH systems, which translates to a program goal of installing SWH systems sufficient to displace 22.6 million therms per year by the end of the program.
- As directed by the Legislature in AB 1470 – and similar to the CSI photovoltaic program – CSI-Thermal incentive levels decline in steps as the program meets interim progress goals. Higher incentive levels have been offered at the beginning of the program, which are designed to decline over time as more systems are installed.
- For cost containment purposes, incentives are capped for single-family residential systems at 125% of the average residential incentive in that step. For example, for single-family residential projects in Step 1, the average expected per-project incentive is \$2,175⁹ and thus the maximum incentive is 125% of that amount, or \$2,719. Incentives for commercial and multifamily systems are capped at \$500,000 per system.
- Because of the complexity involved in establishing appropriate rebate levels, the difficulty of estimating energy savings and developing the technical installation requirements for different applications, for the 2010 program launch, incentives were aimed primarily at domestic hot water systems (which serve bathroom and kitchen hot water needs), and also at laundromats. Other technologies were made eligible for CSI-Thermal incentives in 2013, as described below.

⁷ Public Utilities Code 2863 directs the Commission to “meet the goal of installing 200,000 solar water heating systems, or the equivalent output of 200,000 solar water heating systems” by 2017. The Commission has chosen to track CSI-Thermal Program progress according to the latter formulation, the ‘equivalent output’, since average SWH system sizes differ by customer class. See note 8 below.

⁸ Assuming the average residential SWH system displaces 117 therms per year over a 25-year system life, total thermal displacement is calculated as follows:

$$117 \frac{\text{therms}}{\text{year}} * 25 \text{ year system life} * 200,000 \text{ systems} = 585 \text{ million therms displaced} .$$

⁹ Again assuming an average residential SWH system displacement of 117 therms per year, the average incentive amount per project of \$2,175 is found by multiplying 117 times the Step 1 incentive level of \$18.59.

- The \$180 million incentive budget is allocated to the utilities in proportion to their gas sales, with a larger amount of incentive dollars allocated for the initial steps of the program:
 - PG&E – 39% (\$97.5 million)
 - SoCalGas – 51% (\$127.5 million)
 - SDG&E (CCSE) – 10% (\$25 million)

In addition, the original general market program allocated incentive dollars between single-family residential and commercial and multifamily customers as follows:

- 40% of the total incentive budget was reserved for single-family systems
- 60% of incentive funds designated for commercial or multifamily systems.

In the months following program launch, other changes were put into effect. On October 6, 2011, the CPUC adopted D.11-10-015 which authorized the low-income component of the CSI-Thermal Program. This \$25 million sub-program was launched January 2012. Then, on November 10, 2011, the CPUC issued D.11-11-005 to allow for payment of incentives to solar thermal systems that displace propane usage for electric customers of PG&E, SCE or SDG&E.

Average project figures for systems installed through 2013 are presented below in Table 1 to provide context for the subsequent analysis.

Table 1: Average CSI-Thermal Projects for each Customer Class, 2010-2013

Gas-Displacing Customer Class ¹⁰ <i>(i.e. Sub-Program)</i>	Number of Systems Participating Through 2013	Average of Historical Total Cost per Project	Average Historical Incentive Per Project	Average of Expected Annual Energy Savings [therms]
Single-Family Residential	549	\$9,452	\$1,700	117
Single-Family Residential - Low Income	1	\$2,819	\$2,434	101
Multifamily Residential or Commercial	408	\$90,700	\$32,324	2,407
Multifamily Residential - Low Income	379	\$69,815	\$31,946	1,706
Totals	1,337	\$51,351	\$19,620	1,266

¹⁰ For similar statistics for electric-displacing projects, please see Appendix A.

Incentive Level Adjustments to Increase Participation

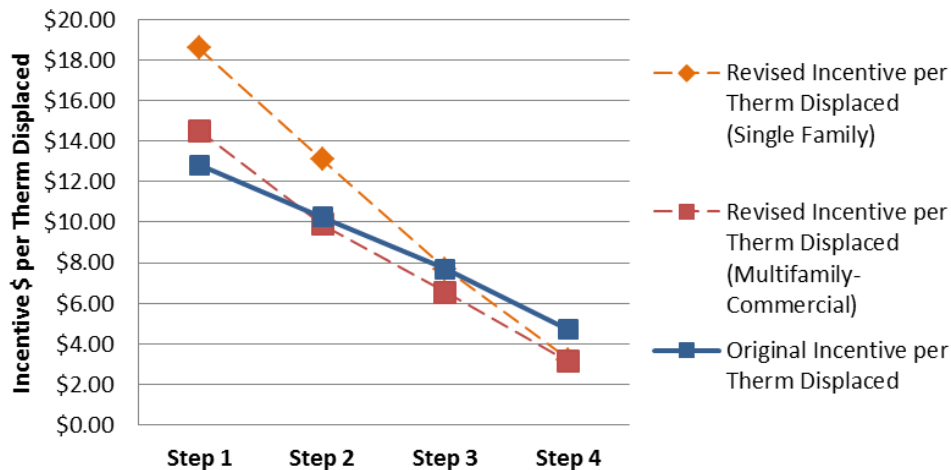
Responding to concerns from the SWH industry that program uptake was occurring too slowly, in 2012 the Commission revised the incentive structure¹¹ in the following way:

- The allocation of incentive funds to single-family customers was increased, from 40% to 45%. Correspondingly, the multifamily/commercial customer class allocation of funds was reduced from 60% to 55%.
- The incentive levels in the four program steps were changed to “front load” the program, i.e. make the earlier steps richer, and the later steps leaner.
- The result of these two changes was that Step 1 rebates for single-family systems rose by 45% and those for multifamily/commercial rose by 13.33%.
- The new incentive structure went into effect September 2012 when the Commission approved the Program Handbook change implementing the decision.
- The changes to the incentive steps and the incentive levels are shown in Figures 1 and 2 and in Table 2 below.

Table 2: Current Incentive Levels as “Front-Loaded” by D.12-08-008

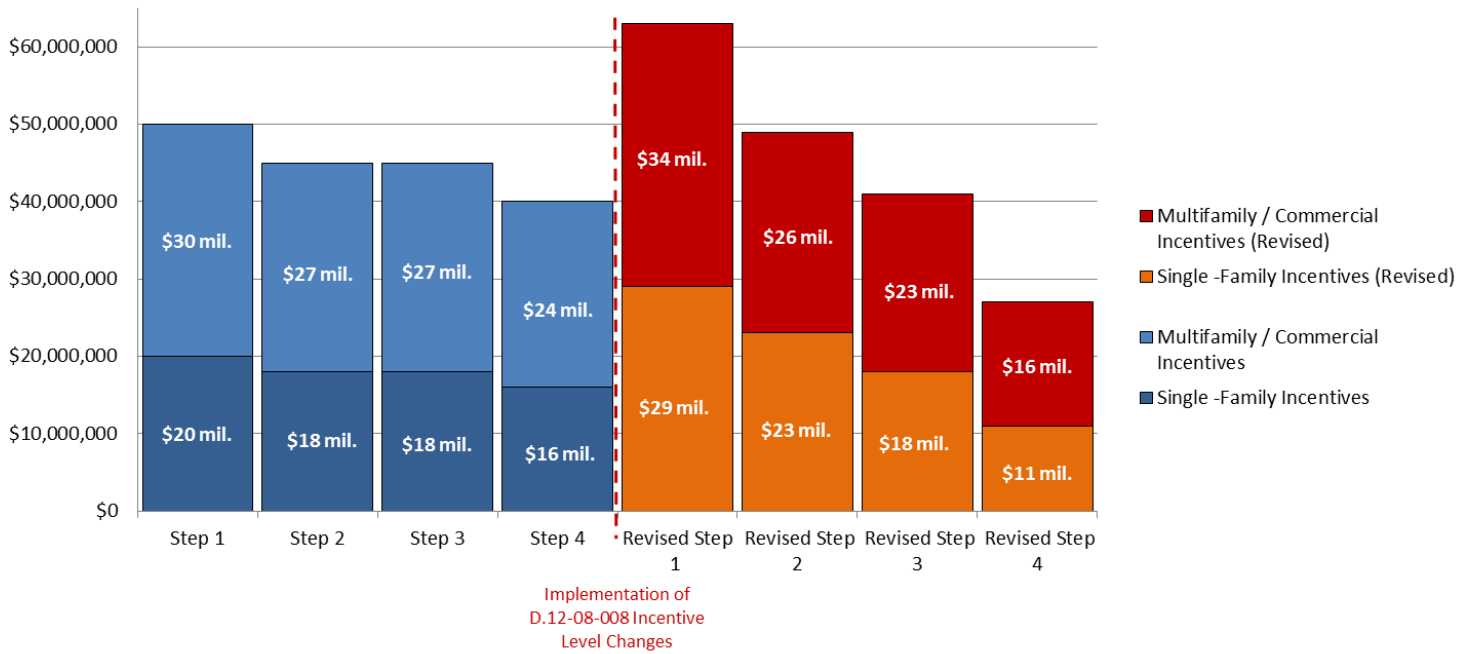
Step	Original Incentive per Therm Displaced	Revised Incentive per Therm Displaced (Single Family)	Revised Incentive per Therm Displaced (Multifamily-Commercial)
Step 1	\$12.82	\$18.59	\$14.53
Step 2	\$10.26	\$13.11	\$9.88
Step 3	\$7.69	\$7.69	\$6.55
Step 4	\$4.70	\$3.23	\$3.13

Figure 1: Incentive Level Changes made by D.12-08-008



¹¹ See D.12-08-008.

