UC Berkeley
Planning & Evaluation

Title
High-Bay Lighting Market Effects Study: Final Study Plan

Permalink
https://escholarship.org/uc/item/0kw0j4vp

Author
Turiel, Isaac

Publication Date
2008-03-18

eScholarship.org Powered by the California Digital Library
University of California

HIGH-BAY LIGHTING
MARKET EFFECTS STUDY
FINAL STUDY PLAN

Prepared by
Isaac Turiel

for
CIEE Market Effects Team
Edward Vine, Project Manager

California Institute for Energy and Environment
Oakland, CA

March 18, 2008

TABLE OF CONTENTS

INTRODUCTION

On behalf of the California Public Utilities Commission (CPUC), the University of California (through the California Institute for Energy and Environment (CIEE)) is seeking proposals from qualified experts for studying the market effects from California's energy efficiency programs on high-bay lighting (HBL) in non-residential buildings. The CPUC's Market Effects Evaluation Protocol presents a working definition of market effects as "A change in the structure of a market or the behavior of participants in a market that is reflective of an increase in the adoption of energy-efficient products, services, or practices and is causally related to market intervention(s)." [1] Typically, these efforts are designed to increase the adoption of energy-efficient products, services or practices and are causally related to market interventions.

In CPUC Decision 07-10-032 (Oct. 18, 2007), the CPUC directed its staff and consultants to examine the market effects from California's energy efficiency programs, as a result of (1) direct effects from participants installing measures, (2) participant spillover, and (3) non-participant spillover. In this decision, participant spillover was defined as the savings from program participants who undertake energy efficiency improvements beyond the scope of the utility's program. In contrast, non-participant spillover was generally defined as the savings from those not directly participating in a utility program but who reduce their energy use after being influenced by a utility program. In this decision, CPUC staff and consultants were requested to examine non-participant spillover, while the CPUC's Evaluation, Measurement and Verification (EM&V) contractors were directed to evaluate participant spillover (in addition to evaluating the direct energy savings from participants). The CPUC stated that they chose a conservative path to explore the issue of non-participant spillover savings because such effects should be credited to utilities only when they can be observed and attributed to utility programs within some high standard of certainty.

Three studies are being conducted to examine market effects for the CPUC: high-bay lighting, compact fluorescent lamps (CFLs), and residential new construction. The latter two studies are being conducted by the EM&V contractors currently evaluating the direct effects and participant spillover in these areas. High-bay lighting is the focus of this Request for Proposals (RFP), and only one contract will be awarded.

The results from the market effect studies will be used by the CPUC for the preparation of reports and workshops on these topics in 2009. The CPUC staff will also report on possible revisions to market effects protocols, utility savings goals and/or performance incentive mechanisms for subsequent action by the Commission.

---

[1] California Public Utilities Commission, *California Energy Efficiency Evaluation Protocols: Technical, Methodological and Reporting Requirements for Evaluation Professionals*. San Francisco, CA, 2006.

A. Overview of HBL Market, Technology, and Programs

High-bay lighting (HBL) is mostly found in indoor spaces with high ceilings (greater than 15 ft). Some examples of buildings with high-bay lighting are factories, warehouses, gymnasiums, and big-box retail stores. High intensity discharge (HID) lighting is common in such spaces. HID systems can often be replaced with high output fluorescent systems with T5 or T8 lamps that offer greater efficiency plus other advantages such as easier dimming capability and occupancy sensor control.

The three electric investor-owned utilities (IOUs) in California utilize a statewide prescriptive rebate program to encourage and assist residential and nonresidential customers to retrofit existing equipment with higher efficiency replacements. This statewide program goes under different names in each of the three IOU service areas, as noted below. From January 1, 2006 through June 2007, the three IOUs estimate that they will save approximately 51 million kWh[2] of energy and reduce demand by approximately 13,000 kW by replacing HID lighting[3] with high output T5 and T8 systems in HBL locations. These energy savings and load reductions are expected to increase through the three-year duration of the IOU programs (2006-2008). More detailed information on each of the utility programs is provided below.

