

## **Planning and Evaluating Market Transformation: What the Industry has Learned, and Possible Implications for California**

Ralph Prah and Ken Keating

### **Introduction**

The energy efficiency industry has now had some 15 years of experience with the planning, implementation, and evaluation of market transformation (MT) initiatives. In the mid- to late-1990s California was in the vanguard of this effort, including a period of several years in which it adopted market transformation as its primary stated policy objective, and sponsored a number of influential theoretical works and market effects evaluations. In recent years California has once again begun to incorporate market transformation into its portfolio of policy objectives and tools. However, for the bulk of the last decade, California's policy framework was perhaps the most sharply focused on pure resource acquisition of any leading energy efficiency states in the US.

As a result of this history, the majority of industry experience with the planning and evaluation of market transformation initiatives has occurred outside of California. It therefore seems like a good time to ask the question: **what are the potential implications of the industry's broader experience with these activities for California, and particularly for the Market Transformation Indicator (MTI) process that is currently in progress?**

This brief white paper seeks to answer the above question. The first half of the paper focuses on an overview of how MT has been operationalized across the country and how differences in perspective can lead to more or less actionable program designs. In fact, a common perspective that is both useful for California and allowed within the policy frame work is a Strategic Market Transformation approach. Some of the attributes of this approach are that MT is viewed as one of a number of methods available to help meet the energy policy goals of the state, and not every program is expected to have market-transforming effects. It argues for clearly defined and characterized markets and a clear market and program theory.

The second half of the paper turns to the issue of evaluation of market transformation initiatives and of market effects, arguing that the lessons learned by the industry to date have important implications for California's MTI process. Chief among these are the need for a clear program theory to guide both target setting and evaluation; and the existence of some tension (resolvable, we hope) between the bottom-up evaluation of specific market transformation initiatives and top-down tracking of progress towards the state's market-related strategic policy objectives.

### **Planning and Policy Issues Pertaining to Market Transformation**

Market transformation is a strategic objective for California (Strategic Plan, Section 1.3). Everyone agrees that market transformation (MT) is good, but not everyone agrees about what it is. Confusion

about how MT is defined clearly hinders the planning, implementation, and evaluation of the actual efforts. This brief paper will describe the various ways in which MT is perceived, including some classic definitions and regulatory alternatives. We will provide arguments for the usefulness of what we call “strategic market transformation,” which allows for a consistent approach to planning and evaluating MT initiatives. The link is tight, because the fundamental role of evaluation is to test the planning assumptions in the field. For MT, the planning assumptions are captured in the program theory. Approaching MT as a strategic tool to achieve energy efficiency will naturally spill over into the selection and measurement of appropriate MT indicators in the California regulatory process.

## **A Multitude of Perspectives on MT**

The classic definition of market transformation in Eto, Prael, and Schlegel (1996) was:

“... a reduction in market barriers resulting from a market intervention as evidenced by a set of market effects, that lasts after the intervention has been withdraw reduced, or changed.”

According to the California Evaluation Protocols market effects are:

“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 interventions...” where a “market” is defined as “the commercial activity (manufacturing, distributing, buying and selling) associated with products and services that affect energy usage.”<sup>1</sup>

In both definitions market transformation represents active efforts to create a beneficial change. MT at its simplest is a set of sustained market effects.

Economists tell us that markets are always in the process of change, and, over a period of time, they become transformed. Sometimes products have such a superior performance that they will become dominant in the market. This is one vision of what market transformation is – a naturally occurring and ongoing process. Watching and waiting, however, is not a good approach for getting energy efficiency into the market.

Corporations and vendors are actively engaged in pushing for transformation that benefits them. They use common tools such as advertising, lobbying for laws that favor their preferred outcome, forming alliances/mergers, supporting R&D to gain an edge, and constantly keeping a finger on the pulse of the markets in which they are involved. Energy efficiency advocates of market transformation become similarly involved in pushing their agenda, using many of the same tools. This implies a targeted, multi-faceted, and strategic approach to energy market transformation.

The State of California in the 1990s had a perspective on MT that basically saw it as a way to privatize energy efficiency and reduce the needs for Public Goods Charge (PGC) funding (D-97-02-014 and 99-08-021, attachment 2; and the CEC 1996 *Annual Electricity Report*). This was a perspective that identified

---

<sup>1</sup> California Evaluation Protocols, pp. 143-145.

MT as a policy goal, even if the actual empirical experience with energy efficiency did not support the specific goal that all markets could be privatized.

California's 2011 version of the Strategic Plan (SP) does reference the earlier definitions, and clearly sees MT as a policy goal, but the goal is no longer to privatize energy efficiency, but to make it the standard practice or a requirement of codes and standards. In addition, the SP adds several nuances.

