Using Logic Models to Improve and Enhance Nonresidential Programs

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ABSTRACT

The authors of this paper were assigned the task of developing logic models for NYSERDA's nonresidential sector programs.[1] The major activity for the 2003 nonresidential logic-modeling efforts focused on the New Construction Program (NCP), which was initiated in 2000.

Developing a logic model that described the NCP as it was implemented was not difficult. The program analysis step analyzed the logic model relative to a literature review, including theoretical papers and evaluations of other nonresidential new construction programs. The review revealed opportunities that the program managers could consider for increasing the likelihood of the program achieving its goals.

The process of developing the logic model, exploring different theories and then bringing these to the attention of the program implementation team had a variety of challenges. In the end, while no changes have been made to the program, the program implementation team is now alerted to opportunities for potential revisions to the NCP.

Introduction

In the past five years, it has become increasingly clear that making a program's theory and logic explicit is important for effective program implementation and evaluation, especially when the program includes or is dominated by market transformation goals and objectives (Erickson, Fagan & Block 2003; Goldstone, Rufo & Wilson 2000). In 2003, NYSERDA contracted with teams of professional evaluators to conduct a variety of evaluation activities for NYSERDA's over 30 initiatives in the **New York Energy $mart^{SM}** program, including measurement and verification, market characterization, assessment and causality/attribution, process evaluation, and program analysis.

The authors were part of the Program Analysis team lead by GDS Associates. The task was to develop logic models for programs and to analyze each program relative to social science theory and other program experience. The program analysis activities cover most of the over 30 residential, non-residential, research and development, and low-income programs in the **New York Energy $mart^{SM}** portfolio. The first-year projects examined two residential, one low-income, two research and development, and one nonresidential program.

The analysis effort for the nonresidential sector focused on the New Construction Program (NCP), a very large and complex initiative that targets commercial new construction throughout most of New York State. Its eight-year budget for 1999-2007 is $74.2 million, of

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which $62.4 million is projected to cover incentives and $11.8 million is dedicated to technical assistance, design and outreach. Program goals through 2006 are to provide services to 300 architecture and engineering (A&E) firms and 785 buildings, achieving 120 GWH of savings and 30 MW of peak reduction, with an average reduction of 20% in all-fuels energy bills.

Study Approach

The program analysis approach includes two primary stages: logic model development and program analysis. The logic model development stage involved four steps by the team: initial data collection, problem description, logic model definition, and logic model diagram construction. At the end of the first stage, the program analysis team reviewed the diagram with the program staff to refine the model and assure that it articulated the program design and implementation.

The second stage involved three steps: theory research and development, theory logic model verification, and recommendations. The recommendations step involved exploring the logic model and program analysis findings with program staff to assure that the findings articulated program design and implementation and to inform staff of any findings, new information or recommendations that arose from the program analysis activities. A detailed discussion of these steps is provided in a separate paper (Albert, et al. 2004).

Study Findings

The findings of the analysis are discussed in three sections dealing with logic model development, program analysis findings, and the role of logic model development and program analysis in evaluation. This is followed by a discussion of lessons learned from the process.

Logic Model Development

In developing a logic model, standard practice involves addressing program inputs, activities, target market, outputs (immediate consequences of program activities), short-medium- and long-term outcomes, and external influences (McLaughlin & Jordan 1999; United Way 1996).