Pacific Gas & Electric (PG&E) Company

In PG&E's Commercial Mass Market Program, high output T8 and T5 fixtures replace HID sources as a change out either in conjunction with a daylighting project where the lamps are dimmed or as a direct retrofit opportunity. From January 1, 2006 through June 2007, PG&E reported that approximately 29 million kWh and 8,400 kW were saved due to the replacement of older fixtures with high output T5 and T8 systems. About three hundred end-users who installed more efficient HBL will be interviewed to determine if there has been participant spillover.

Much smaller energy savings from HBL measures have been achieved in the following three programs: Agriculture and Food Processing, Fabrication and Manufacturing and Retail. Evaluation of participant spillover may occur for some of the above-mentioned programs.

San Diego Gas & Electric (SDG&E) Company

SDG&E's Express Efficiency program has targeted small and medium nonresidential customers for many years. To participate in this program, each

[2] All of the energy savings data contained in this RFP are based on utility filings and were provided by Pete Jacobs, Building Metrics, December 2007.

[3] In some cases, existing HID lighting is replaced with more efficient (e.g., pulse start) HID lighting systems.

customer must have a demand greater than 100 kW on a monthly basis. SDG&E uses facilitators to help businesses in the retrofit process and help locate vendors and contractors. SDG&E provides information to customers through direct presentations, a website, and direct customer contact. Educational lighting seminars are provided to vendors and contractors. Outreach includes coordination with Community Based Organizations, Faith Based Organizations ethnic organizations and other stakeholders. From January 1, 2006 through June 2007, approximately 2.6 million kWh and 725 kW was saved due to the replacement of older fixtures with high output T5 and T8 systems as part of the Express Efficiency program.

SDG&E has another program, the Small Business Super Saver (SBSS) program, that targets nonresidential customers under 100 kW of monthly demand and/or under an average monthly usage of 4,166 therms. It is a prescriptive rebate program that encourages nonresidential customers to retrofit existing equipment with high efficiency equipment. Rebates are intended to cover a significant portion of the incremental cost associated with installing higher efficiency equipment. From January 1, 2006 through June 2007, approximately 1.8 million kWh and 475 kW was saved due to the replacement of older fixtures with high output T5 and T8 systems as part of this program.

About 150 end-users who installed more efficient HBL will be interviewed to determine if there has been participant spillover.

Southern California Edison (SCE) Company

SCE's Business Incentives and Services programs promote more efficient interior lighting in non-residential facilities. The specific elements of this program are the Express Efficiency program, the Standards Performance Contracts (SPC) program, and energy audits. The Express Efficiency program is for facilities utilizing prescriptive energy efficiency measures, and the SPC program is for more complex projects not eligible as an itemized (prescriptive) measure. The SPC program offers cash incentives for the installation of high efficiency equipment or systems. Incentives are based on annual energy savings (kWh) and paid upon completion and inspection of the project. All nonresidential customers are eligible to participate, and all projects require both a pre- and post-installation inspection. Projects are typically customized equipment or systems for commercial, industrial, or agriculture facilities that fall outside the Express Efficiency program. From January 1, 2006 through June 2007, approximately 11.9 million kWh and 2,350 kW were saved due to Business Incentives and Services programs.

SCE also has another program, Savings by Design, which focuses on non-residential new construction or major renovation projects in nonresidential market segments (commercial, governmental, institutional, agricultural, and industrial). The Savings by Design program specifically targets design and construction industry decision-makers: architects, mechanical engineers, electrical engineers,

lighting designers, developers, contractors, energy consultants building owners and operators. From January 1, 2006 through June 2007, approximately 4.1 million kWh and 825 kW were saved due to the Savings by Design program.

Two other programs that may include HBL measures are Energy Efficiency/Demand Response Flex and Lighting Energy Efficiency with Demand Response. It is possible that participant spillover will be evaluated for those two programs.

One other program that may include HBL measures is Local Government Partnerships. This program is not specific to one utility. It has not been decided whether non-participant spillover will be evaluated.

B. Goals

The goal of this study is to explore market effects on the HBL market and to credibly quantify and credit non-participant spillover from programs that target HBL. It must also be determined if the savings from market effects, including non-participant spillover, can be credited with a high degree of certainty. Another goal of this study is to see if it is possible to attribute the savings from market effects to individual utility programs, or at least to service territories.

