Identifying and Enhancing Energy Program Portfolio Synergies: The New York Experience[1]

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ABSTRACT

This paper presents outcomes of a multi-year project to identify and enhance interrelationships among programs in the **New York Energy Smart**[SM] portfolio administered by the New York State Energy Research and Development Authority (NYSERDA). Oak Ridge National Laboratory (ORNL) and NYSERDA conducted this work to assess and maximize the benefits of this administrative model. Synergy exists if the impacts of a program portfolio exceed the sum of the individual program impacts that comprise the portfolio. Several conceptual frameworks helped assess synergy. One framework examines ten organizational conditions for synergy. A second framework examines participants' views of program interrelationships. A third framework examines whether synergy accelerates market penetration.

NYSERDA staff focus groups were convened to collect data. Findings include:

- NYSERDA is meeting the ten organizational conditions for synergy;
- Staff regularly communicate and share lessons learned;
- NYSERDA's portfolio has numerous opportunities for additional synergy;
- Staff believe synergy will accelerate and increase market penetration;
- There are no negative impacts associated with promoting synergy; and
- Barriers to synergy include changing organizational goals, potential confusion resulting from the large number of programs in the portfolio, and lack of customer awareness of NYSERDA programs and technologies.

This project did not comparatively assess alternative administration models; however, NYSERDA's approach is working well and synergies exist. Assessing synergies through employee focus groups motivates communication, awareness, and goal alignment. Future work will collect data from participants, better quantify synergy, and refine and re-implement some focus group exercises.

Introduction

The **New York Energy Smart**[SM] public benefits program consists of approximately 40 program offerings, providing services and support for energy efficiency, improved low-income energy affordability, energy research and development (R&D), and environmental protection.

[1] The views expressed in this paper are those of the authors and do not necessarily reflect the views of their respective organizations.

These programs are centrally administered by NYSERDA, and many program efforts combine and work with one another to foster market "push" and "pull" for energy efficiency measures and services. One example of how the **New York Energy Smart[SM]** programs work together is in the effective, energy-efficient lighting market. The Small Commercial Lighting Program creates the market push by providing design assistance and financial incentives to lighting designers, electrical contractors, and others who install effective, energy-efficient lighting. Other programs like the **New York Energy Smart[SM]** Loan Fund and Smart Equipment Choices provide the market pull by offering end-users reduced interest financing or monetary incentives to implement these measures. Program participants include upstream actors like manufacturers; mid-stream actors like vendors, retailers, and contractors; and various types of downstream end-users. Interventions in each of these areas include information, decision-making tools, technical assistance and support, and financial incentives.

NYSERDA believes that centralized administration of the program portfolio offers several advantages over decentralized administration and has designed the process described in this paper to test this hypothesis. For one, centralized administration provides the opportunity to assess how multiple activities serving different sectors and market actors, and offering different types of incentives can be combined to increase the expected value or benefit of the entire program portfolio. Because of New York's size and social and economic complexity, achieving critical objectives, such as sustainable market development, depends on the quality and nature of interactions between individual program elements. These interactions should reinforce critical energy-efficiency messages as well as leverage additional resources. Consequently, any evaluation or assessment of the portfolio must be systems-based in order to determine whether and how initiatives and market interventions are contributing to overall program goals in a complimentary and reinforcing fashion. Collaborative approaches such as those employed by the Massachusetts, Connecticut, and New Hampshire utilities are alternative administrative models that may offer similar results. However, comparing a central and collaborative administrative model was outside the scope of this paper.

NYSERDA actively manages its portfolio to maximize program benefits measured in terms of energy efficiency improvements, including energy reductions and savings, economic development, and environmental benefits.[2] Overall, benefits or losses associated with individual programs often result from the interactions among program elements. Consequently, a systems-based approach is useful in determining the degree to which individual initiatives and market interventions are contributing to overall program performance. A systems-based evaluation model is useful in that it:

1. Describes and helps communicate concepts integral to systems thinking and identifies the linkages and interconnectedness between and among various program efforts.
2. Supports development of a number of key process-related inquiries and key hypotheses that, when developed and tested, help to "tell the program story" in an integrated and comprehensive manner.
3. Helps identify supplementary evaluation research using experimental design practices that could ultimately lead to more interactive and integrated program evaluation.