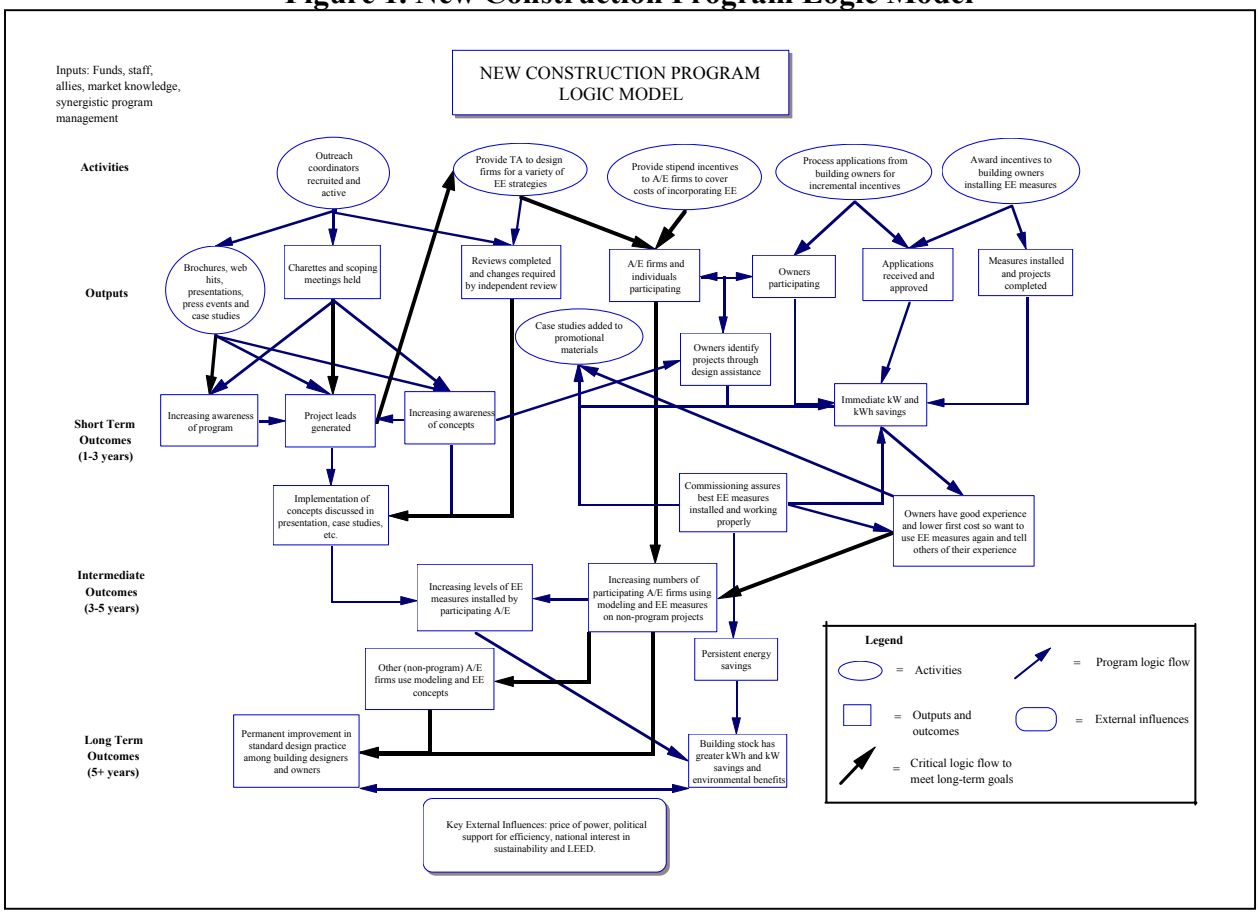
The first activity by the logic team was to have program staff outline the program flows, either in a workshop or interview session. The NCP logic modeling activity was preceded by the existence of a logic model that had been drafted during a logic modeling workshop lead by one of the authors (Peters) in summer 2002. This meant that the team had an initial logic outline for the program and could proceed to collect secondary data. (Had this logic model not existed, it would have been critical to conduct interviews or a workshop with program staff to elicit an outline of the program process and the intentions for each of its activities.)

The team collected all possible documentation describing the program—its goals and objectives, its marketing plan, and reports describing the program from different perspectives. Using these secondary data sources and the pre-existing logic model, we drafted a new graphic logic model and prepared a summary of the secondary data in the form of a description of the logic model.