C. Research Objectives

This study is envisioned as being performed in a manner that is consistent with the CPUC protocols for market effects evaluations. The objectives of this study are the following:

1. Understand and quantify the cumulative market effects of California's energy efficiency programs on the market for HBL.
2. Quantify the kWh and kW savings caused by the above market effects, occurring in the years 2006-2008, with particular emphasis on non-participant spillover.
3. Support the CPUC's strategic planning efforts by clarifying whether savings from market effects can be quantified with sufficient reliability to be treated as a resource and, potentially, afforded shareholder incentive payments.

D. Tasks

The tasks are organized into six sections, each corresponding to a key step in the market effects study. These steps are: (1) scoping study; (2) analysis of market evolution; (3) analysis of market effects; (4) assessment of attribution; (5)

estimation of net energy and demand savings from non-participant spillover; and (6) assessment of sustainability.

The proposed study is summarized in Table 1, below.

Table 1. Summary of Proposed High-Bay Lighting Market Effects Study

Step	Research Activities
1. Scoping Study	• Characterize HBL market using existing data sources. • Review HBL market effects studies from other states. • Develop integrated market and program theories. • Refine study approach based on availability of data. • Detail market indicators to be studied.
2. Analysis of Market Evolution	• Using existing data sources, reconstruct historical trends in the HBL market in California.
3. Analysis of Market Effects	• Analyze current actual HBL sales in California. o Draw on results from evaluation surveys and on-site visits o Expand evaluation interviews to encompass site visits and analysis of electrical contractor sales records. o Triangulate among results • Analyze baseline[4] HBL sales in California. o Targeted quasi-experimental sales data analyses. o Supplement with other, more targeted quasi-experimental sales data analyses. o Triangulate among results • Interview retailers, manufacturers, and other retail market actors regarding market effects, leveraging interviews already planned for evaluation purposes. • Interview supply-side actors involved in commercial lighting markets to develop initial insights into possible HBL market effects •
4. Attribution Analysis	• Sift through the evidence collected in Steps 1-3 to make a case regarding the nature and magnitude of any HBL market effects produced by California's commercial lighting programs.
5. Estimation of Net Energy and Demand Savings	• Estimate non-participant spillover savings for years 2006-2008. o #1A. Estimate total program savings by comparing actual and baseline sales, with appropriate adjustments based on other evaluation findings. o #1B. Subtract direct net and participant spillover savings associated with HBL sales and documented in the 2006-2008 impact evaluations. o #2. Estimate non-participant spillover savings from interviews with contractors, distributors and end-users. • Systematically analyze the uncertainty surrounding the results from the above approaches. • Develop recommendations regarding treatment of any HBL market effects savings in next program cycle.
6. Sustain-ability Assessment	• Using results from all of the above steps, assess the extent to which any observed market effects are likely to persist in the absence or reduction of public intervention.

[4] As discussed later in this plan, baseline refers to a hypothetical projection of sales patterns of energy efficient HBL sales patterns in the absence of publicly funded energy efficiency programs targeting HBL.

STEP 1: SCOPING STUDY

California's measurement and evaluation protocols for market effects evaluations emphasize the importance of performing a scoping study before actually embarking on a market effects study.[5] As stated in the protocols:

> "The appropriate approach for a market effects study cannot be readily determined without a scoping study to define the market to be studied, develop a market theory to test in the analysis, assess data availability for the market effects study, specify a model of market change, develop a methodology for data collection and recommend an analysis approach."(p.149.)

A later passage in the market effects protocol succinctly summarizes the required components of a scoping study when performed at an enhanced level of rigor, as follows:

> "Define the market by its location, the utilities involved, the equipment, behaviors, sector and the program years of interest. Develop market theory and logic model. Detail indicators. Identify available secondary data and primary data that can be used to track changes in indicators. Outline data collection data collection approach. Recommend hypotheses to test in the market effects study. Recommend the analysis approach most likely to be effective. "(p. 150.)

Consistent with the protocols, the first step in this HBL market effects study will be a scoping study, to include all of the components summarized above. The current document is itself the first step of the scoping study, but represents only the beginning of the process. While methodological approaches are discussed in this RFP, these should be viewed as tentative, pending the methods proposed by the winning bidder, the results of the full scoping study (reflecting availability of data), and an associated public workshop.[6]

A. Development of Market and Program Theories

Another key component of the scoping study will be the development of market and program theories for evaluating the HBL market. In the words of the protocols:

---

[5] California Public Utilities Commission, *California Energy Efficiency Evaluation Protocols: Technical, Methodological and Reporting Requirements for Evaluation Professionals*. San Francisco, CA, 2006.