[2] Additional benefits in the form of improved building occupant comfort and safety, improved energy affordability, and energy diversity are also important. Attempts are made to measure these benefits as well; however, work has not progressed enough to report at this time.

Synergy is one benefit of a systems-based approach to program management and implementation. Synergistic benefits could be said to exist if the portfolio's impacts are greater than the sum of the impacts of individual programs. Additionally, a systems-based approach to assessment is required to understand and measure synergy because, by definition, synergy can only arise from the synergistic interrelationships of two or more system components. Synergy cannot arise from only one program; multiple components need to interact to give rise to synergy.

NYSERDA's evaluation process requires the use of tools that are tailored to the life-cycle phases[3] of its program portfolio. The **New York Energy Smart**[SM] program has progressed through the early needs assessment and program planning stages and by most accounts has succeeded in defining a comprehensive set of programs that have been able to demonstrate some early success in meeting it goals. NYSERDA has quickly brought a large number of programs serving a diverse set of customers into operation. Nevertheless, the critical question remains as to whether these individual programs collectively are producing results that will ultimately achieve the **New York Energy Smart**[SM] Program's overall objectives more efficiently and effectively than similar program efforts had they been more decentralized and locally administered.

Methodological Approach for Evaluating Synergy

ORNL has been working with NYSERDA to design and develop the systems-based evaluation approach for assessing synergies. The overall approach has two major components. The first component, which relates to concept development, focuses on developing various ways to conceptualize and measure synergy. The second component, applied research, focuses on collecting information to ascertain whether synergy is being exhibited among NYSERDA's programs. There have been two phases of concept development and applied research over the past three years:

1. The first phase encompassed the development of ten conditions for organizational synergy and the convening of four focus groups involving NYSERDA staff to assess the extent to which NYSERDA was meeting the ten conditions for synergy (Figure 1). Focus groups were held during the winter of 2003 and involved 37 staff. Three additional focus groups were organized around major program areas – Research and Development, Energy-Efficient Services, and Residential Energy Assistance Program. The fourth involved a cross-section of NYSERDA program managers.
2. The second phase encompassed the development of additional ways of conceiving synergy and the convening of another three focus groups. These focus groups were held during the fall of 2003 and involved 19 staff. They were organized around three key NYSERDA program areas: energy-efficient lighting; photovoltaic energy; and peak load demand reduction. The rest of this section describes the tasks and exercises given to the second phase focus group participants to increase the depth and sophistication of our understanding of synergy.

[3] John Boulmetis, Phyllis Dutwin. 2000. *The ABCs of Evaluation: Timeless Techniques for Program and Project Managers*. San Francisco: Jossey-Bass.

The most recent focus groups conducted were structured around selected programs within which similar technologies or measures were supported. For example, energy efficient lighting is supported through technical assistance programs, financial incentive offerings, marketing and general awareness initiatives, and R&D. The focus groups assembled staff from each of the various programs to assess their individual and collective understandings of how their programs were working together or perhaps at cross purposes to meet the broad public benefits programs goals. Focus groups were convened for energy-efficient lighting, photovoltaic (PV) energy systems, and peak load reduction and price responsive load management. The focus groups were charged with various tasks and engaged in many activities prior to and in the focus group meeting itself to assess the ten conditions and the potential for synergy among the portfolio of programs.

As a first exercise, NYSERDA staff was asked prior to the focus group to independently map out the programs, market actors, and interactions they thought to be occurring in the markets in question. Maps included blank squares for staff to enter the names of the programs they thought were influencing the market in question, blank circles for inputting the market actors involved, and different types of arrows to show the interactions and interventions occurring between programs and actors, including both financial and non-financial. These individual maps were compiled prior to the focus group meetings to determine what consensus and conflicting views of the programs and markets existed among staff. These consensus maps were presented to the staff at the beginning of each focus group for comment and revision in real-time. The ensuing discussion about the program and market actor mapping allowed the evaluation team to document possible areas where opportunities for synergy could be better managed and allowed staff an opportunity to discuss program interactions and the potential for synergies at a level of detail that otherwise would not have been possible. Using the maps as a guide, the staffs were asked about barriers to the market penetration of energy-efficient lighting, photovoltaics, and peak-load reduction technologies, respectively. The staffs were then asked about how they may have shared lessons with each other associated with overcoming those barriers and other constraints to implementing their programs.