Figure 2: Incentive Reallocations by Step in D.12-08-008



In February 2013, the Commission authorized payment of rebates for solar thermal applications other than SWH technologies, including process heat and solar cooling.¹² While expanding the scope of the program, this decision did not change rebate levels or alter the amount of funds available for incentives. The program change went into effect July 2013.

In August 2013, the Commission authorized the payment of rebates for solar heating systems for non-single-family swimming pools.¹³ This was in response to and in compliance with AB 2249 (Buchanan, 2012). Under the new arrangement, the pool incentives would draw from the same incentive buckets as the existing multifamily/commercial Steps 1 through 4, whose total amounts would not be changed. The pool rebates, however, are substantially lower on a per therm-avoided basis, beginning at \$7 per therm in Step 1 and ending at \$3 per therm in Step 4. The rebates for swimming pools were first offered on January 14, 2014.

¹² See D.13-02-018. Process heat refers to applications, generally industrial, where hot water is used purely as a medium for heat transfer, rather than to be consumed. Space heating systems use SWH collectors to provide radiant, convection, or forced air. Solar cooling involves a thermodynamic process known as “absorption chilling”, where a heat source is used to generate cooling.

¹³ See D.13-08-004

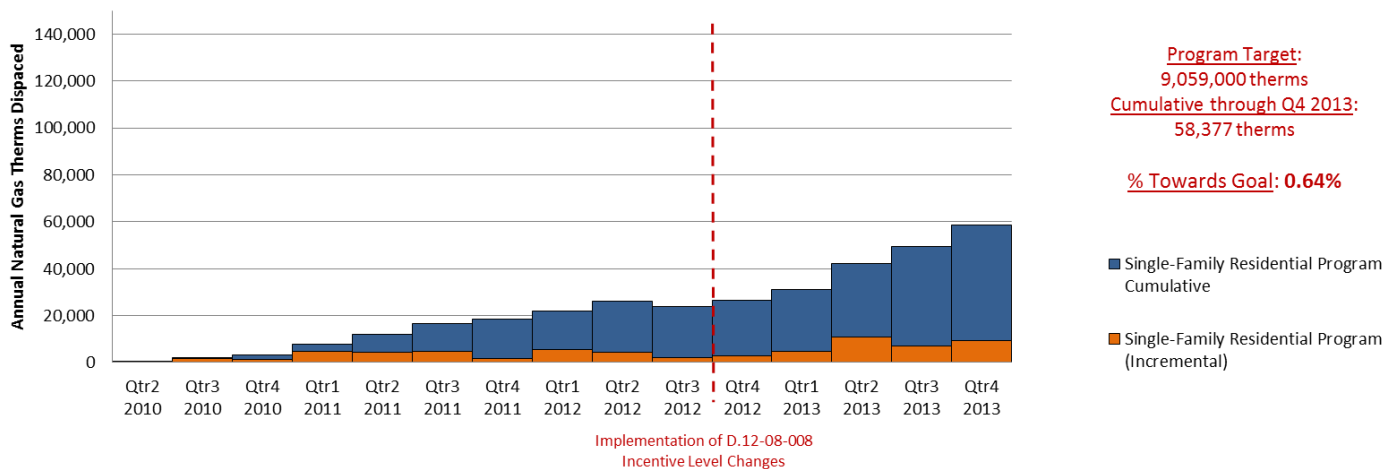
Current Rebates Not Sufficient to Reach Goals

Through 2013, program participation has been limited. While the recent program changes could lead to increased participation in the future, at current installation rates, the CSI-Thermal Program will not reach its target of 585 million therms displaced over the life of the systems installed.

Figures 3-5 summarize the CSI-Thermal Program’s participation levels across customer classes (also known as sub-programs), measured against their individual sub-program goals. Respectively, these figures show that: the single-family program has so far achieved less than 1% of its target; the multifamily /commercial program has had modest success; and the low income program has had some participation. The low income single-family sub-program is not shown here because of extremely limited participation.¹⁴

It should be noted that while the CSI-Thermal general market programs have energy targets (i.e. gas therms avoided, based on Public Utilities Code Section 2863 – see footnotes 5 and 6), the low income programs do not. The low income incentives were designed to provide all utility customers, regardless of income, with access to solar thermal technology, and are less focused on achieving gas end-use reduction. In addition, design of the low income program step reductions makes gas displacement forecasting problematic.¹⁵

Figure 3: Single-Family Program Therms Displaced Progress, 2010-2013



¹⁴ Through 2013 there was only one low income single-family project actually installed. A pilot program to increase participation in this and other customer-side low-income programs is presently underway, led by the state’s Department of Community Services and Development.

¹⁵ For the low income programs, because the movement from one incentive step to the next lower step is triggered by the step change in the corresponding general market sub-program, it is impossible to project energy targets.