[6] A public workshop will be held on the draft scoping study and draft work plan for the remaining tasks.

> "The assessment, refinement, and/or development of a market theory with logic models are key activities of the scoping study. The *2001 Framework Study* and the *Evaluation Framework* both address the value and process of developing a program or market theory. The evaluation contractor will need to articulate a market theory in order to proceed with baseline measurement for market effects evaluation. At a minimum, this market theory shall describe how the market operates and articulate market assumptions and associated research questions. This must be done at a level of detail sufficient to develop data collection instruments for baseline measurement. If the assessment includes programs that are designed specifically to change the way a market operates the program theory should also be consistent with and embedded in the theory of how the market operates." (p. 150.)

A later passage details what should be included in a market theory and logic model:

> "Articulate market theory and, if reasonable, develop graphical model of market theory. Market theory should include market operations and conditions, and changes occurring in the market… Develop multiple program theory and logic models for those programs intervening in the market. Integrate the market theory and program theory/logic models to examine external and programmatic influences, assumptions about changes in the market and associated research questions. Theories and logic models should be generated through interviews or workshops with program staff from each of the programs and a sample of a wide variety of market actors. Use a literature review and other studies of these markets and iteration with program staff to ensure thoroughness in measuring the critical parameters for both market development from external influences and market effects." (p. 151.)

Bidders are encouraged to develop a set of program theories that can be used to address the wide range of programs potentially impacting HBL sales

B. Literature Review

A third important component of the scoping study will be a review of the existing literature on market effects from HBL measures or, if applicable, non-residential lighting programs, with an eye toward lessons learned, methods that are worth replicating, and any available data that may usefully be transferred to the California context. Literature that might be applicable to the study of high bay lighting should be cited.

STEP 2: ANALYSIS OF MARKET EVOLUTION

Because market effects generally occur slowly over time, understanding the long-term evolution of the market is critical to any market effects evaluation. Ideally, this is achieved through ongoing evaluation efforts over the course of many years. However, in the current study we do not have this luxury. Instead we are making a one-shot effort to develop the best understanding of the market effects of California's utility lighting programs on HBL installations. As a result, we anticipate that it will be necessary to resort to a range of existing data sources to do the best job we can of reconstructing the evolution of the HBL market, within and possibly beyond California. Bidders should indicate how they will determine the nature of the market for HBL and whether it is part of a larger market. Additionally, they should discuss the availability of existing market data in their approach to this step. A central focus of this effort will be attempting to reconstruct historic trends in sales of HBL equipment in California. However, trends in other key variables such as consumer awareness and attitudes, prices, and distributor stocking behavior are also of interest. We recognize that developing an accurate picture of long-term trends in these variables will be challenging. Bidders may want to discuss how this study would lay the groundwork for future market effects studies as well as assessing market effects to date.

Data sources that may be useful in reconstructing HBL equipment market trends include: past saturation studies; the Database for Energy Efficiency Resources (DEER); utility process evaluations and market assessment studies; and research performed during and after the California energy crisis to understand the effects of the crisis and programming developed in response to it.

STEP 3: ANALYSIS OF MARKET EFFECTS

The analysis of market evolution described above is expected to contribute to the assessment of HBL market effects from California's utility programs. One of the components of this effort may be a comparison of current actual and baseline HBL equipment sales patterns, buttressed by interviews with manufacturers, distributors, contractors and end-users regarding the market effects of the programs. By "baseline," we mean a hypothetical projection of what HBL sales patterns would have looked like in the complete absence of any programs promoting HBL equipment, in California, either now or at any time in the past.[7] Some of the data needed to support this effort may already be in the process of being collected as part of the CPUC's Small Commercial Evaluation plan or other

[7] It is important to keep in mind that the word "baseline" has various other meanings in energy efficiency evaluation, none of which is intended here. One alternative meaning is the market conditions in force at the beginning of a period of public intervention. Another meaning, used in the context of M&V, refers to the most likely alternative equipment or practice to the one that was actually adopted. Despite these alternative meanings of the work, we use the term "baseline" for the no-program scenario because we believe this has become a convention in the field of market effects research.

evaluation efforts. However, because evaluation plans are focused on measuring direct program impacts, the data collection efforts described in the evaluation plans will need to be expanded and, in some cases, supplemented with separate data sources.

