

Keeping up with HVAC Market Transformation

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The Challenge



- Energy efficiency program efforts are paying off
 - standard practices across sectors are becoming more efficient and improved codes and standards are raising the bar for efficiency.
- But what does this mean for programs that need to stay ahead of the curve to continue to push the market?

A Case Study

- National Grid successfully monitored the baseline conditions for its Heating Ventilation and Air Conditioning (HVAC) commercial program, Cool Choice, and responded to a shift in standard practice.
- Research was conducted from 2006 to 2008 that informed this successful response and change in program design
 - Annual freeridership surveys with Cool Choice participants across three years (2006 to 2008)
 - Quantitative data supplemented with qualitative data to capture whole story
 - In-depth interviews with National Grid account managers, HVAC contractors and vendors, industry experts and national account decision-makers.

Background

- National Grid conducts biannual freeridership surveys for its commercial programs.
 - Energy Initiative
 - Design *2000plus*
 - Cool Choice
 - Freeridership rates were increasing!
 - National Grid tasked PA Consulting to conduct a study to look into what was driving changes in freeridership

Questions asked in the 2006 study

- What is standard design practice for lighting and HVAC?
- What influence have utility or other public program incentives had on this standard practice?
- What is the customer decision-making process for energy efficient equipment?

2006 Study Conclusion that needed a response

Customer interviews and the free rider survey results provided consistent evidence that the HVAC market was transformed to higher efficiency standards for national accounts, a growing percent of National Grid's commercial customer base and participant population.

BIG Changes in HVAC

- In 2007 there were big changes in the program:
 - The regional Cool Choice program de-regionalized into state programs
 - The Consortium for Energy Efficiency (CEE) established new higher Tier efficiency levels for HVAC Equipment
 - The Massachusetts and Rhode Island Cool Choice programs adopted CEE's higher Tier efficiency levels for incentives for smaller equipment (less than 20 tons)

2007 Cool Choice program changes

Table 1. Changes to Equipment Tier Levels

| Size | Old Tier 2 | 2007 Tier 2 |
|-----------------------|------------|-------------|
| <5.4 ton | 13.0 SEER | 14.0 SEER |
| 5.4 ton to <11.25 ton | 11.0 EER | 11.5 EER |
| 11.25 ton to <20 ton | 10.8 EER | 11.5 EER |
| 20 ton to 30 ton | 10.0 EER | 10.0 EER |

Table 2. Equipment Program Incentive Levels

| HVAC Equipment | 2006 Incentive | 2007 Incentive |
|-----------------------|----------------|----------------|
| <5.4 ton | \$92/ton | \$125/ton |
| 5.4 ton to <11.25 ton | \$73/ton | \$80/ton |
| 11.25 ton to 30 ton | \$79/ton | \$80/ton |

Questions Asked in 2007

- Are national accounts purchasing CEE Tier 2 or higher HVAC equipment without a utility rebate?
- What influence have regional and utility programs (including CoolChoice) had on influencing the market for CEE Tier 2 equipment?
- What is the level of free ridership and spillover (FR/SO) for HVAC for national accounts participants in the 2006 Design2000plus Program?
 - Do the results support the analysis of national account free ridership and spillover based on the 2005 FR/SO surveys?
- Is it feasible to require minimum efficiency levels that exceed the proposed new CEE Tier 2 standards for national accounts in the near term?
 - Are equipment readily available to national accounts?
 - What impact would the change have on current purchasing in terms of levels of efficiency for HVAC equipment?

2007 Study Key Findings - HVAC Efficiency Levels

- *National accounts' standard efficiency levels for new construction tend to be one-half to one point higher than the commercial market standard practice for HVAC equipment of 20 tons or less.*
- *The majority of national accounts are buying high-efficiency HVAC equipment, not premium efficiency equipment.*
- *The higher 2007 Massachusetts Cool Choice equipment efficiency levels were viewed as a positive by experts, but there was push-back from the HVAC supply chain.*

2007 study conclusions

- The 2007 program changes were not premature, but instead will be another factor moving the market forward
 - The new 2007 CEE Tier 2 standards and 2007 Cool Choice incentive levels will already be pushing the market for the near term, including national accounts.
 - While at least half of national accounts may have standard practices that met the 2006 program standards, their standard practice is less than the 2007 program standards based on the study's research.
 - HVAC equipment at premium efficiency levels (14.0 SEER, 11.5 EER and up) have higher incremental costs and are not as readily available
 - The study results suggested that there may be a decrease in participating HVAC projects in 2007 as a result of the 2007 Cool Choice changes.