Figure 4: Multifamily/Commercial Program Therms Displaced Progress, 2010-2013

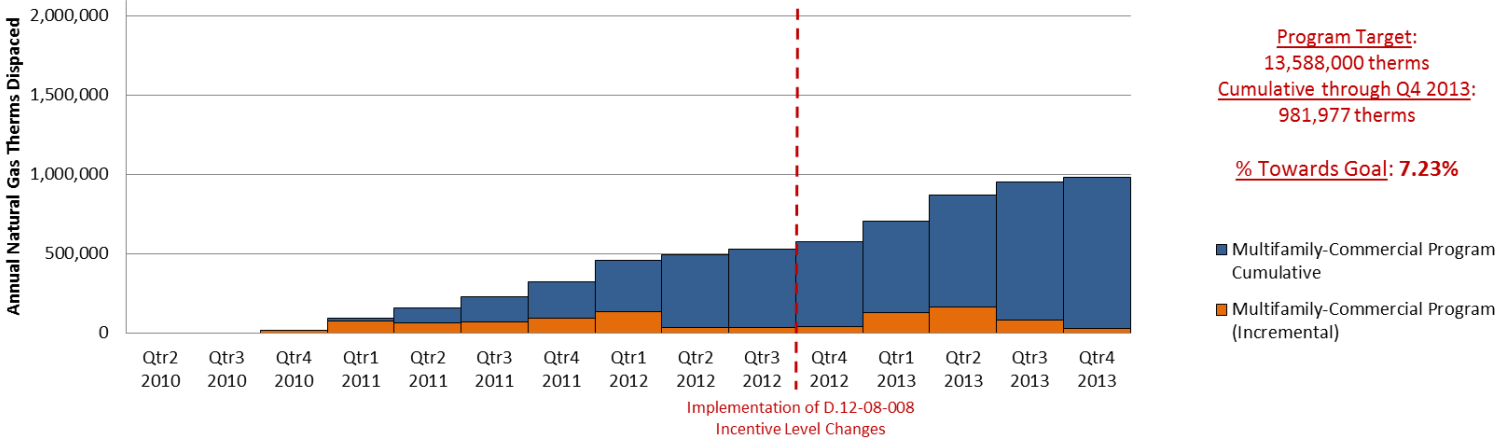


Figure 5: Multifamily Low Income Program Therms Displaced Progress, 2010-2013

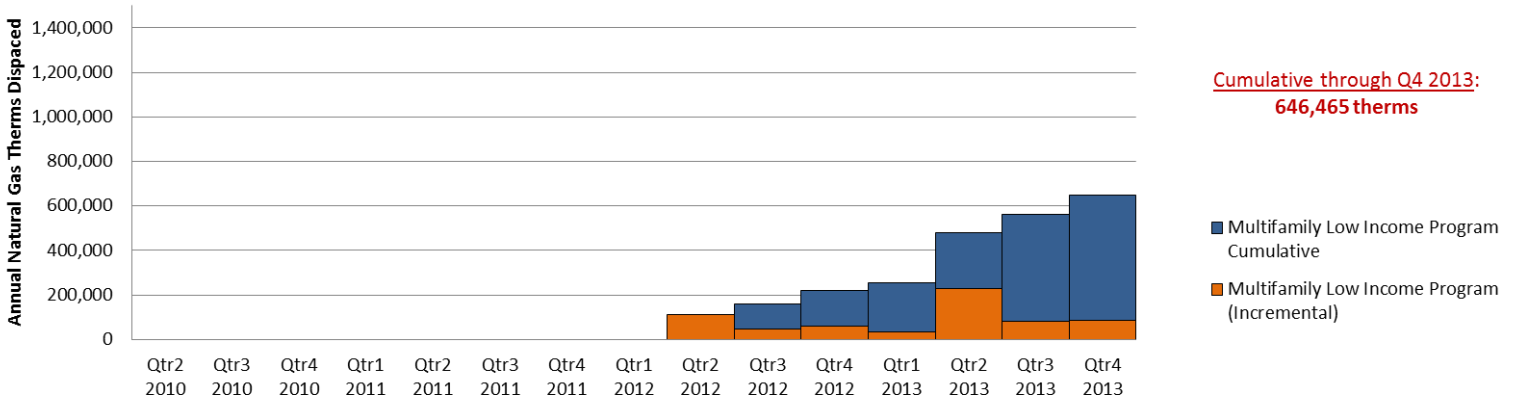
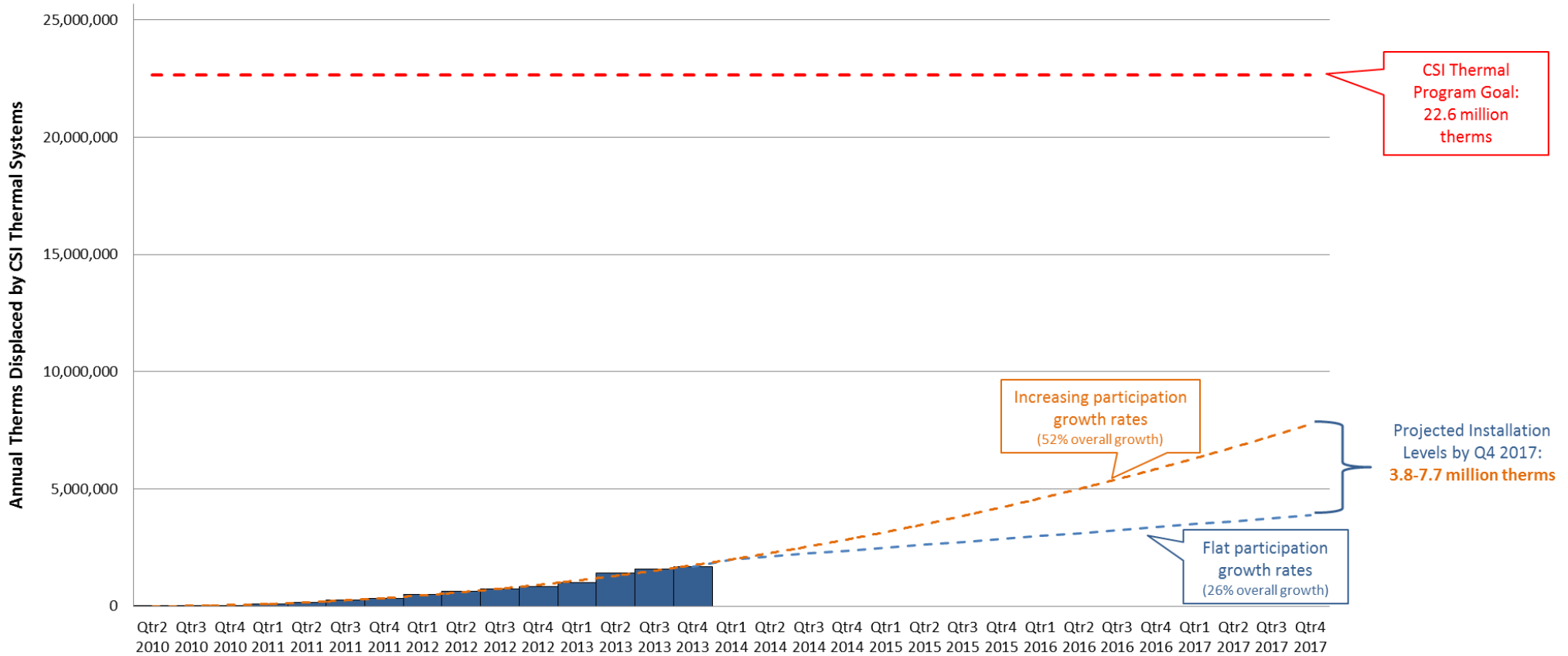


Figure 6 below demonstrates how far the CSI-Thermal Program presently is from its overall target, and how unlikely it is that the program will meet its stated goals. As indicated by the blue trend line in Figure 6, if the average historical installation rate is projected into the future, the program as a whole will achieve only one sixth of its target volume, around 3.8 million annual therms displaced by the end of 2017. If we assume instead that program participation will increase over time at a moderate rate -- as has been observed in the CSI photovoltaic incentive program and is shown in the orange trend line in Figure 6 -- then the CSI-Thermal Program as a whole will achieve one third of its target volume, around 7.7 million annual therms displaced.

It should also be pointed out that so far all six of the gas-displacing sub-programs (namely, the single-family and multifamily/commercial programs of PG&E, SoCalGas, and CCSE) have been offering rebates at the Step 1 level. When the Step 1 incentives are allocated and the program progresses to Step 2, the rebates will decline, which may result in still lower participation.

Figure 6: CSI-Thermal Quarterly Projections Towards Installation Goals, 2010-2017 ¹⁶



¹⁶ For the orange line extrapolation, a mathematical function was fitted to the trend of quarterly progress observed since program inception and was then projected out to the end of Q4 2017. This trend line represents a more optimistic situation, where participation growth rates in CSI-Thermal increase over time, as has been observed in the CSI photovoltaic program. This orange trend line, though not linear, exhibits an average annual growth rate of 52%. For the blue line extrapolation, a line was fitted to the trend of quarterly progress observed since program inception. This trend line represents a more conservative situation, where participation growth rates stay constant over time. This blue linear trend line exhibits an average annual growth rate of 26%.

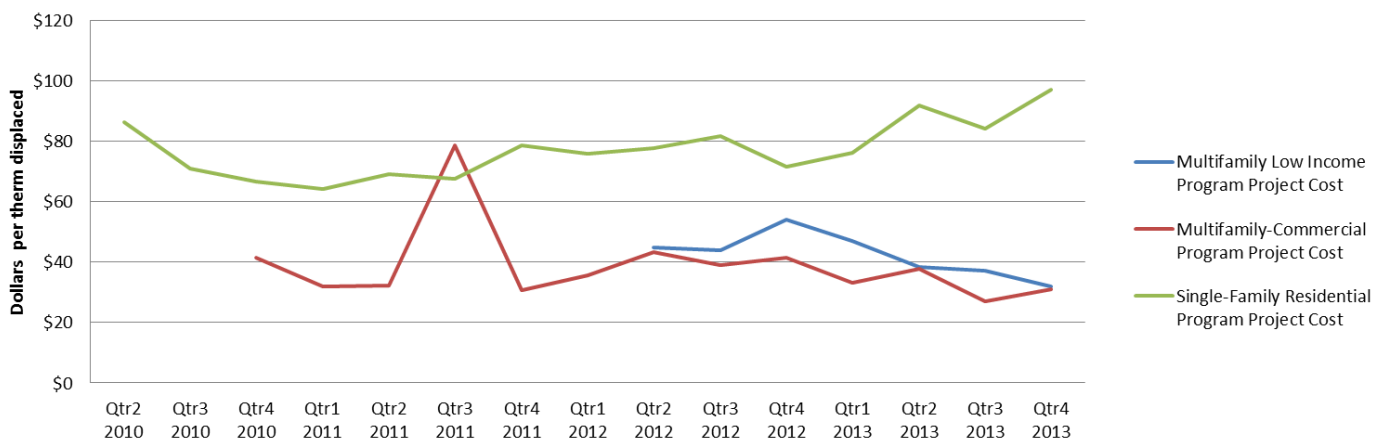
Observations and Analysis

This section offers further observations and discussion.

Observation #1: Installation costs have not declined as expected.

At the time that the CSI-Thermal Program was established, its ultimate cost effectiveness was explicitly conditioned on installation costs dropping by at least 16%.¹⁷ This has not yet happened in two sub-programs, as can be seen in Figure 7 and Table 3 below.

Figure 7 and Table 3: CSI-Thermal Program Quarterly Cost Trends, 2010-2013



Sub-Program ¹⁸	Average of System Costs in First Three Quarters of Sub-Program (\$/therm)	Average of System Costs in Latest Three Quarters of Sub-Program (\$/therm)	Percentage Change in System Costs
Multi-Family Residential - Low Income	\$44.86	\$31.92	↓ 25%
Multi-Family Residential or Commercial	\$41.35	\$31.17	↓ 9%
Single Family Residential	\$86.39	\$97.17	↑ 22%

Observation #2: The single-family sub-programs are performing much worse than the multifamily/commercial programs.