The logic model and narrative were provided to program staff for their review and comment; a two-hour conference was then held to share staff observations with the team. In

many ways, the development of the logic model was the most straightforward of all the activities. The program staff were able to review the narrative and determine where inevitable errors of fact had occurred. They also reviewed the logic model and made recommendations regarding the diagram and how the program logic worked from their point of view. The team then revised the model to reflect this input. In the case of the NCP, the revised logic model and narrative was made available to other evaluation teams for use in their efforts. Figure 1 shows the final logic model for the program.

Figure 1. New Construction Program Logic Model



Some of the key issues that emerged from the development of the NCP logic model were that the program had both resource acquisition and market transformation strategies and associated tactics. Like many resource acquisition programs, the NCP sought to achieve aggressive kWh savings and kW peak reductions by working within the market structure, so there are strong market elements in its resource acquisition strategy. At the same time, the program logic included a strategy and associated tactics that the program staff anticipated would lead to a long-term sustainable transformation in the new construction market by encouraging significant changes in design firm practices.

Program Analysis Findings

This second stage of the process was exciting and innovative territory to the team members. All had extensive experience reading and pondering about social science theories and how they might apply to energy efficiency programs. However, this was the first time that team members were aware of an energy efficiency client requesting a program logic model be reviewed in the context of social science theory and then tested against those theories within the experience of an energy efficiency program. Hence, the team focus on program analysis was a clear indication that a logic model, in and of itself, was insufficient to meet the client's needs and interests; what was most important was to test the model in the context of social theory.

The first steps in the program analysis were to identify what theories might be relevant to the program logic and what anticipated outcomes should be explored through a review of similar programs, then verify the logic model relative to those theories. The theories we identified to be of interest were *social marketing theory*, *diffusion of innovation*, and *consumer economics*. The next phase involved presenting the program staff with the team's findings and recommendations and then discussing their implications for the logic model and the program itself.

Theory Research and Model Verification

The theories of consumer economics drive the resource acquisition strategy for the NCP. As is common in many resource acquisition programs, the NCP offers incentives to reduce the cost of investing in energy efficient measures, including performance-based incentives for custom and whole building design. In addition, the program offers stipends to design teams to cover additional costs of incorporating energy efficiency into the plans. Incentives are also structured to facilitate increased green building approaches, such as Leadership in Energy and Environmental Design (LEED) and the use of building-integrated photovoltaics. The application of these tactics is consistent with current practice in new construction programs; other programs have demonstrated the ability to achieve annual market penetration of 50-90% for larger buildings using these types of approaches (Goldstein 2004; York & Kushler 2003).

Social marketing theory and *diffusion of innovation*s are the theories that are driving the market transformation strategy of the NCP. Analyzing the program logic relative to these theories suggested that success with market transformation is much less assured.

Social marketing is the application of marketing theory to pro-social activities—those activities that have a societal rather than a private benefit (Andreasen 1995). Social marketing has been directly applied to many products over the years: reduction of litter, recycling, the Smokey Bear campaign, condom use in countries plagued by HIV infection, and recently for international energy efficiency campaigns such as the Efficient Lighting Initiative (Vine et al. 2003). Indirectly, many marketing campaigns for energy efficiency products and services in the United States are also social marketing campaigns and the theory of social marketing is important to reference.

Social marketing theory is actively being applied to new nonresidential construction activities by the Northwest Energy Efficiency Alliance through the BetterBricks campaign, which includes Internet (www.betterbricks.com) and print media efforts to influence designers to adopt energy efficient design practices. This effort, however, is in early stages of implementation and evaluation results are not yet available. Nevertheless, what is clear from early experience with the BetterBricks program is that it is difficult to reach designers and owners with messages

alone. Considerable effort is required to develop collateral that is sufficiently technical and informative to persuade designers and owners to adopt new energy efficient design practices (Gordon, Peters & Dethman 2001).