What happened in the 2007 program?

- The number of projects decreased, but the net savings remained unchanged or increased.
 - The decrease in projects is likely a result of both the increased HVAC requirements and the de-regionalization of the Cool Choice program.



2005 to 2007 Project Comparison

- Table 4. 2005 to 2007 Cool Choice Project Comparison1

| | Population of Accounts | Population kWh – Gross |
|------------------------------------|---------------------------|---------------------------|
| <i>Unitary HVAC</i> | | |
| Program Year 2005 HVAC Unitary | 194 | 2,037,081 |
| Program Year 2007 HVAC Unitary | 124 | 1,084,154 |
| Percent change from 2005 to 2007 | 36% decrease | 46% decrease |
| <i>Non-unitary HVAC</i> | | |
| Program Year 2005 Non-Unitary | 111 | 1,047,818 |
| Program Year 2007 HVAC Non-Unitary | 69 | 1,446,774 |
| Percent change from 2005 to 2007 | 38% decrease | 38% increase |
| <i>Total HVAC</i> | | |
| Program Year 2005 all HVAC | | 3,084,889 |
| Program Year 2007 all HVAC | | 2,530,928 |
| Percent change from 2005 to 2007 | | 18% decrease |

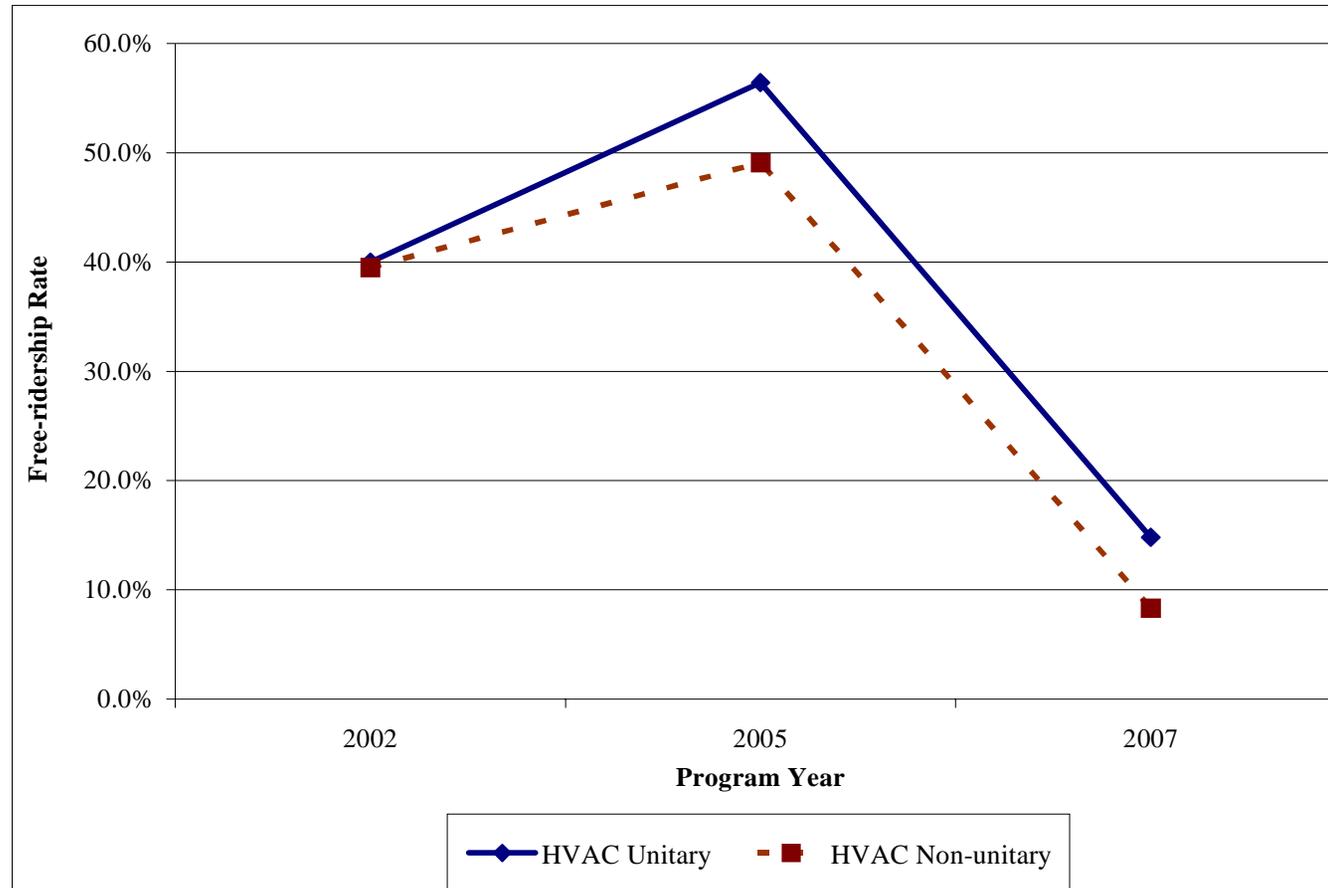
2005 to 2007 Net Savings Comparison

- Table 5. 2005 and 2007 Net Savings Comparison1

| | Population Measure kWh – Gross | Free-ridership rate | Spillover rate | Estimated Net-to-Gross Adjustment Factor | Population Measure kWh – Net |
|------------------------------------|---------------------------------------|----------------------------|-----------------------|---|-------------------------------------|
| Program Year 2005 HVAC Unitary | 2,037,081 | 56.4% | 6.6% | .50 | 1,022,615 |
| Program Year 2007 HVAC Unitary | 1,084,154 | 14.8% | 5.9% | .91 | 986,580 |