Even though rebates for the single-family sub-programs are higher than rebate levels for the multifamily/commercial sub-programs, the participation rates for single-family sub-

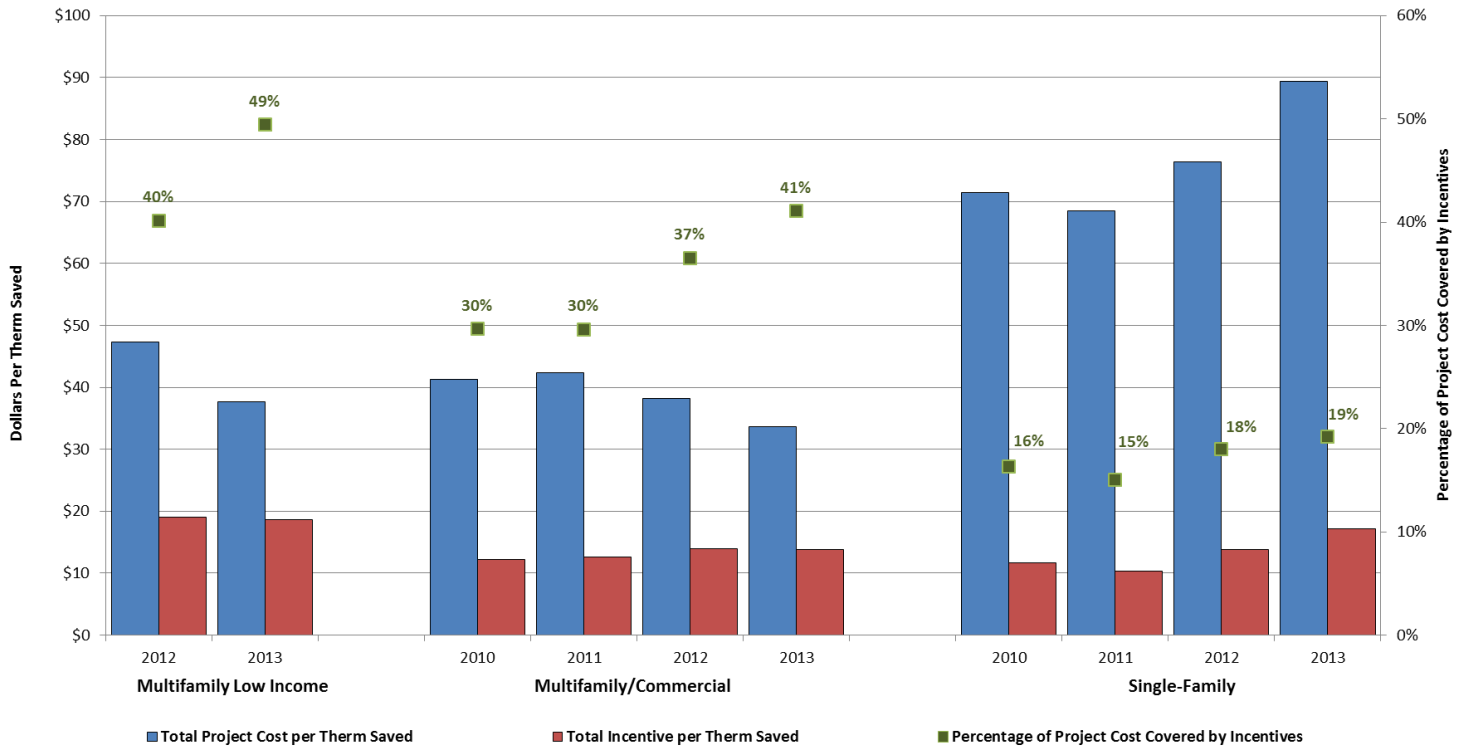
¹⁷ See D.10-01-022 at page 8.

¹⁸ Data drawn from publicly-available program statistics, posted at <http://www.gosolarcalifornia.ca.gov/solarwater/> under 'For More Information'.

programs have been especially disappointing. One explanation for why multifamily SWH is more cost effective than single-family SWH is that, for multifamily applications, “residents in different units will not necessarily follow the same water usage schedule. Though the peak hot water usage still occurs in the morning and evening similar to a single-family home, there is a greater likelihood that some residents will use hot water during the middle of the day. This provides a better match between the energy source availability and the hot water demand, which in turn results in greater system efficiency and a faster payback time for the building owner.”¹⁹

Another factor driving participation rates is how much of the initial investment is covered by the rebate program. As described below and depicted in Figure 8, although the rebates for the Multifamily/Commercial sub-programs are leaner, in fact they cover more of the initial investment. The reason for this is economies of scale. Larger systems deliver more energy savings for a given dollar invested. Low income participation is almost exclusively from multifamily dwellings, and here too rebates are a much larger portion of the initial cost than they are for the single-family sub-program.

Figure 8: Comparing Costs to Incentives, Proportion Covered by CSI Incentives



¹⁹ Itron “Solar Water Heating Pilot Program: Interim Evaluation Report”, 2009. Page 5-17. http://www.cpuc.ca.gov/NR/rdonlyres/B29DD59C-2BD1-4BA7-932E-1EE67C755E33/0/CCSE_SWHPP_Interim_Report_Final.pdf

To explain the figure above, the red columns depict the incentive level for a given amount of gas savings. The incentive levels for the low income programs are, by design, higher than those for the general market multifamily/Commercial and single-family programs. As described below, the incentive levels for the two general market programs rose in 2012 and 2013, reflecting the changes to Step 1 put into place by D.12-08-008.

The blue columns show the installed project cost per therm displaced. Costs for low income multifamily costs projects are on par with general market multifamily/commercial costs. This is not surprising, since the scale of the installations is similar. Meanwhile, higher installation costs mean that smaller single-family systems are a more expensive way to avoid gas consumption.

The difference in height between the blue and red columns tells us how much the system owner has to pay, on net, for the avoided gas consumption. In effect, the disparity between the cost of SWH systems and the incentive levels indicates how much of an up-front financial contribution from the system owner is necessary. Looking at these figures another way, comparing the height of the blue columns below across customer classes suggests how expensive it is to avoid a unit of gas consumption in the different programs in relative terms.

Finally, the green squares combine the blue and red columns to show how much of the system cost (in percentage terms) is paid for by CSI-Thermal incentives. It is clear that the single-family participants are paying much more for their SWH systems per therm avoided than participants in the low income and the multifamily/commercial sub-programs. This helps explain why the multifamily low income and multifamily/commercial sub-programs are doing so much better, relatively speaking, than the single-family sub-programs.

Observation #3: The 2012 increase in incentive levels has not led to a significant increase in program participation.

The 45% increase in incentive levels established in 2012 was aimed especially at single-family participation. However, there was only a minimal uptick in subsequent program participation, partially explained by the fact that installation costs also rose in 2013.

Observation #4: A substantial Marketing and Outreach program has been largely ineffectual for the single-family sub-programs.

From 2011 to 2013, the Program Administrators rolled out a substantial marketing and outreach effort, spending over \$10 million statewide on print, radio, TV, and internet advertising campaigns to spread awareness of the program. These advertising expenditures surely drove *some* customers to install SWH systems; however, program participation overall is still mostly lackluster.

