

A Systematic Application of Theory-Based Implementation and Evaluation of Market Transformation Programs

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ABSTRACT

Consultant program designers worked together with utility program implementers and evaluators, to clarify the intent of each of seven market transformation programs. The team developed and refined market effects tables showing the program stimuli applied to each market participant, market barriers the stimuli were to overcome, and specific market effects targeted/expected to occur (including the approximate time frame for each). Also included was a narrative description of the market transformation process. We intended to use these elements of the “program theory” to support later analyses of sustainability and attribution of market changes. However, the program theory yielded unanticipated benefits: (1) illustrating deficiencies in logic/understanding of specific market segments; (2) illuminating linkages between stimuli and effects, and among market effects; (3) providing implementers with a strong incentive to focus on transformation rather than number of rebates; (4) making the market transformation approach more tangible to the utility’s Board of Trustees; (5) making obvious the market indicators that needed to be tracked; and (6) serving to ensure that all key market effects were being targeted by specific implementation activities. This paper discusses the development and evolution of the market effects tables and related market indicator tables, as well as their usefulness during the first year of program implementation.

Introduction

The Long Island Power Authority (LIPA) took ownership of the electrical transmission and distribution system (and other assets) of the former Long Island Lighting Company (LILCO) in May 1998. Prior to the LIPA-LILCO transaction, Long Island customers paid the highest electric rates in the country. LIPA succeeded in lowering rates by an average of 20% throughout its service area, creating a more favorable economic climate on the island.

Coincident with the LIPA-LILCO transaction, LIPA contracted with KeySpan to manage and operate the former LILCO T&D system under a long-term contract, including management and operation of DSM/energy efficiency-related activities. Many of the former LILCO DSM staff became employees of KeySpan. LIPA thus obtained access to an experienced staff of DSM program implementers and evaluators.

LIPA immediately indicated an intent to develop a comprehensive Clean Energy Initiative and, through its engineering consultant/advisor,¹ retained the services of a

¹ Resource Management International, later to become Navigant Consulting, Inc.

consultant team.² The consultant team designed a set of seven “market transformation” programs that the LIPA Board of Trustees approved for implementation.

The original program designs developed by the consultants were relatively vague with regard to the specific impacts the programs were expected to have on the targeted markets and on the various participants in those markets (end users, retailers, distributors, etc.). A number of the program implementers and evaluators felt that the market transformation aspects of the programs were either merely new jargon for what they had been doing for years, or a vague (and impractical) theoretical construct of efficiency idealists who would not be the ones held accountable for achieving the market transformation goals.

The Need for Structure

Separately, there was a need to add rigor and structure to the program evaluation team’s future efforts to “prove” that market transformation had or had not been achieved by the programs. One approach would be to develop a logical program theory as to exactly how the market would be transformed, including how and when specific market effects would occur. The consultant team was asked to develop a more specific “program theory” for each program. In addition to serving later evaluation needs, program implementation and evaluation staff might gain a better understanding of program intent and how these “market transformation” programs differed from traditional DSM programs.

This was the beginning of a directed effort to develop very specific and articulated program theories, with everyone – including evaluators, designers and implementers – participating in the development and refinement of these theories. This approach arose from a belief that, to effectively implement and evaluate market transformation programs, activity must be based on a specific theory about how each program will change the markets it targets. The approach is often referred to as “theory-based evaluation.” Similar approaches have been implemented recently under the names of “program logic approach” or “telling a story” about how the market transformation is supposed to occur (Feldman et al., 1997; Ives-Petersen, 1999; Rufo, Prahl and Landry, 1999). In essence, it is a forecast of expected outcomes from the market transformation initiative, which can then be compared to what actually happens in later years.

The new programs included a residential lighting and appliances program patterned after similar programs being implemented through the Northeast Energy Efficiency Partnerships (NEEP). LIPA already had a CFL rebate program, a LILCO carryover, and so this program was continued and built upon in what would become a virtually transparent transition from the existing traditional rebate program to the more comprehensive market transformation effort.

While the NEEP utilities had conducted their own residential lighting baseline study, research had not been performed in the LIPA service territory, and KeySpan program staff strongly believed that customers on Long Island were substantially different from their New England counterparts. As a result, there was an immediate need to perform a baseline study. Evaluation staff were very concerned about program implementation contaminating the baseline results. Therefore, they decided to mimic the baseline research performed for

² Optimal Energy, Inc., Vermont Energy Investment Corporation, Northeast by Northwest, Sustainable Energy Partnerships, Kelso Starrs & Associates, LLC, and Will Miller.