| Percent change from 2005 to 2007 | 46% decrease | | | | 3.5% decrease |
| Program Year 2005 Non-unitary | 1,047,818 | 49.1% | 0.2% | .51 | 534,387 |
| Program Year 2007 HVAC Non-Unitary | 1,446,774 | 8.3% | 15.2% | 1.07 | 1,543,708 |
| Percent change from 2005 to 2007 | 38% increase | | | | 188% increase |

Freeridership rate comparison

Figure 1. Comparison of Free-ridership Rates¹



And in 2008

| | Population of accounts | Population kWh Gross | FR Rate | Spillover Rate | net to gross | net kWh |
|------------------|------------------------|----------------------|---------|----------------|--------------|------------|
| 2008 Unitary | 123 | 906,877 | 15% | 6% | 91% | 826,165 |
| 2008 Non Unitary | 65 | 755,398 | 8% | 15% | 107% | 807,520 |
| | 188 | 1,662,275 | | | | 1,633, 685 |

Looking forward

- The HVAC commercial baseline will continue to go up!
- Recent developments in conjunction with utility programs will likely transform the market to the CEE Tier 2 higher efficiency levels in the near future.
 - the changes in federal minimum standards,
 - the growing use of EMS and a whole building approach,
 - an overall increase in commitment to energy efficiency by national accounts and other commercial customers, and
 - changes in manufacturing practices resulting from the increased efficiency practices of companies such as Wal-Mart.



Summary

- Use research to inform program planning and design
 - There is significant debate about the effectiveness of various net-to-gross approaches
 - Consistent measurement of free-ridership and spillover allows programs to track their effectiveness over time and make changes as needed.