- It identifies MT as not only a goal, but also as a strategy.
- It recognizes that ratepayer funded programs alone are not sufficient to attain a transformed market, but that other stakeholders have important roles.
- Perhaps, most importantly, the SP notes the continued importance of short term savings and the programs that deliver them as part of a balanced portfolio. "Utility portfolios must contain an appropriate mix of short and longer term energy savings." (SP, page 1-4).
- Further, the SP does not cast MT as an end-point, but as an evolving process that leads to some ending of support for some measures or practices, but acknowledges that other improvements and new targets will arise that will keep the programs actively engaged in the market. (Pp. 1-4 - 1.5).

However, MT is basically seen as a policy goal, and one to which every program in every sector can, and should, contribute. Within each sector and cross-cutting area of the SP, suggestions are made for seeking MT as a result of the efforts of many parties. Still this casts a wide net and can lead to very varied interpretations of what will represent a transformed market.

In D.09-09-047 (p.89), The CPUC made several updates to the previous definitions: "We modify the existing Commission definition of market transformation to state (changes noted in italics):

Market transformation is 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 *continuation of the same* publicly-funded intervention is no longer appropriate in that specific market. *Market transformation includes promoting one set of efficient technologies, processes or building design approaches until they are adopted into codes and standards (or otherwise substantially adopted by the market), while also moving forward to bring the next generation of even more efficient technologies, processes or design solutions to the market."*

How these aspects of CPUC policy on MT are operationalized is crucial to the task of developing and tracking a list of metrics of progress toward MT as required in the SP and D. 09-09-047<sup>2</sup>.

In the Pacific Northwest and in New England with the formation of the Northwest Energy Efficiency Alliance (NEEA) and the Northeast Energy Efficiency Partnership (NEEP), MT has an important, but more specific, role than in California. While complete market transformation can be seen as an aspirational

---

<sup>2</sup> Subsequently Resolution E-4385 and D.10-10-033 also addressed the specific needs and procedures for operationalizing this objective.

goal, the two organizations were initially set up with a more targeted or strategic purpose. MT was one tool in the energy efficiency tool box, along with acquisition programs, and the R&D and infrastructure development programs that could support both MT and/or acquisition. The key to seeing MT as a strategic tool is understanding that it fits some circumstances better than others, and that not every market can be effectively targeted. Although rebate and custom measure programs can have market effects, and they can be one facet of a MT initiative, they can also have important roles in acquiring energy efficiency as value in and of itself. For geographically targeted savings, for markets that will always require support, for measures with insufficient non-energy benefits, acquisition programs that buy the kWh one at a time are often the best strategic choice.

In the late 1990's the New York State Energy Research and Development Authority (NYSERDA) also defined MT in terms of a policy objective that was characterized by such transformation as to allow a reduction in subsidies to the market:

*“The Market Transformation program area is designed to increase adoption and penetration of energy efficient technologies and practices and to induce lasting structural and behavioral changes in energy use. ...to build a market capability for stocking and promoting energy-efficient products to the point where future publicly-funded incentives and assistance may no longer be required.”* (Interim Progress Report, GDS, 2003).

Later the emphasis on ending subsidies has been downplayed, but the underlying construct is that all programs should be designed to facilitate eventual market transformation defined as:

*“Market states in which desired activities and behaviors have become standard practices due to the reduction in market barriers resulting from market interventions.”* (Appendix A, glossary).

Wisconsin is another active state with a long history of seeking MT. In reviewing documents of both the Wisconsin Department of Administration and Wisconsin Focus on Energy (which was initiated by the Department of Administration), we see both an implicit policy goal of achieving MT and a clear sense of directed MT efforts that are distinguishable from acquisition programs. The 2002 Policy Guidance from the Wisconsin Department of Administration defined both market transformation and acquisition programs (Policy Guidance 11). As synopsised in the statewide evaluation plan:

*“The Wisconsin Focus on Energy was intended from the start to promote market transformation, not just to provide resource acquisition. Market transformation means lasting structural change in the market. Because of these lasting changes, adoption of energy efficiency measures and maintenance of efficient practices will be greater, even without continuing program efforts, than if the program activities had not occurred. Resource acquisition, by contrast, means adoption of specific efficiency measures that are directly traceable to program efforts.”<sup>3</sup>*

The “Major Markets” program, was in fact designated an acquisition program (Ibid, p.1-6), but with

---

<sup>3</sup> PA Consulting: Focus on Energy Statewide Evaluation Final Detailed Evaluation Plan: Major Markets .Revised March 27, 2002

some elements that could play a primary role in MT. The ability to distinguish acquisition from MT was important in Wisconsin, and in one report from 2003, the evaluators recommended, for example, that the ACES (Apartment and Condo Efficiency Services) program be transitioned from a MT emphasis to an acquisition program<sup>4</sup>.