The NCP logic model and program design appeared to suggest that the program was hoping to influence non-participating designers to adopt energy efficient practices through the use of case studies and other promotional material on the **New York Energy $mart**[SM] program website. Based on our examination of the effort expended by BetterBricks, as well as the evolving effort for the nonresidential new construction program in California—Savings by Design (www.savingsbydesign.com)--our analysis suggested that the marketing efforts of the NCP would be insufficient to effectively influence non-program designers. (The program managers later clarified that this was not a key goal for the program.)

Diffusion of innovation theory was also closely examined relative to the program logic. Most market transformation program planners and implementers are familiar with the basic notion of diffusion promulgated by Rogers (1983), by which *innovators* become the first to adopt a technology, followed by *early adopters*, then the *early majority*, the *middle*, and finally the *late majority and laggards*. The late majority and laggards are rarely of interest to market transformation programs, as these people are those who adopt after effective market transformation has occurred. Innovators are those who adopt even without program efforts, though they often take advantage of programs when they emerge and likely becoming free-riders. The focus of most market transformation programs has been on early adopters and early majority adopters.

Diffusion is largely a communications issue in which information is transferred between individuals. When behavior change is sought for pro-social reasons, such as adoption of a new agricultural technology or new healthcare practice, a *change agent* generally initiates interest in the new behavior. Diffusion theory comments on both the characteristics of the change agent and the characteristics of those market actors the change agent targets for their outreach.

Change agents typically have been program staff in energy efficiency programs, but in the NCP, NYSERDA has been charged to be administratively lean. Therefore, contractors have been hired to act as change agents. There are two contractor roles in the program: one is the Outreach Project Consultants (OPC) and the other the Technical Assistance (TA) contractors. Both types of contractors are usually engineers or architects with experience in energy efficiency.

Research by Rogers suggested that change agents needed to be technically knowledgeable, such that the target group respected them; however, those who had a commercial interest in the behavior change might be less accepted by the target group. NYSERDA as a non-utility and a not-for-profit organization is in a good position to be perceived as having a noncommercial interest in energy efficiency behaviors. However, the contracted OPCs and TAs are usually professional engineers or architects. Given their professional position, they could potentially be perceived as having a commercial interest in the energy efficiency behavior, which would negatively affect the program. Alternatively, they could be perceived as being "experts" who provide a level of knowledge that exceeds what NYSERDA can provide, which would be very good for the program. The program analysis therefore pointed to a need to evaluate how these contractors are perceived to determine whether they were providing the anticipated program effects shown by the logic model.

To be effective, a change agent needs to target individuals for outreach. In diffusion theory, who is targeted matters. Rogers' research indicates it is optimum to target opinion leaders

within the community of interest. In agricultural communities, a farmer who other farmers respect, in health care practices, a political or social leader community members respect. An opinion leader's active adoption of a behavior and subsequent word-of-mouth testimonial about his or her experience becomes a key driver of other community members adopting the behavior.

In the NCP logic model, there was no specific expectation for who would be targeted. In part, this is because NYSERDA has operated under the premise that a public benefits program needs to be open to all. Additionally, program participation has been high and thus marketing and outreach has been kept to a low level. The program analysis alerted the team to the importance of targeting in an effective diffusion process.

Recommendations for the Program

Once the program analysis was completed, the team submitted a second narrative to the program staff. The program analysis team then met in-person with the program staff to review the logic model and program analysis results in detail. In the workshop, program staff identified several details of the program logic that they felt had not been accurately portrayed and questioned some of the findings from the program analysis.

The program analysis team then took staff comments and made some changes to the logic model and to the narrative, reviewing the various theories and revisiting findings for other new construction programs. This resulted in a third version of the narrative and additional comments. At this point, the logic model and program analysis appeared to be fairly well accepted, but some of the points about the market transformation theory remained under discussion.

The team decided to return to first principles and make sure that NCP program staff members and the program analysis team were using the same definitions of resource acquisition and market transformation and to confirm that the target behaviors were correctly understood.