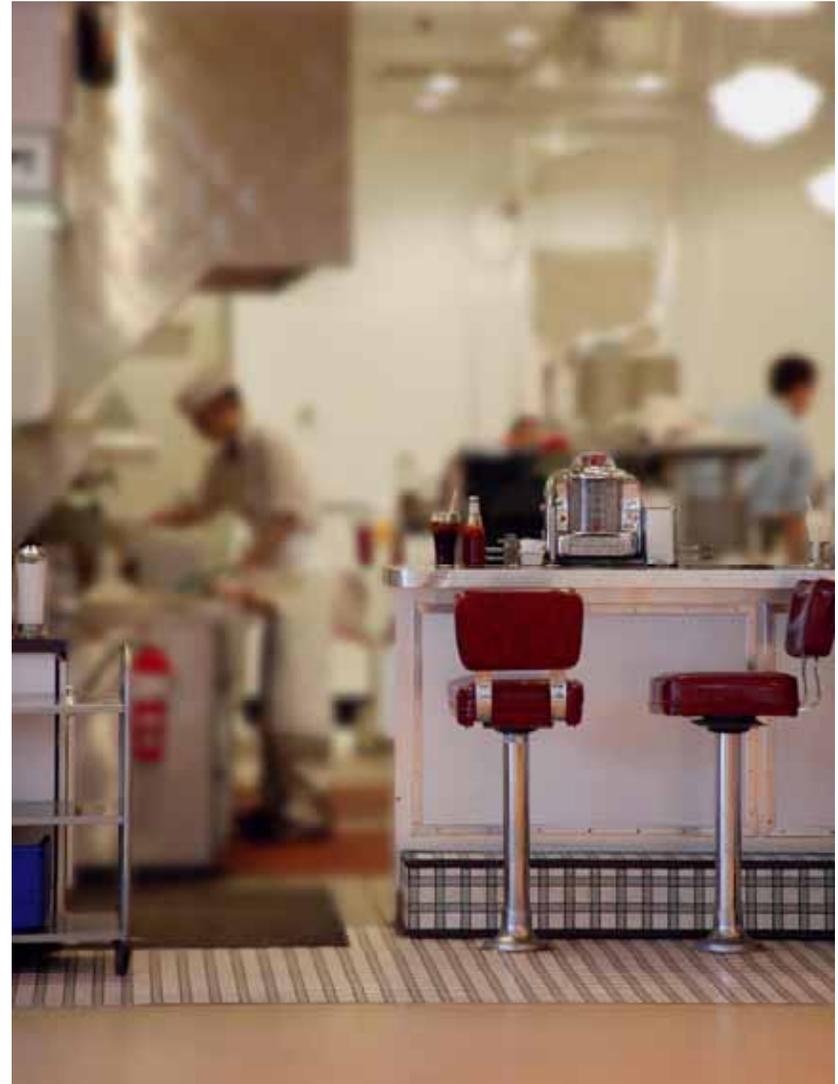


**The
baseline is
cooking!
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The Situation

- Pacific Gas and Electric's Food Services Technology Center (FSTC) has played a significant role in both establishing and raising the baseline in food services.
- How can programs accurately claim credit for their role in market transformation?



The Case Study

- The Food Service Technology Center has been in operation for over 20 years.
- Operated as a “Non-Resource Program”, i.e. no energy savings claimed.
- Energy savings results from the FSTC efforts are real, but difficult to quantify.
 - Market actors recognize FSTC role in developing methods to assess energy efficiency Food Service
 - Baseline difficult to quantify.
 - Prior to FSTC, most commercial food equipment was not tested.

Background

- The food services industry consumes roughly 2.5 times more energy per square foot than other commercial buildings
- But it is a difficult industry to move toward energy efficiency because of first costs, fragmentation, and a culture that tends to be slow adopters
- PG&E has over 38,000 commercial food services customers
- PG&E's Food Service Technology Center promotes the adoption of energy efficient equipment and practices in the food service industry
 - Discussion of FSTC's history and activities

Overall Trends

- “*A greening of the industry.*”
- Having a platform—a common language—on which to share and compare information has helped move the market toward efficiency
- ASTM test methods are now close to standard practice in the industry
 - Prior to the FSTC’s efforts, there were no ASTM test methods for food services equipment
 - Now there are over 20 pieces of food services equipment with ratified ASTM test methods as a result of FSTC efforts

