MARKET EFFECTS AND MARKET TRANSFORMATION: THEIR ROLE IN ENERGY EFFICIENCY PROGRAM DESIGN AND EVALUATION

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List of Exhibits:

Executive Summary

In its recent decisions pertaining to the objectives of upcoming energy efficiency programs, the California Public Utilities Commission (CPUC) has placed a strong priority on market transformation, defined as:

> Long-lasting sustainable changes in the structure or functioning of a market achieved by reducing barriers to the adoption of energy efficiency measures to the point where further publicly-funded intervention is no longer appropriate in that specific market.

This White Paper summarizes the experience of utilities and other publicly-funded program sponsors in the design, delivery, and evaluation of programs aimed at achieving market transformation. The information presented is drawn from an extensive review of literature in the field and neighboring disciplines, as well as from interviews with program sponsors and regulators familiar with the issues addressed. It is meant to serve as a source book of concepts, strategies, and practical solutions for challenges that typically arise in programs whose objectives include market transformation. We focus on the use of evaluation and other types of research to guide program development and delivery and to assess progress and results.

We also offer a number of specific recommendations for consideration by the CPUC and the California utilities as they move forward to design and implement the 2009 – 2011 programs. These recommendations are meant to facilitate the alignment of policies and procedures in regard to energy efficiency program design, program evaluation, and sponsor incentive structures with the CPUC's stated goal of encouraging the achievement of market transformation.

Key Findings

The authors base their recommendations on the following findings, which appear consistently in the literature and in interviews with practitioners.

1. **Ratepayer-supported energy efficiency programs, including those operated by the California investor-owned utilities (IOUs), have contributed significantly to market transformation in key energy end-uses, and continue to do so.**

   Over the past 20 years, ratepayer-supported program sponsors, working in concert with public and private sector organizations, have accelerated the adoption and, through

changes in codes, standards, and supplier behavior, secured high *national* market share for the following technologies:

- Electronic fluorescent ballasts;
- Compact fluorescent light bulbs;
- High-efficiency household appliances, including clothes washers, refrigerators, dishwashers, and room air conditioners;
- Premium efficiency integral horsepower electric motors; and,
- Energy-efficient residential windows.

At the regional level, ratepayer programs have achieved similar results for a wider variety of products and services, including energy-efficient residential construction and commercial lighting design.

In some cases, such as electronic ballasts, ratepayer programs contributed to the process primarily by subsidizing consumer purchases as part of a demand-side resource acquisition strategy. In others, such as resource-efficient clothes washers, ratepayer-funded program sponsors formulated and pursued a long-term strategy that encompassed direct contacts with domestic manufacturers to support product development, development of product standards and testing procedures, retailer merchandising support, broad-based consumer education, and customer incentives.

2. **Success in achieving targeted market changes (market effects) and longer-term market transformation requires the consistent collection and analysis of market data and intelligence, and the integration of that analysis into program design and operation.**

   Practitioners interviewed in preparing this White Paper all report the extensive use of market research and analysis – both existing and specially commissioned – to inform planning and management decisions throughout the program cycle. The key decisions supported by market research are as follows:

   - ***Selection of products for program support.*** In addition to considerations of technology performance and cost-effectiveness, market-related considerations taken into account include the current development of supply channels for the product in question, size of the market, market actor perceptions of product advantages and barriers to adoption, and the availability of exit strategies, such as those offered by changes to codes and standards.

- ***Development of program plans.*** Programs designed to change the behavior of market actors are most likely to succeed when their approach reflects market realities. Market characterization studies that address issues of market size, customer segmentation, supply chain structure and operations, incremental costs, patterns of customer behavior, and current levels of product assessment provide the data required to develop effective program plans. They are also needed to establish baseline conditions against which program accomplishments can be measured.
- ***Monitoring program performance to support mid-cycle corrections***. Programs designed to change market actor behavior often require a number of years to gain traction. However, once they do, documented experience shows that key conditions such as market share for efficient products, level of customer recognition, and extent of supply chain support can change rapidly. Evaluations undertaken at the end of a 3 – 5 year program cycle may register these changes too late for effective use in program planning and management. Therefore, jurisdictions with extensive market transformation program portfolios often commission short-term, limited-scope studies to keep tabs on market development and build data resources for final evaluations.

3. Research at the regional level strongly suggests that energy efficiency programs influence the measure adoption behavior of nonparticipating customers and supply chain establishments within regions served by such programs – at least, at certain stages of market development.

Studies of market share for a variety of products including compact fluorescent lamps (CFLs), efficient clothes washers, and premium efficiency electric motors at the state and regional level have found that the purchase of efficient models accelerates among nonparticipating customers in regions where programs are available, while such purchases lag in regions where programs are not active. In some of these cases, measure adoptions by nonparticipants were observed to exceed those of participants. Typically, as market development proceeds, the pace of efficient technology adoption picks up in areas without programs, thus reducing the ability of conventional social science research methods to detect and quantify program effects on market share in the later stages of market transformation.