As with the analysis of market evolution, a wide range of market indicators other than sales are also of potential interest. Development of the specific indicators to be measured must await the completion of the scoping study. However, they are likely to include measures of end-user and electrical contractor awareness, attitudes, and behavior; distributor stocking, promotional, and pricing practices; and manufacturers' business strategies. The primary objective in developing and measuring these non-sales market indicators is to build a convincing case regarding HBL market effects by assessing whether or not the indicators have changed in a manner consistent with what would be predicted by the program theory.

The core of the effort to analyze market effects may consist of a quasi-experimental comparison of current actual and baseline HBL equipment sales patterns in California, with the baseline being based on current HBL equipment sales patterns in a number of alternative comparison areas, as discussed in more detail below. Underlying this approach is the assumption that one or more comparison areas can be found that are reasonably representative of what would be happening in California in the absence of public purpose HBL measures. In an ideal world, we would use a more powerful quasi-experimental design, such as a pre-post/ test-comparison design, under which we would compare the change in HBL equipment sales between two periods for the test versus the comparison area. However, as discussed above, because this is primarily a retrospective study, for the most part we do not have the luxury of collecting detailed pre-program data. As a result, it will be necessary to take a number of steps to buttress the validity of the results. Key to the effort to strengthen validity will be the use of multiple methods both to analyze current actual HBL equipment sales patterns in California and to develop comparison areas. It should be mentioned here that Wisconsin is presently using a comparison State approach to study this same market. If it is possible to collect California baseline sales data prior to the promotion of utility HBL measures, that should be discussed in the response to this RFP.

We would like respondents to this RFP to discuss their evaluation of the approaches to estimating a baseline for HBL sales that are discussed in this RFP and to also present an approach, or approaches, that they believe would be most efficacious. The approach we propose to use to strengthen the evidence regarding baseline HBL sales patterns is the collection of detailed sales data for one or more specific states, regions, and/or large lighting equipment distributors. We can envision a variety of approaches to the development of such targeted comparison areas. One approach, used in Wisconsin as noted above, would be to look at an entire state or states, using existing distributor sales data or collecting new data through a survey. Another approach that we believe might hold promise would be to focus on a particular distributor chain or sets of chains, and compare sales

patterns in a set of carefully matched stores in and out of California.[8] Whichever approaches are used, as with the estimation of actual HBL sales patterns, we believe it will be as important to characterize baseline HBL sales patterns as total HBL sales

STEP 4: ASSESSMENT OF ATTRIBUTION

This step will involve sifting through all the evidence developed in Step 3 to make a case regarding the nature of the HBL market effects produced by California's utility programs, if any, and the total number of HBL sales induced by these market effects that occurred in the years 2006-2008. Conclusions regarding these issues will be based on:

- Whether comparisons between estimates of actual and baseline HBL sales in California consistently show significant differences.
- Whether supply-side informants (e.g., retailers, distributors, contractors, manufacturers) attribute market effects to the energy efficiency programs, and if so, what kind of effects and from which programs.
- Whether the results of the attempt to reconstruct the evolution of the HBL market within and beyond California are suggestive of long-term market effects.
- Whether differences in the specific pattern of HBL sales (i.e., who is buying exactly which products from whom?) under the actual and baseline scenarios show differences that are suggestive of market effects.
- Whether the analysis of HBL marketing efforts conducted as part of the M&O evaluation show significant marketing impacts on sales, above and beyond the effects of specific HBL programs.

Above all, conclusions regarding the extent of the HBL market effects that can be attributed to California's utility programs will be based on the extent to which all of the above findings are consistent with one another and with the program theory developed as part of Task 1. At the end of the day, attribution in this study will be based on a preponderance of evidence approach, under which the researcher attempts to construct an argument as to just what has transpired based on the convergence of evidence from a wide range of sources, and the consistency of this evidence with the program theory.