Overall Trends - Manufacturers

- Virtually all the manufacturer respondents said their product lines have changed and become more efficient over the past five years
- For some this was due in large part to the FSTC equipment testing and the development of ENERGY STAR standards that changed the competitive landscape in specific product categories
- Manufacturers report their marketing is changing with the times too.
 - Some have rolled out new lines touting their efficiency and performance up front
 - Others have focused on promoting their line of ENERGY STAR approved products

Overall Trends – National Chains

- National chains have worked with the FSTC to either develop or specify more efficient equipment across all cooking equipment categories
- Food services is beginning to recognize the importance of not just the efficiency of kitchen equipment but how better restaurant design and a more efficient envelope can reduce operating costs

Overall Trends – National Chains

- Most manufacturers believe the PG&E food services rebates address the primary barrier—price sensitivity—to increased purchase and use of energy efficient equipment.
- National chains discussed that for corporate stores the PG&E rebates have limited impact.
 - This is because they make national specifications and it would not be cost-effective for them to try and tailor their equipment specifications based on rebates at a regional level.
 - In addition, they discussed that the most important thing is consistency in their equipment because it is set up for consistency in their recipes.
 - They said, however, that rebates could have an impact by influencing their national specifications at the design stage.

Overall Trends – End-users

- Participant end-user results indicate the FSTC is impacting end-users' cooking, lighting and ventilation equipment the most.
- The FSTC is having less impact in HVAC and water heating equipment.
- Forty percent of participants reported they used FSTC resources to make energy changes at their facility or are planning to make changes within the next year
 - The largest percentage reported using FSTC resources to purchase more efficient kitchen equipment. A quarter reported purchasing both more efficient equipment and changing their processes to use less energy.

Overall Trends – National Effects

- The FSTC is resulting in national benefits to the food services industry. These include:
 - *ASHRAE codes for food services.*
 - *ENERGY STAR food services equipment.*
 - *Recent federal and state changes in codes and standards.*
 - *The national CEE Commercial Kitchen Initiative.*
 - *The Electric Foodservices Council*

Overall Trends – National Effects

- *Technical assistance for NAFEM*, the National Association of Food Equipment Manufacturers
- *Food services equipment rebates*. Other utilities throughout the nation are beginning to roll out food services equipment rebates following California's example. These include energy efficiency programs in Wisconsin, Oregon, Washington, New York and Illinois.
- *LEED certification*. FSTC staff sit on the U.S. Green Buildings Council LEED subcommittee that is looking at certification to make sure that they understand how food services is a different entity.
- www.fishnick.com The FSTC maintains a clearinghouse of information on their website.

Energy Savings

- The largest direct benefit of the information from FSTC equipment testing is the ability to compare food services equipment on performance
- In food services, manufacturer testing procedures are newer and historically have not been stringent. Therefore, there is more of a need for third party verification than in other industries with more established practices.
- Manufacturers, suppliers and industry stakeholders are very familiar with the FSTC as FSTC works upstream with market actors to change their production based on FSTC equipment testing results.
- The customer survey indicates there are energy savings resulting from information dissemination for FSTC participants.

Conclusion

The FSTC has played an important role in the transformation of the commercial food service market. Through the FSTC, PG&E has advocated for a more efficient food service industry, provided methods to assess the efficiency of food service equipment, and worked with market actors throughout the supply chain to facilitate efficiency improvements in the industry.

The Challenge

- How do we as an industry accurately assess and evaluate the market transformation efforts of “non-resource” programs like the FSTC?

California Energy Efficiency Strategic Plan:

- *Market transformation is both a strategy and a desired “end-point.”*
- *Market transformation activities do not produce the same short-term, or easily measured or apparent, results as resource acquisition programs. However, they can result in much larger, medium- to long-term results that can yield a much larger payoff.*
- *This plan embraces the goals and strategies of market transformation by seeking to achieving transformative progress in all sectors by 2020.*
- *...the CPUC will examine changes to the policy rules of counting savings from IOU program to appropriately attribute gains from market transformation and long-term strategies to the IOUs*

Take-away: Programs like the FSTC will play an increasing role in achieving the aggressive goals (Zero Net Energy in Commercial Market by 2030) of the California Energy Efficiency Strategic Plan.