NEEP, using the same baseline research contractor and essentially the same scope of work. The NEEP contractor had been selected through a competitive process – by utilities with a long and successful history of effective DSM program implementation and evaluation.

Survey questionnaires for several market participant groups were refined and research began. However, as the evaluation team reviewed the plan for the research and the questionnaires being used, one thing became more and more apparent. The questionnaires were designed to collect important information about how the residential lighting market operates, but they would only *accidentally* collect data on key market indicators that would be used to track the program's market transformation impacts. The key market indicators had not yet been specified. The evaluation staff made an attempt to quickly identify key market indicators but felt they were guessing. The baseline surveys were, therefore, stopped, until the market indicators could be finalized.

While this situation became crystallized with regard to the lighting program, it applied to all of the market transformation programs for which implementation plans were being developed. The experience with the lighting program acted as a catalyst for the decision to move to a systematic theory-based approach. It immediately showed that baseline research would otherwise proceed as if there were no program theory. It also pointed out the need for much greater and much more specific communication from the program designers about exactly what the programs were supposed to accomplish and how. This need was intensified by the fact that the program designers (consultant team) and program implementers (KeySpan staff) did not work for the same company.

Under these circumstances, implementers would be left to speculate on how and when to alter their typical implementation practices for DSM programs, being guided, in the end, by their previous experience and by whatever goals and objectives that could be made concrete – most likely, energy and demand savings – as they had in years past. Evaluators would have little basis for evaluating the market transformation effects of the programs, both because there would not have been sufficient consensus among the program design team, implementers and evaluators about the specific mechanisms by which the programs were expected to generate beneficial market effects and because the only effects everyone would agree on would be those not expected to occur until well into the program. The evaluators would have to develop program theories themselves, in order to design evaluations. However, when the evaluations were complete, they would most likely find that there was insufficient buy-in to the theories from the other parties involved for the evaluation results to be meaningful.

This problem would be compounded by the need to have the LIPA Board of Trustees both understand and accept the results as indicative of whether programs should be continued, changed or abandoned. Board members, of course, would face a steep learning curve even to understand what was being attempted. Instead, by developing the program theories up front, with full participation from the diverse group of individuals important to the programs' success, everyone focused on a set of clear market transformation objectives. Progress toward these objectives would be reported regularly to the Board, further educating Board members slowly over time.

The Impact of Market Effects Tables

Therefore, in an attempt to clarify the program theory, the consultant team was asked to develop market effects tables. The team first created draft market effects tables for each program, identifying the main market participants affected by the program and the changes the program was expected to induce for each participant, and the program stimuli that would lead to the changes. These tables were similar to what has been referred to as “market influence diagrams” in the past (Eto, Prahl and Schlegel, 1996), except that they used a somewhat simplified format that did not go into as much detail on the causal linkages between market effects. Having to forecast and present specific market effects challenged the consultant team to define and defend specific projected market effects, and to jettison those that were too vague, not believable, or virtually impossible to measure.

This exercise forced the staff to come to grips with the specific intent of the program designs, as reflected by the many projected market effects, focusing them on the market transformation aspects of the programs. It made clear the market participants (end users, retailers, etc.) who were to be targeted, the stimuli to be applied to each, the market barriers the stimuli were to overcome, and the specific objectives to be accomplished by applying the stimuli in each year of each program. For example, prior to analyzing the residential lighting market effects table, the program and evaluation staff had not realized that the program was to address property management professionals or public housing authorities, in addition to end users, lighting retailers and manufacturers.

The implementation team thought that it would be held accountable for achieving specific market effects,³ and this forced them to critically assess these projected effects – differentiating idealistic and un-measurable market effects from realistic, feasible ones – and request clarifications and justifications for specific market effects. For several of the programs, the program evaluators felt that LIPA could not and should not be held accountable for ensuring that certain market effects were achieved. This process of scrutiny helped the staff to separate out those market effects that could only reasonably be achieved through regional efforts from those that might be achieved by the utility.