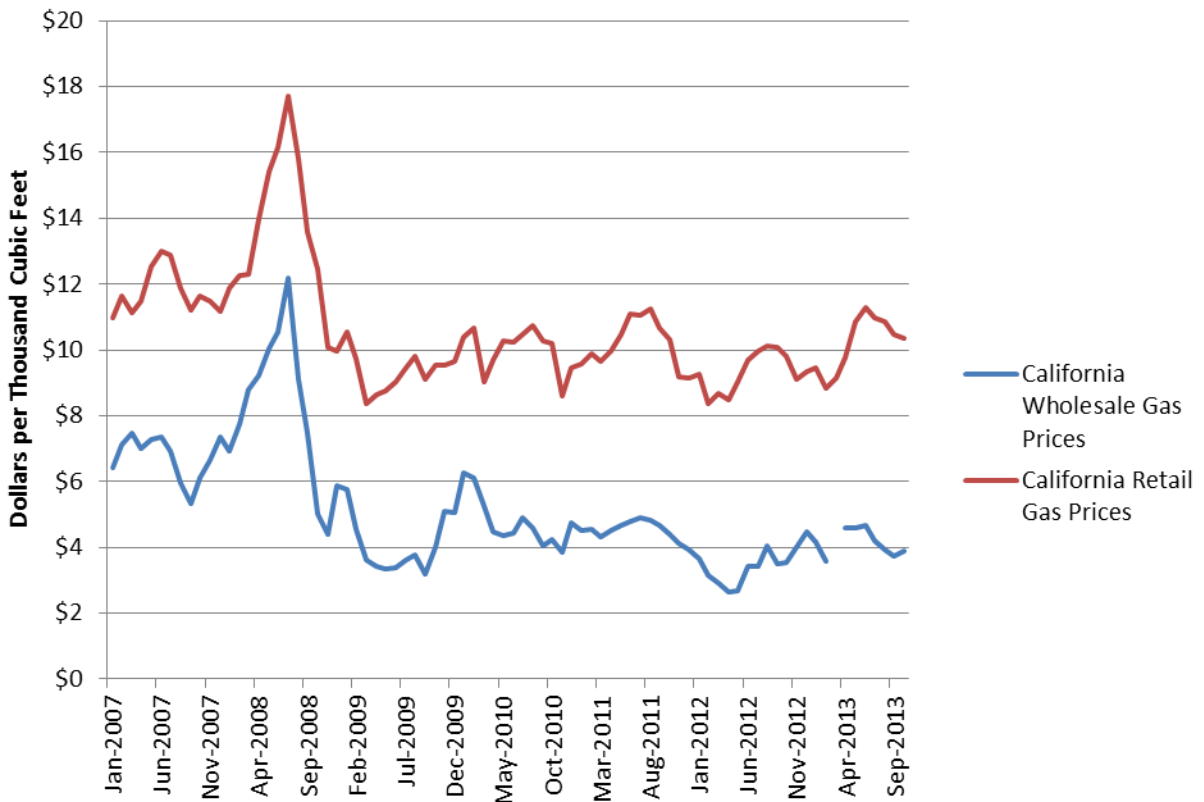
Observation #5: The low income program is doing relatively better than the general market program, especially in the multifamily market.

The low income sub-programs have substantially higher rebates than their general market counterparts, both in terms of dollar value and in the percentage of cost covered by CSI Incentives, as seen in Figure 8 above. Low income program participation, to date, has been almost exclusively limited to the multifamily sector.²⁰

Observation #6: Avoided gas costs are lower than expected.

The CSI-Thermal program was approved in January 2010, based on cost effectiveness evaluations which assumed that the price of natural gas (the avoided cost) would rise from 2010-2017. During the 2007-08 timeframe, the California wholesale gas price ranged from \$6 to \$10 per mmBtu. Contrary to expectations, the combination of the economic crisis of October 2008 and innovations in drilling techniques led natural gas prices to *fall* dramatically since 2008, with retail prices dropping by roughly 20%. This decline in natural gas prices significantly hurt the economics of gas-displacing SWH technologies of all kinds. At present, natural gas futures prices into 2017 show no increase over current prices.

Figure 9: Natural gas price trends – 2007-2013²¹



²⁰ See note 14 above.

²¹ This data comes from the U.S. Department of Energy’s Energy Information Administration, available at http://www.eia.gov/dnav/ng/ng_pri_sum_dc_u_sCA_m.htm

Observation #7: The new technologies and the swimming pools sub-program may breathe life into the Program.

The CPUC allowed for incentives to be paid for new technologies beginning in the summer of 2013 under the multifamily/commercial sub-program. The swimming pools sub-program is being launched very close to the time of the release of this report. Even though pool rebates are much lower than non-pool applications (for Step 1, it is \$7 per therm, as compared to \$18.59 per therm and \$14.53 per therm for single-family and Multifamily/Commercial respectively), even this lower incentive may spur significant program participation. The reason for the lower incentive level is that pool SWH technology, with simpler components, is much cheaper and thus requires less of a subsidy for it to be a cost effective investment for the customer. It is still too soon to determine the impact on participation from either of these new program changes.

Recommendations

Before launching the CSI-Thermal Program, Public Utilities Code Section 2863 required the Commission to find that a SWH program was cost effective for ratepayers and in the public interest. The Commission fulfilled this obligation in D.10-01-022 when it determined that the program would become cost effective, given reasonable gas price trends and if installation costs dropped by 16% during the course of the program.²² Since that time, *gas prices* have dropped substantially, while installation costs have only declined for multifamily installations, not for single-family systems. These market forces help explain why the CSI-Thermal Program is not on pace to meet the Commission's expectations.

This report does not undertake a rigorous re-evaluation of the cost-effectiveness of the CSI-Thermal Program, nor does it assess the performance of the CSI-Thermal Program Administrators. As noted above, the CPUC is planning to undertake a full evaluation of the cost effectiveness of the program in 2014, as outlined in the CSI-Thermal Measurement and Evaluation Plan. Findings from that cost effectiveness study will inform subsequent policy decisions. Meanwhile, a rough proxy for SWH cost effectiveness and project economics can be found in the participation levels of the program.

In addition to completing these planned program evaluation studies, the Commission also intends to provide an opportunity for public comment in the R.12-11-005 proceeding on the results of the CSI-Thermal M&E effort as they become available. Part of this upcoming evaluation effort includes a reassessment of the sufficiency of rebate levels needed to spur program participation, which would effectively serve as an update to this report. This reassessment is expected to be completed within twelve months, utilizing program experience and data from 2010-2014, including approximately one year of program participation from new technologies including swimming pools.

²² The decision used the Societal Test from the California Standard Practice Manual, available at http://www.energy.ca.gov/greenbuilding/documents/background/07-J_CPUC_STANDARD_PRACTICE_MANUAL.PDF.

To summarize, the program is unlikely to meet its goals, especially in the single-family sub-programs. Commission staff members have developed several potential policy options going forward, classified here into two general categories—implementation steps the Commission can take given its present authority under the Public Utilities Code, and broader issues the Legislature may need to address.

Options Presently Available²³ to the Commission:

1) Further ‘front-loading’ of incentives:

The Commission could further front-load incentives by moving more money towards Steps 1 and 2 of the program and increasing per-therm incentive levels in the process. For example, the incentive levels for single-family systems might be raised so that their proportion of installed costs is similar to that of the multifamily/commercial systems now being installed,²⁴ in hopes that increased participation would lead to the lowering of installed costs, thereby spurring further market activity.

Of course, this hope is speculative and is not necessarily supported by the modest program activity observed in response to the increase in Step 1 incentives in 2012. In fact, given the allotted funding for incentives, any further front-loading would require very optimistic—perhaps even unrealistic—market transformation assumptions in the latter steps of the program in order to meet the program goals presently in statute.

2) Removal of separations between customer class incentive budgets:

The Commission could remove the customer class silos that presently dedicate certain percentages of the CSI-Thermal incentive budget to single-family and multifamily/commercial projects. In essence, this would make CSI-Thermal incentives available on a ‘first-come, first-served’ basis regardless of customer class.

This option is inspired by the observation that the multifamily (both general market and low income) sub-programs are showing some modest participation level increases as their respective installation costs decrease (see Figures 4, 5, and 8). The larger multifamily/commercial projects are more efficient in terms of therms saved per dollar, and thus perhaps are inherently a more financially viable application of SWH technology.

Giving incentives to the first projects that apply for them, regardless of sector, would give an edge to the projects with the lowest per-therm avoided costs. Such a program redesign would still comply with the statutory mandate of offering incentives to all customer classes, while increasing the chances of achieving the overall avoided gas consumption goals set for the program, and continuing to encourage the development of the solar thermal industry in California. Of course, if the newly launched

²³ Note: These options are not mutually exclusive.

²⁴ In effect, this program change would bring the green squares of Figure 8 level across all customer classes, although to do so would require a very significant ‘front-loading’ of Step 1 incentive levels.

swimming pools sub-program (with its much lower incentives) proves to be popular, its success would bring the program that much closer to achieving its avoided gas consumption goals.

3) Request for guidance and policy suggestions from parties:

Within the relevant proceeding (R.12-11-005), the Commission may take public comment and consider what (if any) program changes to make in response to suggestions from the solar thermal industry, Program Administrators and other parties.

Issues for Legislative Attention:

Program changes that go *beyond* the general ideas described above can only be made by the Legislature in making amendments to the Public Utilities Code. Since the CSI-Thermal Program's goals and funding limits exist in statute, the Commission can only make program changes within the existing scope of the Public Utilities Code.

Conclusion

Approximately four years into the CSI-Thermal Program, underwhelming program participation makes it unlikely to meet the goals the Legislature has set for the program, at the presently-allowed level of funding. Even if the program design options available to the Commission are adopted in full, these steps still may not be sufficient to spur the necessary level of growth needed in program participation. Thus, members of the Legislature should be aware that it may be necessary to alter the program's statutory goals or raise the funding cap in order to make this program a success. It should be noted again here that this report is a prelude to, *not* a substitute for, a more robust program evaluation effort that will soon be underway at the Commission. This M&E effort will be made available for public comment and discussion. In advance of that effort, Commission staff has submitted the above report to meet the requirements of AB 2249 and to inform members of the Legislature of the current state and general prospects of the CSI-Thermal Program.