The Challenge

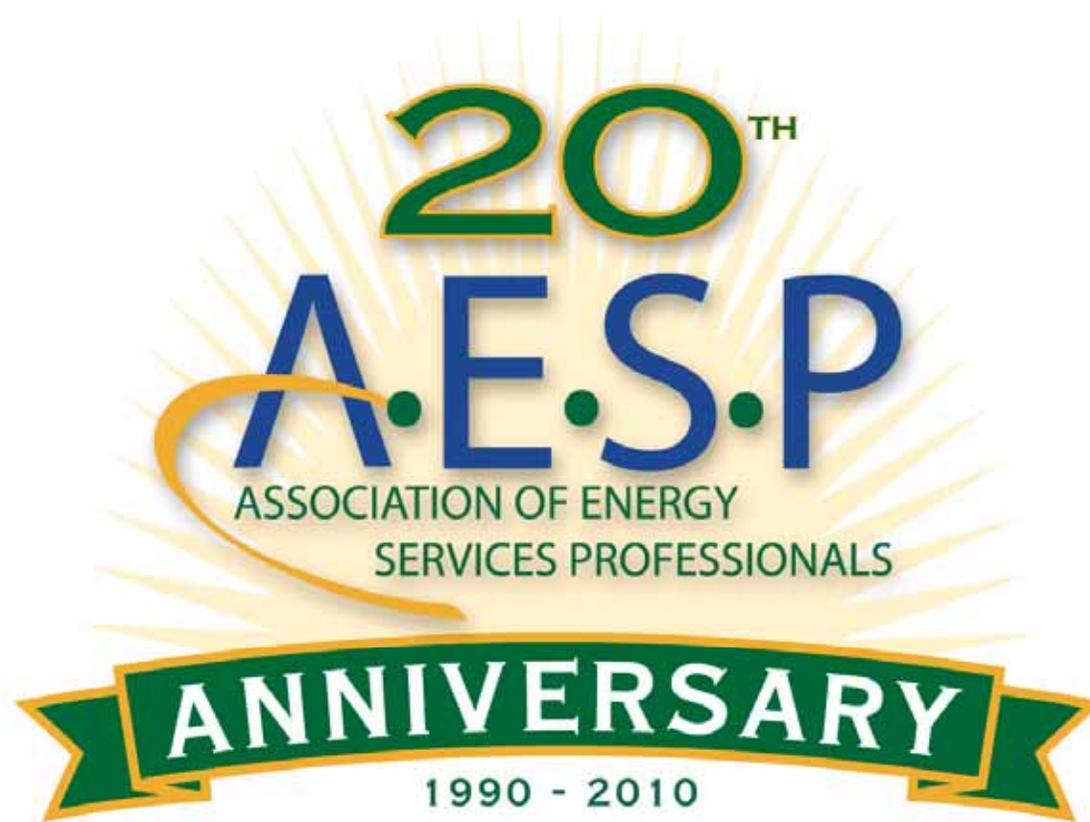
- **PG&E is working on other programs that will use market transformation to facilitate industry change. These programs will require innovative methods to evaluate and assess impacts.**
- **Example:**
- **Business and Consumer Electronics Program**
 - Working with retailers, manufacturers, and regulators to drive the market toward energy efficiency in the TV and computer market.
 - Working cooperatively with other utilities (IOUs and Munis) to drive a program that will have effects not just in California, but nationwide.
 - Use of upstream incentives limits the ability to assess results by interviewing “participants.” However, customer market research plays a key role determining how to market the program.
 - Multi-pronged approach, “carrot and stick”, i.e. providing incentives for products that go beyond the current standards while also encouraging progressive codes and standards.

The Evaluation, Measurement, and Verification Challenge

- Developing new methods to assess and evaluate the impacts of the program.
- Documenting baseline market in order to better assess impacts.

Summary

- The FSTC’s activities have the food services market primed for energy efficiency gains.
- How does PG&E capture and receive credit for these impending energy savings?
- They are difficult to quantify because there is so much they do “behind the scenes.”
 - Examples of this kind of “behind the scenes” work include equipment testing, working with manufacturers, contributing to publications, and providing education.
- PG&E is capturing energy savings now for rebated food services equipment only.



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