The ensuing dynamic of questions and revisions, followed by more questions and revisions, greatly improved the precision of the program theory and forged a common understanding of the program intent. The consultant team was more confident that the program implementation and evaluation staff understood the true intent of the programs, and program staff were more confident that the programs’ market impact goals were realistic. All agreed that the market effects tables would be *living* documents, to be updated and refined as more program experience was gained. In short, creating and refining the market effects tables educated everyone involved about the specific intent of the programs and forged a consensus on what could and could not reasonably be accomplished and measured.

³ Actually, the implementation team would not necessarily be held accountable for achieving market effects (i.e., for transforming attitudes or purchase behavior in a permanent way). These were educated guesses about the future that would guide implementation and structure evaluation. The program’s success would be judged by measuring market indicators, the proxies for the market effects. The accountability of implementation staff would be assured by measuring performance indicators – proxies for maintaining a certain level of activity at a certain level of quality (e.g., number of vendors visited, number of retailers signing up for Energy Star).

The market effects tables included columns for each market actor (e.g., end users, retailers, manufacturers/distributors, others) and six rows, including rows for program stimuli, market barriers overcome, and market effects expected in less than one year, one to three years, three to five years, and five to ten years. A partial example, showing market effects for all market actors but for only two time periods, appears as Table 1.

The market indicators tables included columns for the expected market effects, the indicators that would be used to measure whether the market effects were occurring, and the data sources that would be used to collect information on the market indicators. An example of a market indicators table for all four time periods, but for only one market actor, appears as Table 2.

The forecast of market effects included generally stated quantitative effects, such as “an increase” in the percentage of retailers carrying the product. When the team of evaluators, designers and implementers tried to specify exactly what type of “increase” was expected, it became clear that baseline research was first needed. For example, a baseline value of 5% might suggest that an “increase” of 10 percentage points in the number of retailers carrying the targeted product might be quite ambitious. However, if the baseline value were 30%, such an increase might seem much more likely. The baseline research would establish the starting point for the program – baseline values for equipment efficiency, standard practice, and key market indicators that would be tracked throughout the program. The level of expected increase in the targeted market change could then be estimated (the specific market effect), and, finally, indicators of changes in that market effect (market indicators) would be measured to evaluate the program’s impact on the market. Separately, indicators also would be set up for gauging the performance of the implementation effort (performance indicators). The performance indicators (e.g., number of retailers contacted, number of workshops held) would also be measured on an ongoing basis, but as a check on good-faith implementation, not necessarily as part of the effort to determine whether the market was changing.

Program implementers and evaluators were charged with developing prospective market indicators that could be used for measuring the extent to which the programs actually caused the forecast market effects. Rather than guessing which market indicators would be appropriate to track, the team now had a specific set of market effects to which specific market indicators could be linked.

Table 1. Residential Solar Pioneer Program – Partial Market Effects Table

Market Actors Influenced	Consumers	System Integrators/Contractors/Installers	Manufacturers	Other
Program Stimulus	<ul style="list-style-type: none"> ▪ Program kick-off lottery and installation of 30 systems ▪ LIPA offers \$3 per Watt for residential PV installations (maximum rebate \$15,000) ▪ Additional interest rate buy-down incentive for early systems (currently 6%) ▪ Technical assistance and vendor linkage service ▪ LIPA comprehensive marketing effort including target marketing to: traditional niche markets (independent power, Y 2K, established green consumers) new construction, and latent green consumers ▪ Turnkey-service plan (after year 1) ▪ Develop and offer PV friendly interconnection agreements 	<ul style="list-style-type: none"> ▪ Program kick-off lottery and installation of 30 systems ▪ LIPA offers \$3 per Watt for residential PV installations ▪ Develop and offer PV friendly interconnection agreements ▪ LIPA comprehensive marketing effort ▪ Technical assistance and vendor referrals ▪ Training and infrastructure development 	<ul style="list-style-type: none"> ▪ Develop and offer PV friendly interconnection requirements, reducing costs to manufacturers associated with testing and/or custom manufacturing to meet specifications ▪ LIPV comprehensive 5-year program commitment to the development of Long Island PV market 	<ul style="list-style-type: none"> ▪ Provide technical training for utility engineers, linemen, emergency restoration personnel, municipal electrical inspectors, electricians, architects, and roofers ▪ Educate lenders, real estate agents, and building developers about the program ▪ LIPA comprehensive marketing effort ▪ Develop and offer PV friendly interconnection agreements ▪ Financing buy-down and direct incentives ▪ Outreach and infrastructure development

Table 1. Residential Solar Pioneer Program – Partial Market Effects Table (Cont.)