In another exercise, staffs were asked to list all potential NYSERDA programs that customers could utilize in combinations that might lead to synergy. Partly based on the results of this exercise, the fifth exercise required staff to fill in a table, like the blank Table 1, to estimate the percentage of projects they thought were influenced by weak, moderate, and strong synergy, as illustrated in Figure 2.

- No synergy exists if there was no energy efficiency purchase or if there was a purchase but it either was not influenced by any program or only influenced by one program.
- Weak synergy exists if a purchase was made and it was weakly influenced by two or more programs.
- Moderate synergy exists if a purchase was made and it was moderately influenced by two or more programs.
- Strong synergy, which is the most stringent level, exists if a purchase was made and it was strongly influenced by two or more programs to such an extent that the purchase would not have been made had any of the programs not been in existence.

Figure 1. Ten Conditions of Synergy

Ten Conditions of Synergy

1. Shared Vision — Program managers and staff understand and work toward the same corporate-wide goals.
2. Systems Thinking — Program managers and staff understand systems thinking, including positive and negative feedback, limiting conditions, cause & effect connections, and system leverage points.
3. Shared Understanding of NYSERDA System — Program managers and staff work within an organizational system whose attributes, characteristics, and protocols they understand.
4. Shared Understanding of Current Market — Program managers and staff understand how their programs influence the market and have a shared understanding about how markets work.
5. Shared Understanding of Future Market — Program managers and staff have shared conceptions about the future of market in question.
6. Programs Map to Marketplace — The Program portfolio should target key market leverage points. Positive synergies will result if programs mutually reinforce desirable cause and effect relationships in the market. Negative synergies will result if the programs conflict. Positive synergies must outweigh negative synergies.
7. Portfolio Diversity — To help minimize risk, the Program portfolio must contain a variety of reinforcing and supporting programs recognizing the uncertainties inherent in markets and about how influential and timely various programs could be in transforming markets.
8. Synergies Recognized by Market Actors — Market actors need to have ready access to program information and understand how programs work together.
9. External Feedback Effectively Communicated — All relevant external feedback needs to be seamlessly and accurately communicated to all affected program managers and staffs.
10. Systems Understanding of Responses to External Feedback — Program managers and staff need to respond appropriately to feedback. Only by understanding the market and how the programs fit in can program managers and staffs decide the best course of action.

ORNL's efforts over the past three years have helped expand and enhance NYSERDA's efforts to quantify program energy savings. First, the systems approach helps identify areas where program influences are overlapping, and where double counting of energy savings for the same energy efficiency measures needs to be identified and netted out of the overall benefits. Second, the systems approach has also led to a more comprehensive view and assessment of program and portfolio free ridership and spillover. Instead of a program-by-program assessment of net energy savings, all of the interventions involved (whether there is strong synergy or weak synergy) need to be examined and weighted to determine the overall free ridership and spillover for the grouping of programs.