The definition of resource acquisition strategy agreed to was that a resource acquisition strategy: "uses trackable (to the individual program participant and measure), measurable, cost-effective investments in energy efficient equipment to replace generation energy, transmission, and distribution capacity" (Sebold et al. 2001). This definition was agreed to, along with recognition by program staff and the program analysis team that best practice resource acquisition strategies use the structure of the market to stimulate owners to improve the efficiency of their buildings.

The definition of market transformation strategy agreed to was "to intervene in the market, causing beneficial, lasting changes in the structure or function of the market, and/or practices, and with the changes in the marketing being *lasting* changes, meaning that the changes last beyond any revision to or discontinuation of the intervention." (Schlegel et al. 1997)

The next issue to discuss was the specific behavior targeted by the program. Based on the program information they had reviewed, the analysis team had focused on full whole building systems design as the targeted behavior. In the return to first principles discussion, the program staff revealed that they felt the targeted behavior was advanced energy efficient design, such as those discussed in the *E-Benchmark*™ guidelines developed by the New Buildings Institute (Johnson & Edelson 2003).

In confirming the definitions of change and of the behavior targeted by the program, it became clear that the logic model had hypothesized greater change for nonparticipants than the market transformation strategy of the program anticipated. This return to first principals also had the effect of helping program staff recognize that the issues of perceptions about commercial

interest of change agents and the potential value in targeting opinion leaders with limited marketing dollars could facilitate the market transformation goals of the program.

The Role of Logic Model Development and Program Analysis in Evaluation

There are indications that the program is fulfilling its resource acquisition objectives. Program participation is high, as is program satisfaction. Implementation of recommended designs from the technical assistance contractors appears to be high as well. Designers have reported learning new information from the TA services and applying it to non-program projects. (NYSERDA 2004)

At the same time, the market transformation strategy expects the program designers and owners who adopt advanced energy efficient building design will be able to influence other designers and other owners who do not participate. To do this, it is important that participating designers accept the OPC and TA contractors as technical experts and adopt the new behaviors, without any concern for commercial competition from the OPC and TA contractors in the future.

A variety of indicators of program outputs and outcomes, as well as research issues concerning the indicators, were identified for the evaluation teams to research. Some of these were obvious, such as whether the promotional activities were generating leads; others, such as investigating perceptions of the OPCs and TAs as change agents and the effectiveness of outreach with opinion leaders, emerged from the program analysis.

Short Term Research Issues

The short-term research issues tend to track outputs and outcomes from program activities. Among the short-term outcomes also are kWh and kW savings. A few of the short-term research issues are noted below, along with an explanation of why these should be tested:

- Promotion using brochures and the website generates project leads that result in technical assistance being provided for new construction projects.
  Promotion in the NCP is limited to only brochures and the website. The promotion is designed primarily to get owners and designers to use the technical assistance services.
- OPCs generate project leads that result in technical assistance being provided for new construction projects.
  OPCs include in their responsibilities generating leads for technical assistance, however marketing dollars are limited and outreach by OPC was very limited after the first year of the program.
- Technical assistance reports lead to changes in project designs, resulting in more energy efficient buildings than would have been built otherwise.
  Technical assistance is offered to change project designs to be more energy efficient; or if conducted early in the program design process, that the results of the technical assistance carries through to a more energy efficient building than would have been built otherwise.

- Stipend incentives to designers lead them to develop energy-efficient designs.
  A stipend incentive is offered to designers to encourage them to do the steps necessary (such as computer modeling) to be able to design a more energy efficient building. These incentives are distinct from incentives offered to owners for installation of measures.
- Because of program incentives, owners incorporate recommended measures from technical assistance reports.
  Owners may install the measures, not only because of the incentives, but also because their architect recommended them, and possibly because of ROI analysis, among other things; however the program offers incentives primarily to motivate owners to install the recommended measures. It is important for the evaluations to test the program logic and to also explore what might be driving the installation in addition to the incentives—the assumed driver.
- Participating owners are enthusiastic about their projects and are willing to highlight them as case studies at the NYSERDA website.
  The premise is critical to the marketing process for the program, which is primarily being promulgated with case studies.