Market Actors Influenced	Consumers	System Integrators/Contractors/ Installers	Manufacturers	Other
Market Effects < 1 year	<ul style="list-style-type: none"> ▪ Significant public awareness of LIPV initiative ▪ Consumer’s ability to describe (and therefore potentially shop for) PV systems is significantly improved 	<ul style="list-style-type: none"> ▪ Local contractors are aware of LIPA’s Solar Pioneer Program initiative ▪ The number of local contractors qualified to install PV systems begins to increase ▪ Integrators and installers establish an independent PV trade organization in response to potential growth in market demand and to interface with LIPA’s Solar Pioneer Program 	<ul style="list-style-type: none"> ▪ A majority of the top inverter and panel manufacturers are aware of LIPA’s comprehensive 5 year commitment to PV market development in LIPA territory 	<ul style="list-style-type: none"> ▪ Increased awareness of PV technologies in key sectors (finance, new construction, local inspection, real estate) ▪ System monitoring helps utility engineers address or reduce concerns over PV grid connection ▪ State government and interested parties continue development of standardized and streamlined statewide interconnection agreements

Table 1. Residential Solar Pioneer Program – Partial Market Effects Table (Cont.)

Market Actors Influenced	Consumers	System Integrators/Contractors/ Installers	Manufacturers	Other
Market Effects 1-3 years	<ul style="list-style-type: none"> ▪ Increasing consumer knowledge of PV leads consumers to more frequently consider including PV in new construction and renovation design specifications ▪ General increase in consumer’s awareness of the environmental benefits of PV ▪ Consumer’s ability to identify potential PV contractors improves 	<ul style="list-style-type: none"> ▪ Begin to see integrators/installers developing and delivering consumer oriented PV marketing and education materials that supplement program materials ▪ Experience with program helps integrators and contractors to streamline specification, procurement, and installation processes ▪ Integrators/installers gain additional experience on serviceability and reliability of PV units 	<ul style="list-style-type: none"> ▪ Recognizing market opportunity created by programs such as LIPA’s Solar Pioneer Program, an increasing number of manufacturers establish partnerships with system integrators and contractors ▪ Manufacturers increase production levels as necessary to maintain sufficient inventories to keep up with increased program and non-program demand 	<ul style="list-style-type: none"> ▪ More professionals and trade people (architects, engineers, electricians) trained to understand PV basics and to help facilitate installations ▪ An increasing number of lenders are able and willing to integrate PV into new construction loans using appraisal and operating cost adjustments

Table 2. Residential Solar Pioneer Program – Preliminary Market Indicators Table (Consumers)

Timing	Projected Market Effects	Market Indicators	Data Source
Less than one year	<ul style="list-style-type: none"> ▪ Significant public awareness of LIPV initiative ▪ Consumer’s ability to describe (and therefore potentially shop for) PV systems is significantly improved 	<ul style="list-style-type: none"> ▪ Survey questions to assess consumer awareness of LIPV initiative, including LIPA rebates, state solar tax credit, net metering, financing, and contractor training. ▪ Survey questions asking for descriptions of PV systems 	<ul style="list-style-type: none"> ▪ Telephone survey of homeowners ▪ Telephone survey of homeowners
One to three years	<ul style="list-style-type: none"> ▪ Increasing consumer knowledge of PV leads consumers to more frequently consider including PV in new construction and renovation design specifications ▪ General increase in consumer’s awareness of the environmental benefits of PV ▪ Consumer’s ability to identify potential PV contractors improves ▪ Consumer’s willingness to pay for PV increasing – possibly as a result of lower costs 	<ul style="list-style-type: none"> ▪ Survey questions to assess consumer knowledge of PV, and to determine whether consumers buying/building new homes or renovating homes are considering PV ▪ Survey question to assess consumer awareness of the environmental effects of PV compared with other methods of electricity generation ▪ Survey questions asking consumers where they would look for a PV contractor and how they would evaluate them ▪ Survey questions asking how likely consumers are to install photovoltaics with/without available incentives. 	<ul style="list-style-type: none"> ▪ Telephone survey of homeowners ▪ Telephone survey of homeowners ▪ Telephone survey of homeowners ▪ Telephone survey of homeowners

Table 2. Residential Solar Pioneer Program – Preliminary Market Indicators Table (Consumers, cont.)