As recently as 2009, Wisconsin continued to target both short-term savings and longer term market transformation. “Short-term quantitative energy savings goals should be established as well as qualitative targets for long-term market effects over the planning horizon. Program planners should prioritize designs that simultaneously achieve short-term energy savings while targeting longer-term changes.” (5-UI-115, 10/22/09: p.6). For purposes of the discussion below, it is important that when defining MT, the Wisconsin Department of Energy’s Policy Guidance 11, also defined what they meant by an “intervention” in the market: “a deliberate effort by government or utilities to reduce market barriers and thereby change the level of investment in (or practice of) energy efficiency.” “Deliberate” implies a proactive and planned role.

### **Strategic Market Transformation**

From the examples above, including California, there is a very real policy option to use the tools of market transformation to make a deliberate and rigorous effort to intervene in selected markets that is more focused than simply viewing all markets as transformable. The strategic use of MT as method to contribute to meeting the strategic policies goals of California needs to be distinguished from the goals themselves. Strategic MT is a rigorous and focused effort targeting clearly defined markets. Policy goals that apply to all markets with overlapping market actors tend to be aspirational. Designing a strategic initiative that tactically incorporates other programs to enhance the changes in the target market is, by its nature, more structured and efficient than asking existing programs to develop a strategy within their programs that results in MT. This builds on the paradigm that some, but not all, short-term PPMs and long-term PPMs can be measures of MT, but all can contribute to the overall Strategic Plan policy goals.

However, without limiting and delineating specific target markets, the task of coming up with sufficient and necessary metrics of MT progress may result in an enormous number of unlinked tactics and metrics. Resources for tracking and evaluation will get diluted and overburdened at the same time. In addition, some markets are simply so diverse and specialized that the idea that each can receive an MT focus is not practical. The commercial sector includes an enormous number of markets and submarkets. Industrial processes can be standardized within some product/market mixes, but it can never be exhaustive, and site-specific technical and incentive assistance will never be obsolete.

Strategic MT requires that:

- The market be defined clearly enough to be targeted;
- That the market be characterized so that program administrators can understand the opportunities and barriers as well as the relationships in the market;
- That a baseline for the targeted measure or practice be identified, and be trackable over time;
- That the market/product nexus will produce large enough savings if successful to justify the

<sup>4</sup> Focus on Energy, Focus contract year 3 presentation. February 6, 2003.

resources;

- That there is a coherent market and program theory usually captured in a logic model, that connects the expected actions with the desired outcomes; and,
- whether there is a better approach to capturing the potential energy savings such as an acquisition program.

Once this type of analysis is done, there are still risks that the long term MT will not be achieved. In some markets, there will not be a way for a private sector partner to make money without a utility subsidy (such as audits, unitary HVAC tune-ups (according to NEEA) or truly deep retrofits), or the dis-benefits of the measure may overwhelm the energy savings motivation (some industrial measures like sewage treatment, removing motor sheaves, or increasing air flow).

The proper metrics should flow from the market and program theory models. Evaluation can be carried out to test progress toward the MT and the other assumptions in the planning. All metrics – MTI, LTPPM, STPPM –can be tracked to make sure they are contributing to the SP goals.

## Evaluating Market Transformation and Market Effects

As noted earlier, in the mid- to late-1990s, California sponsored several influential theoretical works bearing on the evaluation of market transformation, along with a number of actual market effects evaluations. In recent years the state has once again begun to conduct market effects evaluations, with trial studies of the residential lighting, residential new construction, and high-bay lighting markets. However, for the bulk of the last decade, California's evaluation efforts were sharply focused on supporting its ambitious resource acquisition objectives. Meanwhile, market effects research was proceeding more or less continuously (albeit at a relatively limited level of effort) in the Northeast, Northwest, and Wisconsin. As a result, a majority of the industry experience with the evaluation of market effects has occurred outside of California. This section explores the implications of this experience for California's nascent effort to develop and track MTIs. We begin by discussing a number of lessons learned, and then turn to the issue of specific implications for the MTI process.

Extensive conference literature exists regarding the evaluation of market effects. Reviewing this literature is beyond the scope of this paper, but readers interested in a thorough literature review are referred to Rosenberg and Hoefgen (2009).<sup>5</sup>

### Lessons Learned

We believe the cumulative industry experience with the evaluation of market effects suggests the following lessons learned.