Appendix A – CSI-Thermal Electric-Displacing Program Statistics

Table 1: CSI-Thermal Electric-Displacing Statistics as of December 2013

Customer Class	Number of Systems Participating Through 2013	Total Project Cost	Total Incentive Amount	Sum of Expected Annual Energy Savings [kWh]	Project Cost to Expected Annual Energy Savings [\$/kWh]
Multi-Family Residential or Commercial	6	\$261,718	\$34,183	86,444	\$3.03
Single Family Residential	279	\$2,207,916	\$326,470	811,877	\$2.72
Electric-Displacing Total	285	\$2,469,634	\$360,653	898,321	\$2.75

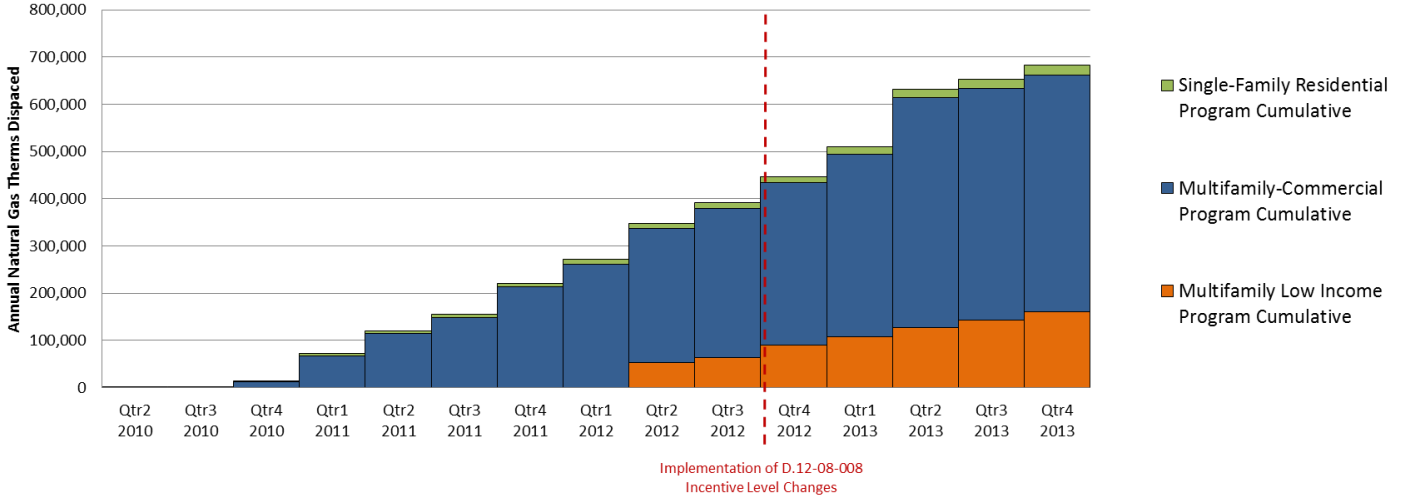
Table 2: CSI-Thermal Electric-Displacing Project Averages as of December 2013

Customer Class	Average of Historical Total Cost per Project	Average of Historical Incentive per Project	Percentage of Project Cost Covered by Incentives	Average of Expected Annual Energy Savings [kWh]
Multi-Family Residential or Commercial	\$43,620	\$5,697	13%	14,407
Single Family Residential	\$7,914	\$1,170	15%	2,910

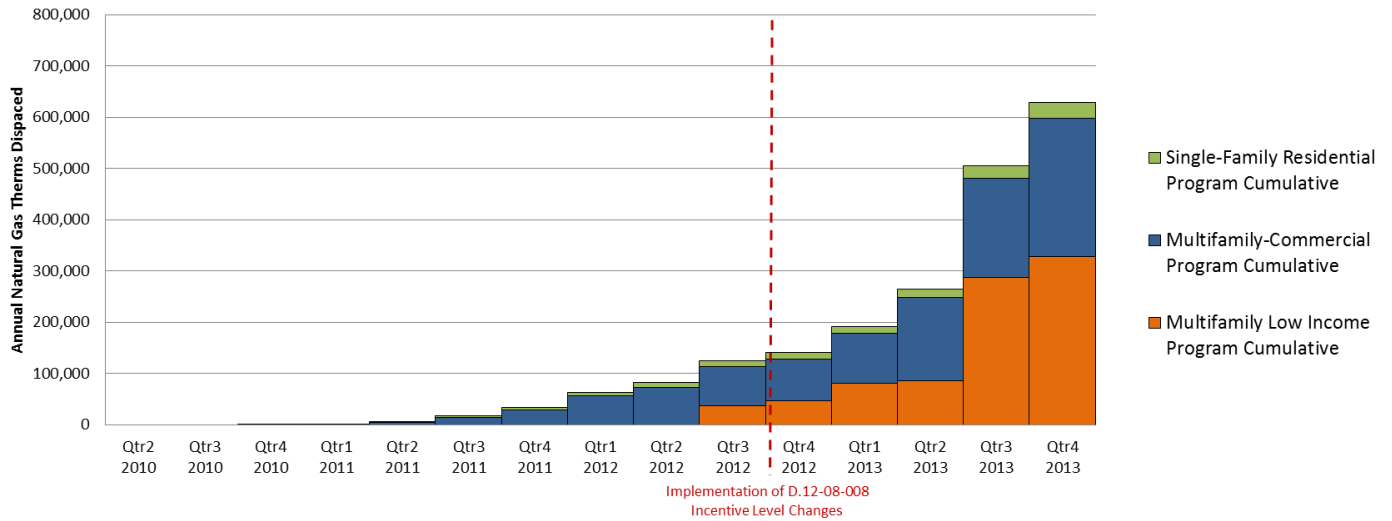
Appendix B – CSI-Thermal Program Progress Charts (Natural Gas)

Overall Program Progress by Utility Territory

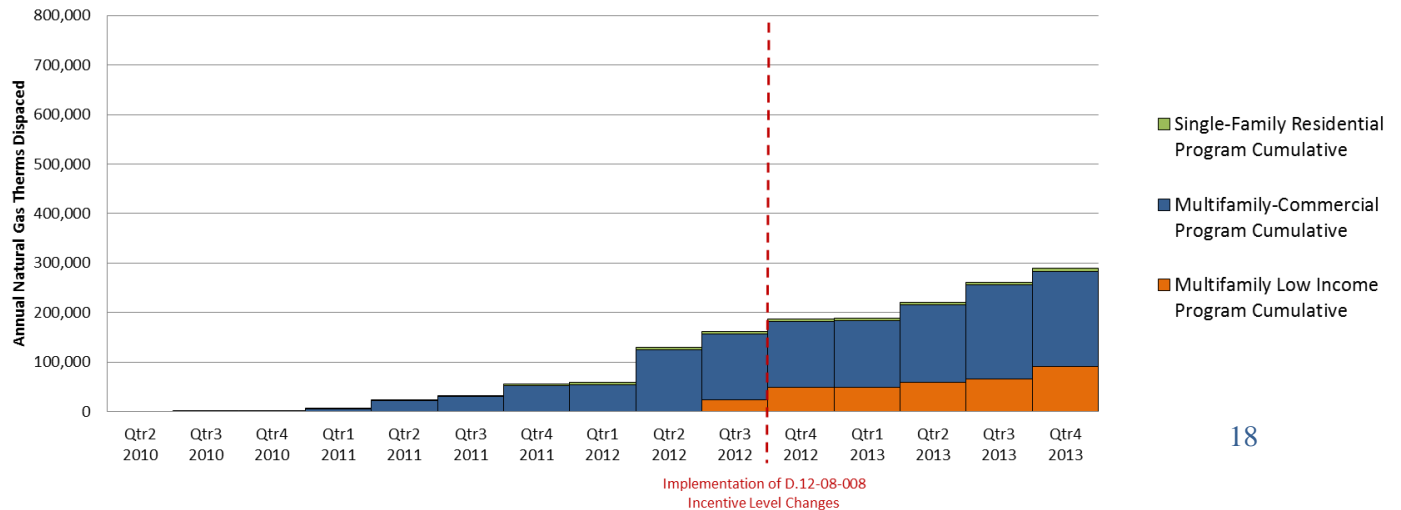
PG&E CSI Thermal Program Therms Displaced Quarterly Progress, 2010-2013