Figure 2. Synergy Illustration

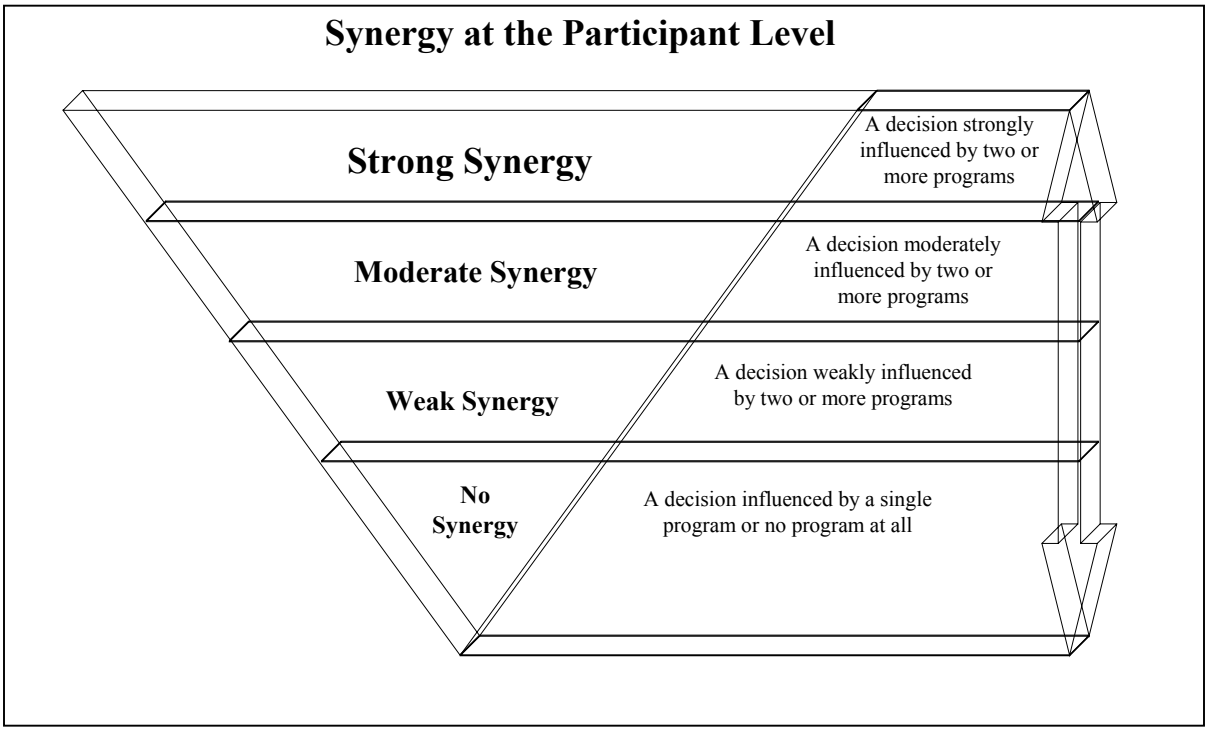


Table 1. Rating NYSERDA Program Influence and Program Synergies*

	% Purchases Influenced by NYSERDA Programs			% Purchases Influenced by Strong Synergy			% Purchases Influenced by Moderate Synergy			% Purchases Influenced by Weak Synergy		
	L	B	H	L	B	H	L	B	H	L	B	H
Energy-Efficient Lighting												

* L= Low Estimate, B = Best Estimate, H = High Estimate

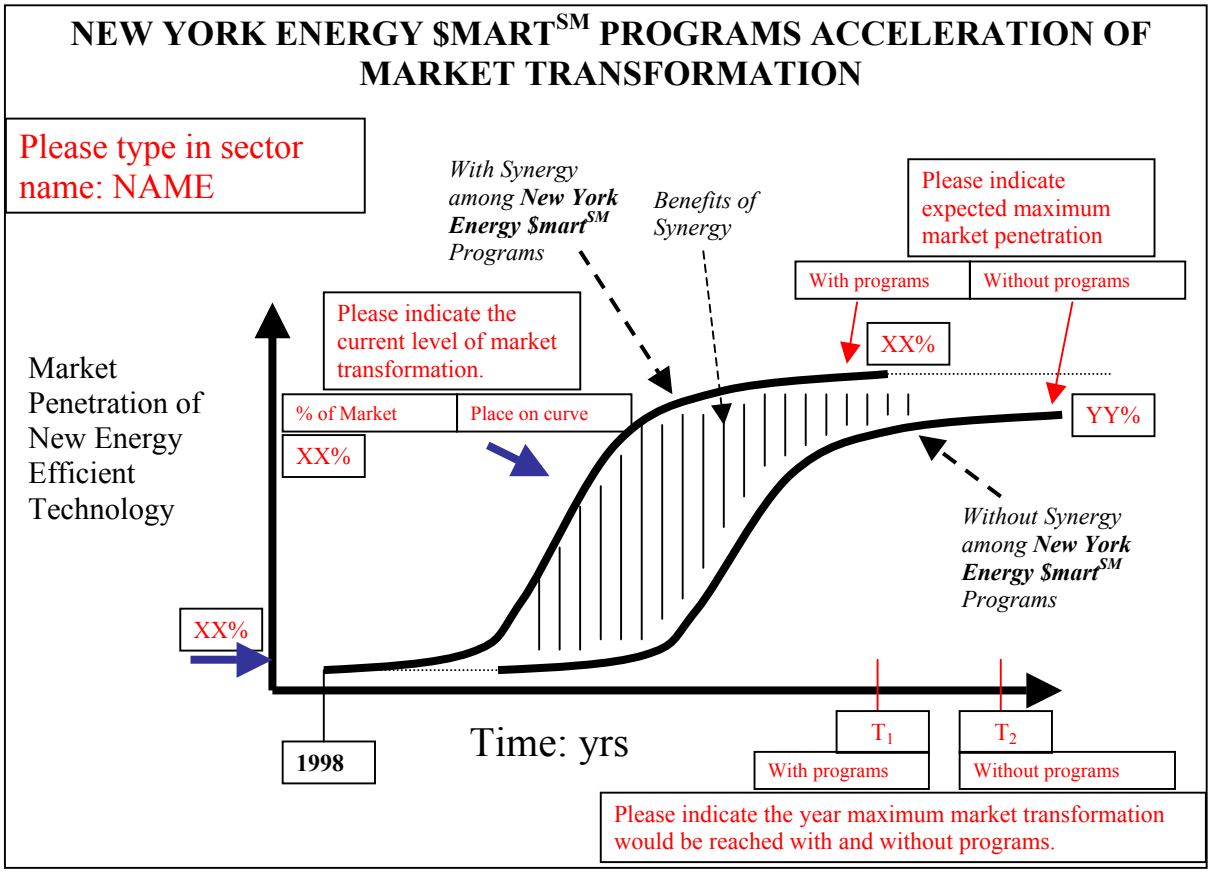
For the next exercise, staff was asked to complete the graphic in Figure 3. This challenged staff to envision the future state of the market for PV, lighting, or peak load reduction, and show what they believe the impacts of synergy to be over time. This exercise was intended to provide insights in two areas: (1) whether staff had common understanding and vision in terms of the maximum market penetration and when it would occur, and (2) whether staff believed the maximum market penetration or the time frame for reaching it would be accelerated by program synergy.