4. **Evaluation methods have been developed and successfully deployed to quantify the net effect of energy programs on measure adoption within the program area(s), including program-related adoptions by non-participants.**

   Researchers in the field have developed estimates of net program effects using a wide range of well-established methods including:

   - Cross-sectional methods that use indicators of measure adoption from regions with no active energy efficiency programs to establish a baseline for comparison to the program area.
   - Expert judging methods, such as the Delphi process, which used structured solicitation of expert opinion to establish a baseline.
   - Case study methods which use a variety of primary and secondary sources to develop a "weight of evidence" argument concerning the extent of program influence.
   - Surveys of program participants and nonparticipants within the program area to develop estimates of spillover, that is, adoptions "outside the program" that customers attribute to program influence.

   Of course, these methods have relative advantages and disadvantages in specific applications, as well as varying requirements in terms of time and resources required for proper implementation. However, from the standpoint of basic research technique, they are capable of generating estimates of net program effects that are equal in validity, reliability, and accuracy to the estimates of *participant only* effects that the CPUC currently uses as the index of energy efficiency program performance.

Recommendations

Our recommendations focus on three elements of the regulatory process that we believe will facilitate the realization of the Commission's policy to promote market transformation. These are (1) the approach to program sponsor performance assessment and compensation, (2) research in support of program planning, and (3) evaluation.

Program Sponsor Performance Assessment and Compensation

Recommendation #1: Include spillover and other benefits of demonstrated market effects among achieved savings and net benefits counted for the Performance Earnings Basis. Under the Performance Earnings Basis (PEB) now in force in California, assessment of

program sponsor performance and determination of compensation are linked to a single quantity, namely: verified participant energy savings less a factor reflecting free ridership, evaluated over the entire program portfolio. This definition of benefits to be counted towards savings goals is inconsistent with the definition of program goals and guidelines used for the 2009 – 2011 programs. If program sponsors are to be encouraged to expend program resources on efforts that are likely to generate market effects, then the performance of those measures should be assessed and their success compensated.

Based on our review of experience with planning, delivery, and evaluation of market transformation programs, we recommend that the CPUC and utilities undertake the following processes ***as early as possible in the development of plans for the 2009 -2011 programs*** to enhance the likelihood of success of market transformation efforts and to promote fair and useful evaluations of their outcomes:

a. Identify programs in the utility portfolio that are likely to generate market effects during the three-year program cycle, and focus market-oriented planning and evaluation efforts on those programs.
b. Commission initial market characterization research for those products and services for which the structure of the market and the motivations of the market actors are not well understood or documented, at least in terms of their response to the product in question.
c. For programs deemed likely to generate market effects, develop program logic models that explicitly identify the mechanisms by which the programs will achieve market effects.
d. For programs deemed likely to generate market effects, develop preliminary evaluation plans that specify the preferred approach(es) to estimating net savings.

Market Transformation Program Planning

Recommendation #2: Establish a process to identify products or services for which program support should be withdrawn or reduced over the program cycle and to formulate plans for an orderly withdrawal from the market. In assessing whether to reduce program support, we recommend that the following be taken into account:

- Market share of the product within and outside of program areas.
- Recent trends in prices and availability.
- Likelihood of inclusion in a near-term codes or standards rulemaking.

- Market readiness of more efficient substitute technologies.

This assessment should be made by program sponsors working closely with the Peer Review Group and representatives of the CPUC evaluation consultant team.

Recommendation #3: Provide market research support to validate proposed growth strategies for products and services supported by the Emerging Technologies Program. The case for public investment to support new technologies will be greatly enhanced by research to validate proposed growth strategies. Specific kinds of issues to be researched in this regard would include: feasibility of technology licensing and other methods to gain rapid increases in volume; motivations and capabilities of downstream market actors such as retailers and contractors to promote and install the technology; and presence, price, and performance characteristics of competing or similar products on the market.

Market Effects Evaluation

Recommendation #4: Conduct one or more pilot studies involving cross-sectional analysis of the market share for energy-efficient practices in California compared to other jurisdictions. Several High Impact Measures – refrigerant charge and airflow checks (RCA), steam trap replacement, and hot water pipe/tank insulation – involve customer adoption of installation and maintenance practices as opposed to purchase of efficient equipment. Cross-sectional studies of the prevalence of these measures would strengthen estimates of the net benefits of programs to support these measures. They would also provide strategic insights into the need for and design of such programs.

Recommendation #5: Conduct research to define and assess the validity of indicators of sustained market effects other than changes in codes and standards. Analysts have proposed a number of indicators of sustained market changes other than changes in codes and standards. However, we know of no systematic efforts to operationalize and measure these indicators or to apply them in program planning decisions. We recommend conducting a research study based on existing sources to reconstruct trends in market share, incremental prices, customer awareness, and vendor practices for energy-efficient products and services that have achieved high levels of acceptance. Such a study would provide program sponsors and regulators with some historical reference against which progress with current programs can be compared.