SoCalGas CSI Thermal Program Therms Displaced Quarterly Progress, 2010-2013

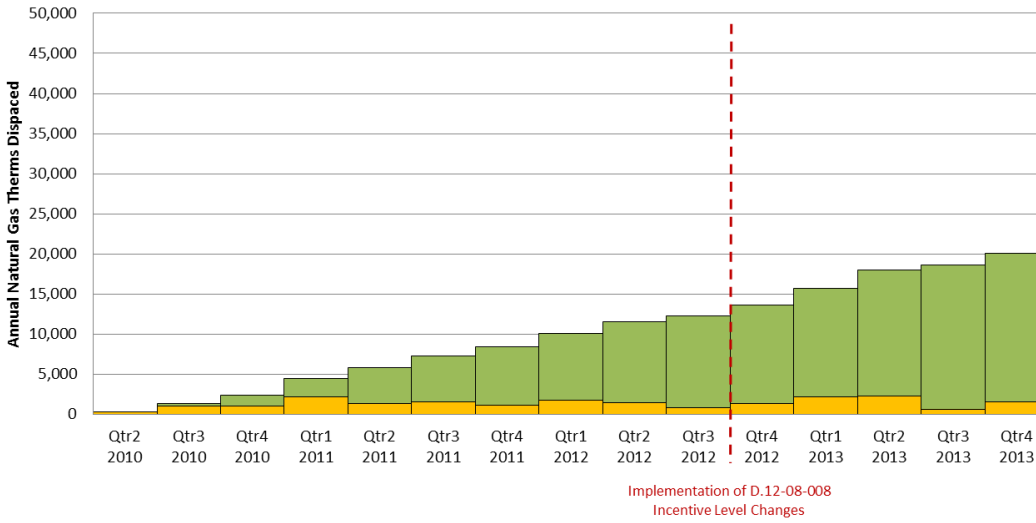


CCSE CSI Thermal Program Therms Displaced Quarterly Progress, 2010-2013



PG&E Program Progress

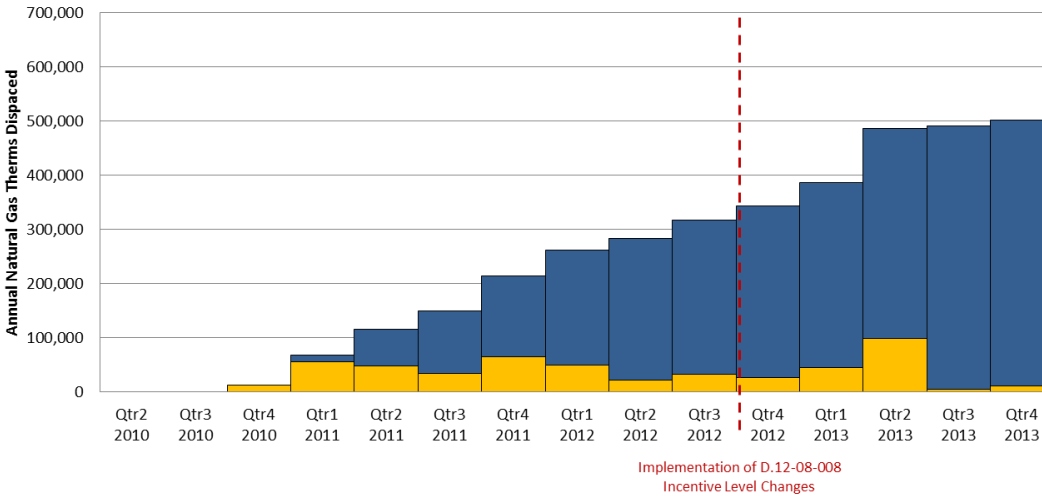
PG&E Single-Family Residential Program Therms Displaced Progress, 2010-2013



Sub-Program Target:
3,533,010 therms
Cumulative through Q4 2013:
20,095 therms
% Towards Goal: 0.6%

■ Single-Family Residential Program Cumulative
■ Single-Family Residential Program (Incremental)

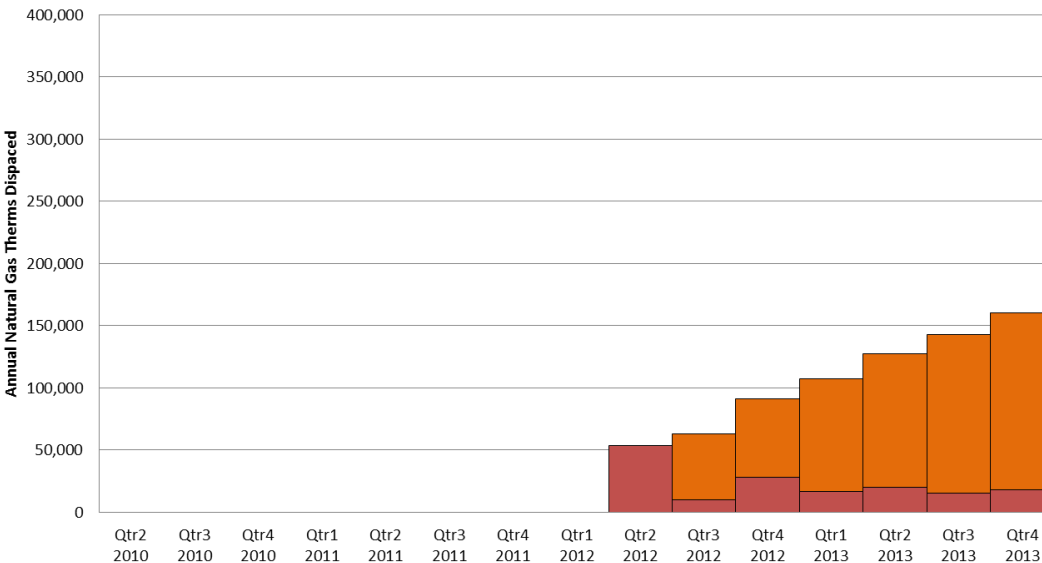
PG&E Multifamily - Commercial Program Therms Displaced Progress, 2010-2013



Sub-Program Target:
5,299,320 therms
Cumulative through Q4 2013:
502,822 therms
% Towards Goal: 9.5%

■ Multifamily-Commercial Program Cumulative
■ Multifamily-Commercial Program (Incremental)

PG&E Multifamily Low Income Program Therms Displaced Progress, 2010-2013

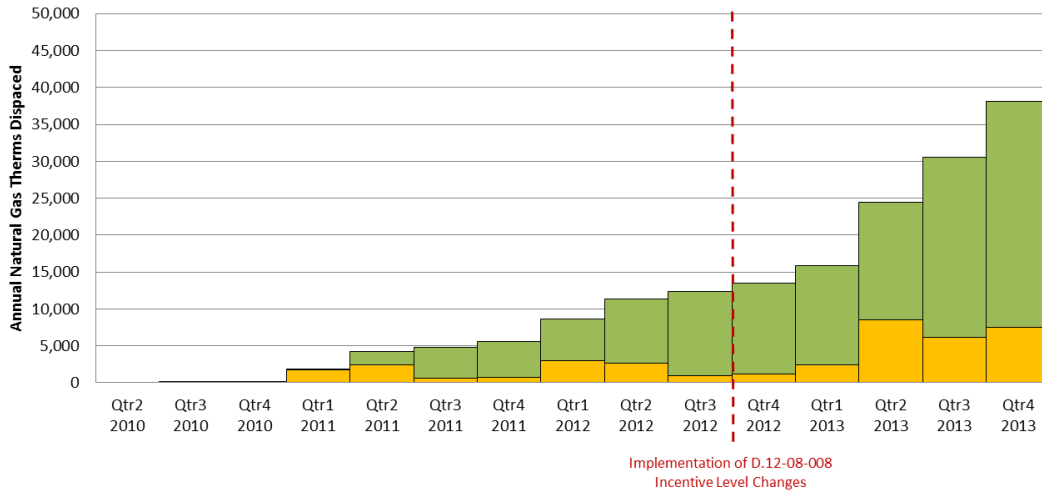


Cumulative through Q4 2013:
160,667 therms

■ Multifamily Low Income Program Cumulative
■ Multifamily Low Income Program (Incremental)