Focus group participants were also asked about the diversity of NYSERDA's portfolio, overlaps among programs, the adequacy of information provided to customers, how to enhance information to improve synergy, ways they receive feedback from the outside world, and suggestions for improving evaluation. Lastly, participants were asked about changing market circumstances and the future of their programs. Separate from the focus groups, the exercise

described below is a methodology being developed by ORNL and NYSERDA to measure synergy among programs at the end-user level (*e.g.*, household or firm).

Figure 4 shows a survey question designed to collect this data. It is assumed that the survey respondent has recently purchased an energy-efficient lighting system. Several related NYSERDA programs could have influenced this customer.

Figure 3. Market Penetration Illustration



Four programs could have provided direct financial subsidies and benefits to the new lighting system buyer (*e.g.*, Smart Equipment Choices, **New York Energy Smart**[SM] Loan Fund). Several NYSERDA programs, such as the ENERGY STAR® Public Awareness Campaign, could have indirectly provided information about energy-efficiency to the decision maker that made them more aware of energy-efficiency in general. Additionally, NYSERDA incentives provided to contractors and lighting designers to sell effective, energy-efficient lighting systems could have spurred these market actors to provide their prospective customers with qualifying designs. Thus, the example question lists all seven potential sources of influence on the lighting system buyer's decision-making. The respondent is asked to indicate how influential each source was on their decision, using a Likert Scale from 0 to 3, where 0 implies no influence, 1 implies weak influence, 2 implies moderate influence, and 3 implies strong or absolute influence. From this viewpoint the three different types of synergy for an entire portfolio of programs can be defined in these ways:

- *Strong synergy* is said to exist if two or more of these sources of influence were rated as strong or absolute (*i.e*., given the score of 3);
- *Moderate synergy* is said to exist if two or more sources of influence received ratings of 2 or higher; and
- *Weak synergy* is said to exist if two or more sources of influence received ratings of 1 or higher.

Strong synergy for an entire portfolio of programs influencing a new lighting system buyer can be estimated by the sum of the fraction of lighting bought, whose respondents reported experiencing strong synergy (*i.e*., reported two or more sources of influence as having ratings of 3). Given this definition, the magnitude of synergy can range from 0.0 to 1.0 (total or complete strong synergy).