[8] One potential advantage of this approach is that, depending on the nature of the sales records maintained by the particular chains being studied, and the cooperativeness of the chains, it may be possible to collect trend data covering a number of past years. Another potential advantage is that it would allow for comparisons with stores in multiple states outside of California, helping to sort out the confounding effects of unique events and conditions in individual states.

STEP 5: ESTIMATION OF NET ENERGY AND DEMAND SAVINGS

In this task, the results of the analysis of market effects discussed in Steps 3 and 4 will be converted into a stream of estimated savings. Initial estimates of savings from market effects will be based upon the difference between total actual and baseline CFL sales, with triangulation among the alternative estimates of these two quantities, and adjustments as appropriate based on other evaluation findings discussed above.

It is important at the outset to understand the basic nature of the savings estimates produced using this method, as it is the source of several analytic complications discussed in this section. The ultimate objective in this step of the study is to estimate savings from program effects in years 2006-2008 that are not covered (i.e., non-participant spillover) in the direct and participant spillover effects being measured by the impact evaluation studies. Two possible ways to approach the calculation of energy savings are:

(1) Estimate savings from program effects in years 2006-2008 which are not covered in the direct and participant spillover effects being measured by the impact evaluation studies (i.e., non-participant spillover).

(2) Directly estimate non-participant spillover by obtaining information from the appropriate actors in the HBL market.

In the first method, the initial plan is to use the data collected on actual and baseline HBL sales in California. Fundamentally, because we are comparing actual HBL sales with a hypothetical estimate of the level of sales that would exist in the historical absence of any utility programs which include HBL measures, the difference between actual and baseline HBL sales represents the current, total, cumulative effects of all programs that have ever been run in California. As such, it does not differentiate between impacts induced now versus in the past, between different categories of current impacts such as direct program impacts or spillover, or between impacts induced by one program versus another. Since this method will produce estimates of total savings from California's utility programs (with the baseline already backed out with this approach), in order to calculate non-participant spillover, we need to subtract from our initial savings estimate all savings estimates produced in the 2006-2008 impact evaluations that are (1) program induced and (2) not counted in other impact evaluation results. To summarize:

$$\text{Non-Participant Spillover} = \text{Total Program-Induced Savings} - \text{Direct Savings} - \text{Participant Spillover}$$

Alternatively, by rearranging the terms in the equation, one could calculate total market effects by calculating total program-induced savings and then subtracting direct savings, leading to the following equation:

Non-Participant Spillover + Participant Spillover = Total Program-Induced Savings – Direct Savings

Unfortunately, using this approach, we do not know what proportion of market effects is due to non-participant spillover and what is due to participant spillover. Utilization of this approach, to estimate only total market effects, would depend upon approval of the CPUC.

The second method involves obtaining data on HBL installations that were indirectly impacted by utility programs. In each of the three utility districts, this will likely require interviews with contractors, distributors and end-users to determine if they were indirectly influenced to install more efficient HBL equipment. This could be through such actions as prior education (e.g., workshops on lighting technologies and economics), word of mouth, and distributor or contractor promotion.

If it can be determined, with a high degree of confidence, that more efficient HBL installations by non-participants were indirectly influenced through IOU programs, then the quantitative portion of this step can proceed. The more difficult portion of this exercise will be translating information gathered during these interviews into quantitative data on HBL installations that were influenced by IOU programs. Finally, a stream of energy use and demand savings will need to be constructed from actions taken by these non-participants. We would like respondents to this RFP to discuss other approaches to the two approaches that are discussed in this section and to also present an approach, or approaches, that they believe would be most efficacious.

One important issue that needs to be addressed is whether to count all non-participant spillover realized in 2006-2008, or only that which was caused by programs implemented in these years.[9] Because the focus is on a cumulative savings estimate, it is very likely that some of the observed impacts will have been caused due to efforts prior to 2006, In other words, it is likely that, even if the 2006-2008 programs had never been run, energy-efficient HBL sales would still be higher than the baseline, due to the lingering effects of pre-2006 programs. Accordingly, to the extent that the objective is to estimate non-participant spillover both caused and realized between 2006 and 2008, another step is needed to estimate what fraction of the observed savings was caused by the current cycle of programs. Such an estimate would probably have to be subjective in nature, adding uncertainty to the results.[10] There is no formal CPUC policy regarding whether impacts from market effects must have been not only realized but also

[9] A concrete example of the difference between these two terms would be lighting a stick of dynamite with a long fuse. The resulting explosion would be *caused* at the time the fuse was lit, but *realized* at the time of the explosion.