Timing	Projected Market Effects	Market Indicators	Data Source
<p>Three to five years</p>	<ul style="list-style-type: none"> ▪ Due to high levels of consumer satisfaction in key areas (reliability, performance, service support) a significant minority of PV consumers are willing to recommend PV to others, or to expand their own systems ▪ PV installations remain steady, or even increase, as the program incentive decreases 	<ul style="list-style-type: none"> ▪ Survey questions to assess satisfaction with PV systems, including overall satisfaction, as well as satisfaction with program materials, service support, reliability, savings on energy bills, contributions to environmental protection, example provided to others in the neighborhood, etc. Also willingness to recommend to others. ▪ Number of PV installations 	<ul style="list-style-type: none"> ▪ Telephone survey of program participants ▪ Program Tracking System
<p>Five to ten years</p>	<ul style="list-style-type: none"> ▪ No significant decrease in installation with possible loss of incentives ▪ Increase in customers acting to upgrade or add to existing PV system, driven by satisfaction with past experience 	<ul style="list-style-type: none"> ▪ Number of PV installations ▪ Survey questions to assess satisfaction with PV systems, including overall satisfaction, as well as satisfaction with program materials, service support, reliability, bill savings, contributions to environmental protection, example provided to neighbors, etc. Also willingness to recommend to others. Questions about past/planned upgrades. 	<ul style="list-style-type: none"> ▪ Manufacturer/distributor sales tracking system (to allow tracking of installations outside of program) and/or other sources ▪ Telephone survey of program participants.

Use of Market Effects and Market Indicators Tables in Baseline Studies

An immediate use of the market effects and market indicators tables was to enable the redefinition of the residential lighting baseline study and the definition of two other baseline studies. The RFPs included the market effects table and a blank market indicator table for each relevant program. Bidders were asked to suggest market indicators to track for each market effect and to prioritize the market effects. The reviewers of the proposal had their own market indicator tables they had created, to compare to what bidders submitted. The purpose of including both types of tables was to focus the bidders' proposals on the specific intent of the programs and encourage creativity in methods for collecting market indicator data as a way for bidders to differentiate their proposals. To date, three baseline-study RFPs have been developed – focused on residential CFL markets, non-residential building design/equipment replacement, and residential photovoltaics. Contractors have been selected for all three studies.

Clearly, some bidders ignored the theory-based approach reflected in the market effects tables that were included in the study RFPs and provided more of a cookie-cutter baseline study proposal or their own vision of how the baseline study should be performed. However, the winning bidders are “tuned in” to the approach and are linking specific survey questions and study activities to the specific market indicators they proposed to measure for each expected market effect. The contractors also have provided a further critique on the clarity and “measurability” of certain market effects, knowing that they will be held accountable for the indicators they proposed and for providing a measure of those indicators. As of the end of May 2000, the issue of prioritizing the market effects that will be tracked over time has not been addressed. The initial drafts of data collection instruments are currently under review. It is possible that, at least for some studies, all projected market effects will be tracked.

Tables 1 and 2, above, present excerpts from LIPA's Residential Photovoltaics (Solar Pioneer) Program market effects and preliminary market indicators tables. Note that each market indicator table is based on one column of the market effects table (i.e., there is one market indicator table for each market actor influenced by the program). Complete tables will be made available at the conference.

Conclusion

What made the LIPA approach to implementation and evaluation of its market transformation programs unusual was the attempt to reach a consensus among program designers, program implementers and program evaluators, with regard to specific program theories as to how certain programs would transform their target markets. Specifically, the program team has attempted to:

- Precisely and concisely specify the sequence, staging and causal relationships among intended market effects.
- Obtain consensus on the expected timing of these market effects.
- Relate specific program stimuli and market effects to reductions in specific market barriers targeted by the programs.

While program implementation did not wait for this activity to be completed, the theory building was completed at the beginning of program implementation and was able to impact key

aspects of program baseline studies. This should both guide and focus program implementation efforts and facilitate the collection of evidence as to whether the programs do or do not achieve their market transformation goals.

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