Figure 4. Example Synergy Question for the End-User

Please rate the influence of each NYSERDA program and NYSERDA-related source of information on your energy-efficient lighting purchase(s). (Please circle appropriate answer)

	No Influence	Weak Influence	Moderate Influence	Strong Influence*	N/A
Smart Equipment Choices	0	1	2	3	99
Loan Fund	0	1	2	3	99
Peak Load Reduction Program	0	1	2	3	99
New Construction Program	0	1	2	3	99
Lighting Designer/Distributor	0	1	2	3	99
Contractor/Energy Service Company	0	1	2	3	99
ENERGY STAR® Awareness	0	1	2	3	99

* In other words, you *absolutely would not have made purchase* without this program or source of information.

Several empirical studies are required before expectations about the estimates of synergy can be developed. It is not known whether, for example, 0.60 is an appropriate level of strong synergy, or is extraordinarily high or low. The same can be said for the estimates of moderate and weak synergy.

Preliminary Findings

The results of this continuing work suggest that a fair amount of synergy is taking place. Synergies have been identified within the larger marketplace context that includes market actors and NYSERDA programs; at the program participants level (*i.e.*, customers who may benefit from more than one NYSERDA program at a time); and within NYSERDA itself. Even given these findings, more can be done to develop additional opportunities for synergy that could further improve program effectiveness and efficiency. The results of the phase I focus groups indicate that NYSERDA is substantially meeting the ten organizational conditions for synergy.

It was learned that staff have created robust communications processes, and share common understandings about goals, internal processes, needs of stakeholders, and the markets targeted. Factors that could impede synergy include: multiple and changing goals, and the perceived complexity of NYSERDA's portfolio of programs (an observation which was also strongly supported by participants in the second phase of focus groups). The focus groups also indicate that there appears to be a high level of synergy across NYSERDA programs for the areas studied. However, the degrees to which end-users participate in NYSERDA's multiple programs appear to differ significantly across the programs studied. Key findings from the second round of focus groups include the following:

- The NYSERDA programs in the three areas examined (energy-efficient lighting, PV, and peak load reduction) are characterized by numerous means of financial influence and communication that have the potential to create substantial system synergies. These observations were drawn from the maps developed by each focus group.[4]
- There is general consensus among focus group participants that a lack of customer awareness is the most significant barrier inhibiting market penetration of energy-efficient technologies, which suggests that the focus group participants believe that the numerous channels of influence acting on customers are not yet having a major impact outside of NYSERDA program participants.[5]
- Programs work together in numerous ways, but few examples were mentioned of the sharing of actual lessons learned (*i.e.*, from trial and error types of activities) that could improve organizational efficiency. Supervisory staff demonstrated a greater understanding of program interactions and interrelationships than line staff.
- Customers can benefit from numerous programs at one time, especially incentive and technical assistance programs, but the staff generally did not mention the potential for augmenting synergistic benefits through energy-efficiency-related public awareness campaigns. As a result, additional benefits might be derived from bundling messaging and target marketing to selected customers across program areas.
- Multiple incentive programs and interventions were found to influence a higher percentage of purchases in markets for immature products (*e.g.*, PV) than in larger markets for more mature products (*e.g.*, energy-efficient lighting), however, more discussions are needed to develop reliable estimates of participant-level synergy.
- Staff believes that synergies will lead to higher market penetration rates and accelerated market transformation, but their views of the future adoption of the technologies supported by their programs, and by argument, their views of improved synergistic relationships among programs and technologies, appeared limited in both scale and scope. This could reflect the newness of some staff, the immaturity of some programs,

[4] This is especially pronounced with respect to the ability to create multiple influences upon customers and multiple opportunities for market actors and customers to purchase energy-efficient technologies either through, or outside of, NYSERDA's programs.

[5] Market effects research being conducted to assess program spillover and market transformation progress suggests that significant spillover is occurring in many programs; however, free ridership is equally present in many instances. Conversely, as free ridership increases, one can begin to assert that markets are indeed being transformed and programs might no longer be needed in their current form to move markets to greater levels of energy efficiency. As market effects become more transparent, programs need to transition and adapt to emerging market needs.

the limited time frame for program funding, or the complexity of this exercise and the fact that limited time was given to complete it.