Medium and Long Term Research Issues

The medium and long-term research issues address the larger questions of whether the program is actually resulting in market and long-term environmental effects. A few of these are noted below:

- The combination of technical assistance and stipend incentives provided to A&E firms, and the active involvement of program-recruited Outreach Project Consultants, lead to changes in the frequency or number of energy efficiency measures and strategies suggested by A&E firms in non-program buildings they designed.
  The model assumed in this research issue is summative for these various actions (TA + stipend to A&E + OPC involvement = more measures in non program buildings designed by participating A&E firms). The program premise is that the TA + stipend + OPC is the means by which A&E firms learn enough to be able to apply the ideas on their own to projects that don't have technical assistance or incentives from the program.
- Opinion leaders in the design community participate in the program and influence other designers to participate.
  Diffusion theory suggests that opinion leaders (versus large firms or most commercially active firms) will be the most persuasive to other designers. The evaluation should explore whether opinion leaders are participating in the program and influencing other designers.
- The combination of technical assistance and stipend incentives provided to A&E firms lead to increased use of whole building modeling for non-program buildings designed by participating A&E firms.
  This research issue assumes a summative relationship between program features in terms of influencing participating A&E firms to use whole building modeling for their work on non-program buildings. It is likely that fewer A&E firms will use whole building modeling than just design more efficient buildings.

Over the next few of years, evaluations of the NCP program will use the above issues to structure research agendas. At the same time, as the program evolves it will be important to revisit the logic model and program analysis and perhaps identify new research issues or modify those that have been generated here.

Lessons Learned

The program analysis team learned that explicit logic modeling can be a low priority to some program designers and implementers. Though these individuals had given a great deal of thought to the design of the NCP and the theory behind the program, they did not have the time to invest in the process of explicitly modeling the project or conducting the program analysis steps. Designers and implementers are correctly focused on getting a program into the field, making weekly and daily decisions about implementation and keeping the program progressing toward its annual goals and objectives.

This may be more of a lesson confirmed than a lesson learned. Evaluators have the sense that logic modeling tends to be pursued by evaluators more often than by program designers and implementers. Nonetheless, it is important to recognize this at the outset of any logic modeling and theory development effort. For NCP logic modeling and program analysis, staff time was initially difficult to obtain, but the team persisted in seeking program staff input and concurrence. In the end, the involvement of all key program staff in the discussions, especially the program manager who makes final decisions, led to the program analysis being better understood and the logic model being more consistent with the program.

A second lesson is that logic modeling and program analysis require not only technical skills and knowledge, but also good listening and facilitation skills. Because logic modeling may be a low priority for program staff, it is necessary for the logic modeling team to be able to facilitate discussions about the program, the program analysis and the logic model, and to be able to take the time to listen to the response from program staff. It is not necessary for staff to articulate the model and the theories, but it is important to recognize that they developed the program theory and thus, if they do not buy into the logic model and analysis, any work that flows out of the modeling process, such as evaluation research and reports, risks limited acceptance.

A third lesson is that a program analysis step can reveal issues and risks for the program logic that are not apparent in the logic modeling process. Most commercial new construction programs operating today use a similar program design to the NYSERDA NCP. Therefore the program managers had every reason to believe that their program would be as effective as they hoped. Yet in the process of the program analysis, issues that other programs were seeking to solve, as to how to get designers to willingly adopt and commit to advanced energy efficient design practices, were identified. The program analysis step provided an opportunity to look at these same issues relative to the NCP. Additionally, by looking at social science theories, the program analysis team was able to go deeper into the program design logic and assess whether it was consistent with the theory. These revelations in the logic modeling and program analysis process will not only influence the questions the evaluators examine, but have begun to provide the program staff with fodder for thinking about opportunities to further refine the program.

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