SoCalGas Program Progress

SoCalGas Single-Family Residential Therms Displaced Progress, 2010-2013

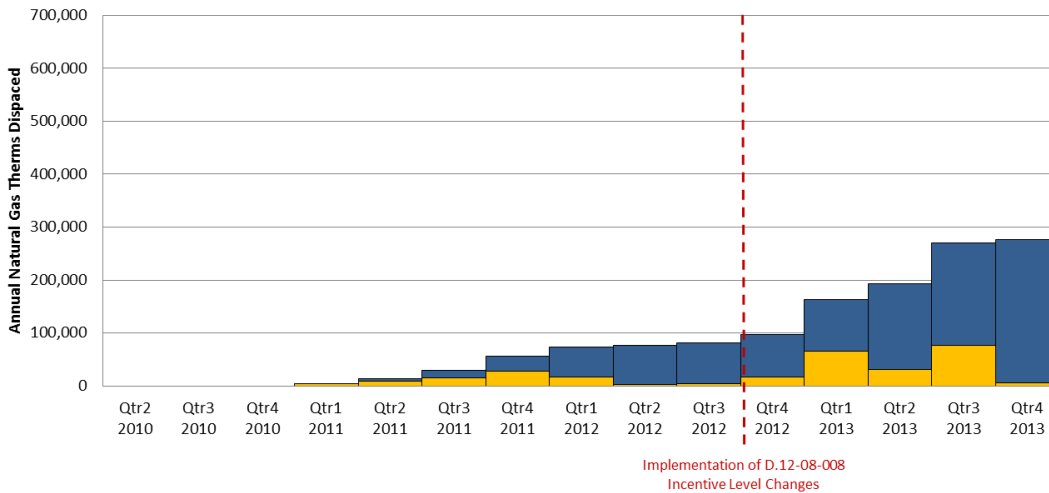


Sub-Program Target:
4,620,090 therms
Cumulative through Q4 2013:
38,100 therms

% Towards Goal: 0.8%

- Single-Family Residential Program Cumulative
- Single-Family Residential Program (Incremental)

SoCalGas Multifamily - Commercial Therms Displaced Progress, 2010-2013

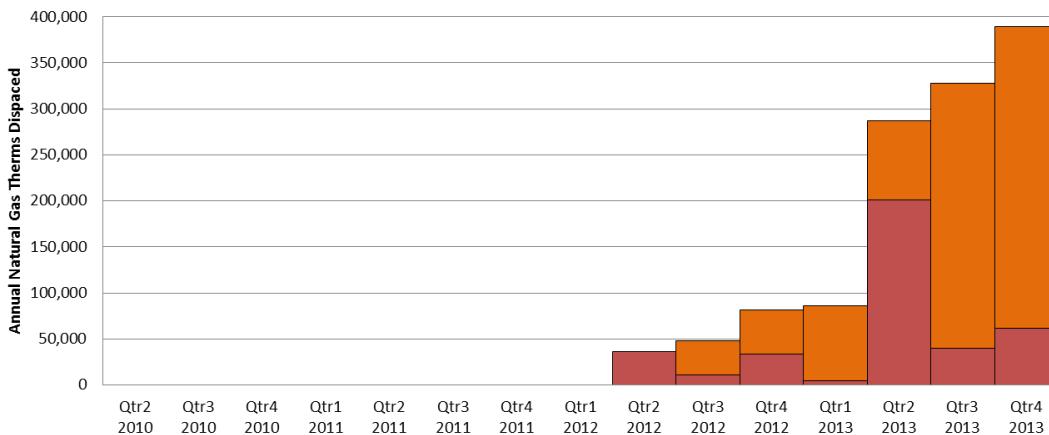


Sub-Program Target:
6,929,880 therms
Cumulative through Q4 2013:
276,276 therms

% Towards Goal: 4.0%

- Multifamily-Commercial Program Cumulative
- Multifamily-Commercial Program (Incremental)

SoCalGas Multifamily Low Income Therms Displaced Progress, 2010-2013

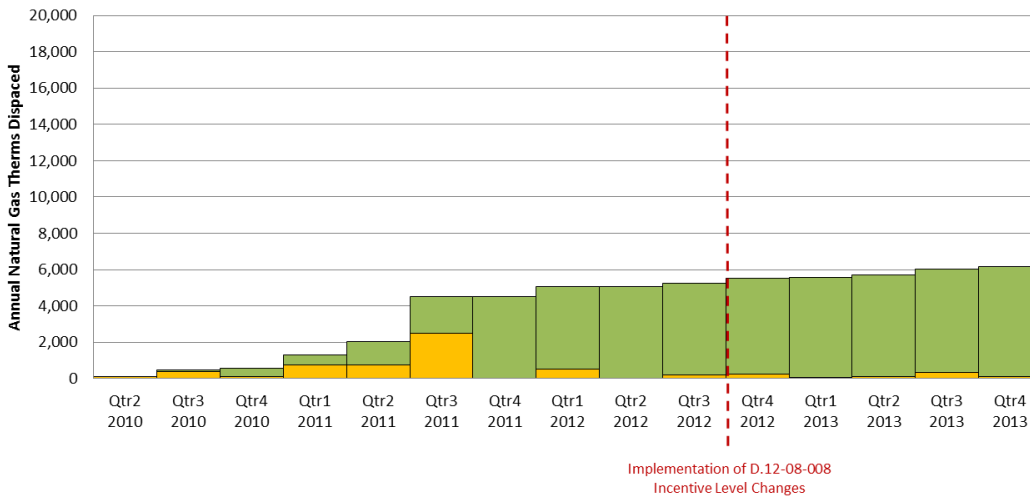


Cumulative through Q4 2013:
388,992 therms

- Multifamily Low Income Program Cumulative
- Multifamily Low Income Program (Incremental)

CCSE Program Progress

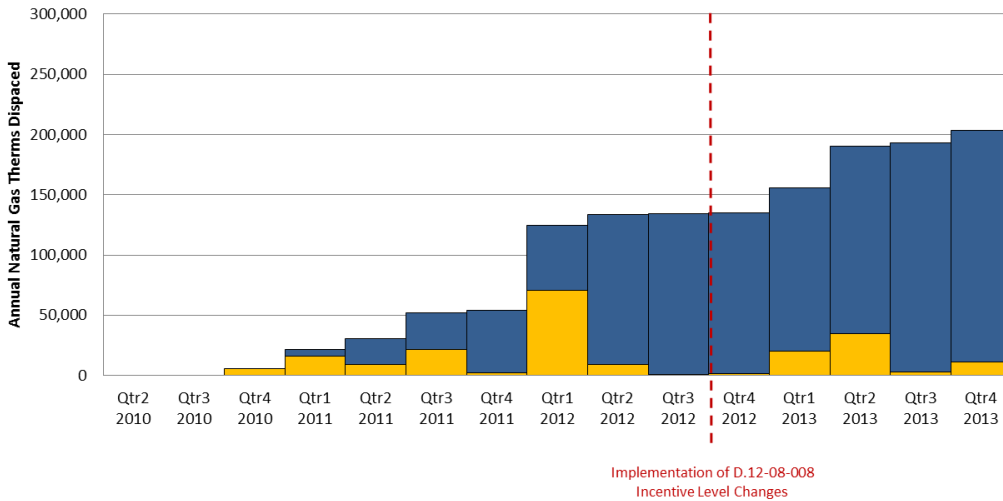
CCSE Single-Family Residential Program Therms Displaced Progress, 2010-2013



Sub-Program Target:
905,900 therms
Cumulative through Q4 2013:
6,140 therms
% Towards Goal: 0.7%

■ Single-Family Residential Program Cumulative
■ Single-Family Residential Program (Incremental)

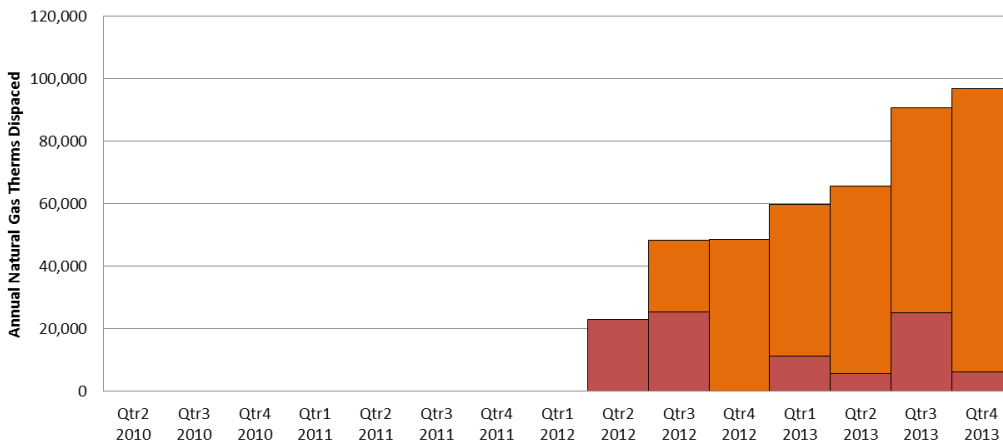
CCSE Multifamily - Commercial Program Therms Displaced Progress, 2010-2013



Sub-Program Target:
1,358,800 therms
Cumulative through Q4 2013:
203,679 therms
% Towards Goal: 15%

■ Multifamily-Commercial Program Cumulative
■ Multifamily-Commercial Program (Incremental)

CCSE Multifamily Low Income Program Therms Displaced Progress, 2010-2013



Cumulative through Q4 2013:
96,806 therms

■ Multifamily Low Income Program Cumulative
■ Multifamily Low Income Program (Incremental)