- NYSERDA does have a diverse portfolio of programs and services and for the most part, this diversity is serving customers well and generally working as intended. The number of programs and the fact that several programs serve the same customers, however, does cause some confusion. As a result, some customers might not take advantage of complimentary programs because of the perceived complexity.
- There are few programmatic overlaps in the three program areas studied, leading to the conclusion that deliberate efforts to promote synergy are not adversely affecting program or administrative management.
- Improvements are needed in how information about programs is provided to customers and to NYSERDA staff, and more market information and penetration data needs to be collected about these technologies, which would allow staff to better understand synergy opportunities and how to measure the results of synergy.[6]
- Comments about changing market circumstances and the future did identify many important issues for programs to consider, but generally did not address the improvement of synergistic opportunities.

Lessons Learned

In addition to the findings presented above, there are several other lessons learned from this work effort that could be of value to other organizations. Key lessons learned are summarized below. First, the focus groups had value above and beyond their purpose of measuring synergy. Staff said they benefited from the extended discussions, which helped to build interpersonal relationships that either had not existed before or were not as strong as participants desired. Staff agreed to reconvene periodically on their own to share information and ideas related to his or her program area. One can imagine that these discussions will help create shared visions about the goals of NYSERDA and meet many of the other conditions for synergy listed in Figure 1. Thus, it can be argued that the focus groups themselves helped to improve synergy at NYSERDA.

The focus groups employed several novel exercises. The mapping of market actors and NYSERDA programs is a case in point. Staff was requested to create and submit their own maps prior to the meetings. Not all participants did this, and the maps submitted were generally limited in scope. On the other hand, the real-time discussion of the maps went very well. Participants were very active, and major additions and revisions were made to each map during the meetings. Copies of the maps were printed out and given to the participants during the meeting, which greatly facilitated the following exercises. The participants had no difficulty with the other exercises, save two. There was some confusion about how to fill in Table 1, which required participants to estimate percentages of purchases influenced by different levels of synergy. In hindsight, more time could have been allocated to explaining the exercise and the distinguishing the different concepts of synergy. The participants also exhibited some difficulty with the exercise illustrated in Figure 3. It was hard for them to think in time frames much beyond their programmatic horizons and to think broadly about key markets rather than about

[6] Market characterization and assessment work is being conducted simultaneously with the effort to determine identify and quantify synergies, and will be available shortly to help inform this effort.

specific products and technologies. In hindsight, more time should have been allocated to this exercise as well to make the process iterative.

Finally, four hours proved insufficient to accomplish all the exercises designed for the focus groups and it was also not possible to ask the already busy staff to devote even more time to the meetings. A solution to be explored in the future would be to hold more frequent but shorter focus groups that tackle fewer exercises but in more depth. One area not covered by the research to date is a comparison of the **New York Energy Smart**[SM] program structure to alternative models. While a strict control group experiment is not appropriate or necessary based on the goals of this research, some comparative research could be undertaken in future work. The research approach could be modified to examine the impacts achieved per dollar spent on the past utility DSM programs (New York does have significant experience with different utility demand side management programs which were run by each of State's six investor-owned utility companies in their own territories through the late 1990s), or to examine the same from other, more current programs in other states or jurisdictions. However, the impact achieved per dollar spent is only one key metric in terms of assessing the synergistic benefits of the portfolio-based approach.

Additional Research Opportunities and Needs

In terms of the ORNL effort to identify and quantify synergy, additional research is planned with end-use customers who have participated in multiple programs. As noted above, ORNL plans to ask a focused set of questions of these customers to attempt to get at the relative importance of the various parts of the "package" of program assistance they received, and whether or not the same actions would have been taken if one of the programs were removed from the package. In addition, the work being done by ORNL and NYSERDA to help identify and quantify synergies also reinforced previous knowledge that additional market intelligence data are needed by program managers and staff to more fully understand target markets, energy efficiency and demand reduction potential in those markets, and program impacts over time. For the first time, sufficient funding is available to collect detailed market characterization and assessment data for some of the major target markets, and NYSERDA has hired evaluation contractors to begin collecting such data. By disseminating these data to program managers and staff, NYSERDA expects to see improvements in several of the ten conditions (including shared understanding of current and future markets, and program mapping to the marketplace), and also an improved ability among program managers and staff to identify and anticipate the collective effects of the portfolio of programs and to quantify the benefits of synergy. Similar focus group sessions could be conducted two years from now to determine if this hypothesis is true.

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