1. *Effective planning and evaluation of market transformation initiatives requires regular, ongoing research into the status of the market – from the initial planning/baseline phase, through every stage of implementation, and even after programming has ended.* At the inception of a market transformation initiative, careful market assessment is needed to help understand the leverage

---

<sup>5</sup> Mitchell Rosenberg and Lynn Hoefgen, 2009. *Market Effects and Market Transformation: Their Role in Energy Efficiency Program Design and Evaluation*. California Institute for Energy Efficiency.

points of the market being targeted.<sup>6</sup> During the program's life, regular market evaluation serves to assess the progress of the program in generating the hoped-for changes in the structure and functioning of the market, and to redirect the program if necessary. After the program has ended, continued monitoring of the market helps to assess the sustainability of market effects.

2. *Attribution of observed market changes to programs generally involves establishing a preponderance of evidence as to whether the "story" found in the initial program theory is borne out by experience.* Markets are complex social constructs that are in a state of constant evolution regardless of whether they are being targeted with market transformation initiatives. Analytic tools do exist for helping to sort out which observed changes are naturally occurring and which are program-induced (a prominent example is quasi-experimental design). However, fifteen years of experience with the evaluation of market effects has established convincingly that there is nothing more critical to distinguishing market effects from secular market changes than having a clear, detailed, long-term program theory up front that specifies which market indicators are expected to change, and when. Evaluation of the program can then focus on comparing how the actual evolution of the market compares to what had been forecasted by the program theory.<sup>7</sup> The program theory is thus a critical evaluation tool.<sup>8</sup>
3. *Effective evaluation typically requires a combination of leading/interim and lagging/long term market indicators.* Market transformation is typically a relatively slow process, lasting 5 to 10 or more years. If it is true that a detailed, long-term program theory is needed in order to guide market evaluation efforts over time, then it follows that the ideal program theory will typically include some indicators that are expected to change almost immediately, and some that are not expected to change for many years. This combination of leading and lagging indicators helps both to provide near-term feedback as to whether the program and the market are on course, and a long-term guidepost.
4. *Evaluation of the effectiveness of market transformation initiatives can typically be done only qualitatively -- but this is generally enough to meet information needs.* Establishing the causal role of programs in observed outcomes is challenging enough in the case of resource acquisition programs. In the case of the evaluation of market transformation initiatives, the complexity of the market processes being targeted, the long-term nature of the intervention and the associated evaluation effort, the wide range of players intervening or otherwise bearing on the market, and the need to rely upon the overall preponderance of evidence all mean that it is rare to be able to provide quantitatively precise estimates of program effects.<sup>9</sup> We would argue, though, that

---

<sup>6</sup> While market assessments have been performed in California in support of resource acquisition programs, those programs may target different leverage points than market transformation programs.

<sup>7</sup> Program theories (or, alternatively, logic models) are also useful for guiding the evaluations of other types of energy efficiency programs. However, what is unique about program theories for market transformation initiatives is that they tend to be unusually complex and long-term in nature, reflecting the complexity of target markets and the long-term nature of the intervention. Some observers also advocate for having a separate market theory describing how the target market is believed to function.

<sup>8</sup> At the same time, it is important to acknowledge that too much focus on program theory can lead to wearing blinders. Sometimes there are unforeseen market actors and unanticipated linkages at work, and when these are discovered through the field research, they need to be included in the program theory.

<sup>9</sup> To be clear, we are not asserting here that it is impossible to produce good quantitative estimates of market indicators; rather, we are arguing that we can typically discern only qualitatively the role of the program in causing these indicators to change in the manner which has been observed.

qualitative answers are often good enough. Planning for supply-side resources also faces irresolvable uncertainties, and even the effects of energy efficiency resource acquisition programs can be difficult to quantify precisely.

5. *While market effects evaluations can be and often are performed on programs not specifically designed as market transformation initiatives (or on programs containing both resource acquisition and market transformation elements), such efforts face particular challenges.* Some of the most dramatic market effects observed in the energy efficiency industry to date have been the result of programs that were primarily intended as resource acquisition rather than market transformation initiatives. Examples include residential furnaces in Wisconsin in 1980s and electronic ballasts nation-wide in the 1990s. Given this fact, it would seem to follow that market effects evaluation should not completely ignore markets not being specifically targeted by market transformation initiatives. However, the lessons learned discussed above suggest several challenges that such evaluations must face. One is that, because the programs involved have not typically been intended as market transformation initiatives, the kind of detailed, long-term program theory that we argue above is a critical evaluation tool is often lacking. A second challenge is that market effects studies of markets not being specifically targeted by market transformation initiatives are often performed as one-shot efforts, after the relevant programs have existed for many years. Under these circumstances, it is often not possible to build up the cumulative body of evidence that is needed to reach reliable conclusions. Lastly, market effects studies focused on resource acquisition programs must compete for evaluation resources with more traditional impact evaluation activities. Such studies are thus often poorly funded.