[10] However, if it proves possible to retroactively develop meaningful estimates of actual and baseline sales of energy-efficient HBL as of 2005, it might be possible to use these estimates to estimate total market effects savings as of that year. Subtracting this figure from the estimate as of 2008 would then yield an estimate of market effects savings caused between 2006-2008.

caused in the current program cycle to be counted. However, for the purposes of this study, the contractor will be expected to quantify the additional savings that were realized in 2006-2008, and to gain qualitative insights into how much of these savings were also caused in 2006-2008.

As discussed earlier, a key purpose of this study is to help establish whether savings from market effects can be quantified with sufficient reliability to be treated as a resource by the CPUC. Given this objective, a key component of this step will be an effort to understand and manage the uncertainty surrounding estimates of savings from HBL market effects. Specifically:

- The uncertainty surrounding final estimates of savings from market effects will be systematically analyzed, using either Monte Carlo simulations or other appropriate methods.
- Based on the results of the study, recommendations will be made regarding whether and how savings credit for market effects might reliably be established in the next program cycle. For example, one approach that has been used in other jurisdictions is to develop a range for estimated savings for market effects and, in order to be conservative, credit program administrators with the bottom of the range. However, other approaches are also possible.

As part of this task, the effects of any savings from market effects documented by this evaluation on the cost-effectiveness of California's HBL programs will be analyzed.

STEP 6: ASSESSMENT OF SUSTAINABILITY

As defined by the Protocols, sustainability refers to the extent to which the observed market effects can be expected to last into the future. Thus defined, it would appear that analyzing the sustainability of any HBL market effects documented by this study is not necessarily essential to support either of the two primary objectives of the study, estimating savings from market effects for the years 2006-2008, and clarifying the extent to which savings from market effects can be quantified with sufficient reliability to be viewed as a resource. It is not needed to support the first of these objectives because we do not need to know about future savings in order to estimate savings for the years 2006-2008. It is not needed to support the second of the objectives because the CPUC's primary focus is on understanding current rather than future savings.

Nonetheless, it is important to include an assessment of the sustainability of market effects in this study, and CPUC staff is interested in pursuing such an assessment. Gaining an understanding of the sustainability of any observed market effects could be very helpful in shaping the direction of future programming efforts in this market. If a sustainability analysis is included, a primary focus will be, as stated in the Protocols:

> "Identifying changes in market structure and operations, and how the changed market contains mechanisms to sustain them. This could include examining profitability analyses for important support businesses or business operations and how these are maintained without continued program intervention."

Recent market effects evaluation work in Massachusetts provides a potential model for applying the general approach described above to the HBL market. However, this is just one approach and we are interested in hearing about other possible approaches. The Massachusetts work draws on a 2000 paper by David Hewitt[11] that proposed answering the following questions in order to help assess the extent to which a market has been transformed:

- Is someone making money by offering it?
- Has a private market developed to continue the facilitation?
- Has the profession or trade adopted it as a standard practice?
- Would it be difficult or costly to revert to earlier equipment or practices?
- Are end-users requesting or demanding it?
- Have the risks to private market actors been reduced or removed?

To the extent that the results of this step suggest that sustainability has not yet been reached, two additional questions that will need to be addressed are:

- How will we know when the energy-efficient HBL market is self-sustaining?
- What further programming efforts, and how much more time, will be needed in order to make the energy-efficient HBL market self-sustaining?

Recommended References to Review

1. California Public Utilities Commission, "Market Effects Protocol," in *California Energy Efficiency Evaluation Protocols: Technical, Methodological and Reporting Requirements for Evaluation Professionals*. San Francisco, CA, 2006.
2. Small Commercial Contract Group, *Direct Impact Evaluation*, Table 7-5 and 7-6, Itron, Inc., November 15, 2007.

[11] Hewitt, D.C. 2000. "The Elements of Sustainability." In *Efficiency & Sustainability, Proceedings of the 2000 Summer Study on Energy Efficiency in Buildings*. Washington DC: American Council for an Energy-Efficient Economy. Pp. 6.179-6.190.