### **Potential Implications of These Lessons for California's MTI Process**

We believe the lessons discussed above have the following potential implications for California's current effort to define and track market transformation indicators now and maintain a framework for the future.

1. *There is some tension between the standard industry approach that has evolved for the evaluation of market effects (focused on specific markets and market transformation initiatives, driven by program theory, and planned and implemented in a bottom-up fashion) and California's desire to let the California Energy Efficiency Strategic Plan (CEESP) drive the metrics in a top-down fashion.* At the same time, having a strategic plan that guides both programming and evaluation is a legitimate objective. The metrics framework developed by the CPUC Energy Division (ED) represents an attempt to resolve this tension. It features highly program-specific indicators at the bottom of the hierarchy (some focused on market-related issues and others focused on other kinds of program outputs and outcomes); market transformation indicators in the middle of the hierarchy, influenced by identifiable programs but also serving to help measure California's progress toward its overall market-related goals; and very general strategic policy indicators at the top of the hierarchy, measuring progress toward overall strategic policy goals. Within this framework there are likely to occur both bottom-up evaluations intended to evaluate the market effects of specific initiatives or sets of initiatives, and top-down tracking of California's progress toward its market transformation-related policy goals.
2. *The metrics themselves will not be sufficient to guide the evaluation of specific market transformation initiatives.* As discussed earlier in this paper, there is typically nothing that is more important in guiding the evaluation of an individual market transformation initiative than the existence of a detailed program theory that delineates exactly which market indicators are expected

to change when, and in what order. In distinguishing between short-term program performance metrics (STPPMs), long-term program performance metrics (LTPPMs), and Market Transformation Indicators (MTIs), California's proposed new metrics system does attempt to differentiate to some extent between shorter-term, more limited program outcomes and longer-term, broader market changes. However, the new metrics system is intended to serve at least as much as an overall guidepost for progress toward the state's market-related energy efficiency goals as it is a resource for the bottom-up evaluation of specific market transformation initiatives. Further, because California's policy goals do not focus exclusively on market transformation and market effects, the metrics framework must include many indicators focused on other types of outcomes. It follows that, in evaluating specific market transformation initiatives, the metrics framework cannot replace a detailed program theory.<sup>10</sup> A related implication is that the metrics framework may be most effective in the context of an accepted market sector-level theory that explains how all of the relevant programs will work together to achieve the desired outcomes.

3. *It can be confusing to assume that every program will lead to market transformation, especially if the program theory and the exact market were not established before the program was designed.* As discussed in the "lessons learned" section of this paper, while programs intended primarily as vehicles for resource acquisition can and do produce market effects, attempts to identify these effects often face special challenges, including the lack of a guiding program theory, competition for evaluation resources, and the need to do the research as a one-shot study rather than as an ongoing effort over the course of many years. Trying to document market effects from programs not intended primarily as market transformation initiatives must therefore be approached with a certain amount of caution. The special relevance of this fact for California's proposed new metrics framework is that, because it is intended partly as a top-down effort to map progress toward the state's policy goals, the framework does imply an intent to look for desired market changes even in markets that are not being targeted explicitly by market transformation initiatives (albeit with the recognition that finding these changes will not in and of itself demonstrate that they are program-induced). In order to avoid confusion in both the evaluation and the policy spheres, it will be important to keep clear track at a conceptual level of when we are attempting to evaluate specific market transformation initiatives and when we are attempting to assess overall progress towards the state's market-related energy efficiency goals.
4. *Whatever market-related metrics are established, this will need to be an iterative process, with periodic updating.* California's programs, markets, and policy objectives are all subject to evolution over time. The programs themselves are likely to be particularly changeable, as they must constantly adapt to the changes in markets and policy objectives. Under the circumstances, it would be unrealistic to view any one set of metrics (even long-term ones) as being carved in stone. Clearly a systematic process will be needed to drive periodic updating of individual metrics and the overall metrics framework. At the same time, markets typically change relatively slowly, suggesting that the metrics framework will be most effective if the individual indicators, too, do not change too quickly.

---

<sup>10</sup> It is to be hoped, however, that there will be an identifiable congruence between program theories for individual market transformation initiatives and relevant portions of the metrics framework.