

Integrating Technical Education and Training into Energy Efficiency Program Delivery: A Strategy to Drive Program Participation and Create Short Term Impact and Long Term Market Effects

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ABSTRACT

To realize the significant savings necessary to meet energy savings goals, meet carbon reduction goals and ensure our energy future, energy efficiency program strategies must evolve beyond simply paying for savings. The evolution will include educating, and empowering current and future generations of designers, developers, owners and operators on methods and practices to save energy on every project – not just those supported through an efficiency program.

ComEd has developed an integrated approach to support short-term program savings goals and long-term market effects goals in the *Smart Ideas for Your Business*sm New Construction program. Historically, education and training were not part of an integrated program delivery strategy. It was a separate effort (if it was included at all) with no relationship to strategies to drive program participation, increase savings or to impact the marketplace.

Education and training is essential in transforming the market to use energy efficient technologies and practices. While incentives can motivate and marketing can raise awareness, training bridges the gap between theory and practice. It provides the hands-on learning necessary for behavior change. And change is the necessary prerequisite for a transformed economy, one that is more energy efficient, productive, and environmentally responsible.

Introduction

ComEd's *Smart Ideas for Your Business* program grew out of the '2008-2010 Energy Efficiency and Demand Response (EEDR) Plan' which commits ComEd to implementing a comprehensive portfolio of demand-side program solutions. The plan was filed with the Illinois Commerce Commission in November 2007 as a response to enactment of Public Act 95-0481 which created a new Section 12-103 of the Illinois Public Utilities Act. Over the three year plan, ComEd will help its customers save approximately 188GWh of energy.

Throughout the program planning and design process, it was clear to ComEd that meeting future statutory goals could not be accomplished and sustained without including market transformation strategies. Technical training and education provide a powerful tool for market transformation and support ComEd's EEDR Plan objectives:

- Lay a solid foundation for energy efficiency programs going forward by investing in the program infrastructure needed to support comprehensive and integrated approaches to energy efficiency.
- Build customer awareness of energy management options and the relation between energy use and environmental impact.

The impact of education and training has been measured within the energy efficiency industry and other industries as well. For over 20 years, the training and development industry has contributed a rich body of work around training impact measurement, evaluation, and return on investment in both the public and private sector (Phillips 2003 and Kirkpatrick 1994).

There are documented energy savings resulting from attendance at targeted efficiency education programs as well. The U.S. Department of Energy's *Compressed Air Challenge* program documented 149 MWh/year average project savings per attendee (Lawrence Berkeley National Laboratory and Xenergy 2004) and the Energy Center of Wisconsin's *Better Buildings, Better Business* Residential Conference estimated \$0.5 - \$2 million in energy savings. (Bensch, 2006)

Education and training is essential not only for the market transformation strategies needed to meet the EEDR Plan objectives, it is a good fit for commercial new construction programs specifically. There are measureable and known market barriers to designing energy efficiency into a new building that targeted training programs can address. Some of the market barriers are:

- Need for integrated design approaches
- Lack of awareness and understanding by building owners, designers and architects of high performance buildings and their potential energy savings
- Preconceived notions regarding high performance building design difficulty
- Perceived risk of using new practices and systems

ComEd selected the Energy Center of Wisconsin to implement its new construction program. The Energy Center has expertise in running a commercial new construction program as well as expertise in delivering training programs that meet the twin goals of driving program participation and transforming the market.

ComEd launched its new construction offering June 1, 2009. The focus of this paper is to show the impact of education and training in meeting the first year program goals. The program's goal is to save .596 net MWh by May 31, 2010 and an additional 1.98 net MWh by May 31, 2011. Savings will come from the energy efficient design and construction of new buildings and from major renovations of existing buildings in the private-sector nonresidential market. It is anticipated that MWh goals for energy efficiency in the new construction market will continue to increase in future program years, further emphasizing the need for building a strong foundation of energy efficiency through education and training.

ComEd's strategy to meet both its MWh savings goal and longer term market transformation goal is to integrate education and training with traditional new construction technical assistance tools such as building energy modeling and design services. This strategy drives program participation to create short term impacts while simultaneously training the professionals who will go on to create the long term market transformation.

Documenting the effectiveness of this strategy, including behavior change resulting from attendance at education and training programs, is an integral part of the ComEd program. The Energy Center builds evaluation mechanisms into its education and training programs in order to analyze the effectiveness of its program offerings. This paper will review ComEd's program results to date to determine the effect of this integrated strategy.

Program Design

The Smart Ideas for Your Business New Construction service offers financial incentives and technical assistance to encourage building owners, designers and architects to exceed standard, new construction, renovation and lighting practices. The technical assistance component uses a building science approach during the early design phase of a project to provide key technical information and address construction design processes and construction management practices.

In addition to technical assistance and incentives for specific building projects, the program offers education and training sessions on complementary topics for architects and engineers. The educational workshops are designed to change behavior and transform the market. These workshops are presented by industry and trade professionals who work in the market, know industry best practices and understand the technical issues. The trainings are full-day workshops and offer continuing education credits that many of today's professionals require. Training topics and content match program incentives and address energy efficiency design principles. Offerings range from energy efficient lighting design to designing high performance buildings using an integrative design process. The education and training component is expected to achieve beneficial impacts that extend beyond the life and scope of the new construction program.

Program Theory

ComEd's *Smart Ideas for Your Business* New Construction service and incentives program theory focuses on the potential participant—those offerings and services that are needed to drive both program participation and create a longer term attitudinal and behavioral change that will provide savings after the program has ended. To address these dual objectives, the overall program logic model (Figure 1) creates offerings that encourage participants to incorporate design approaches and efficiency measures.

A critical element of the logic model is an understanding of key market actors and the barriers that must be overcome through program interventions. For the ComEd New Construction offering, interventions include:

- financial incentives (measure, performance and design)
- technical assistance (influence specific building design and create knowledge for long-term influence)
- education and training (provides a conduit for technology transfer to field implementation).

The goal of the new construction services is kWh savings and all of the program interventions are designed to work together to meet specific savings levels. However, education and training is both a specific task of the program as well as a naturally occurring event associated with providing technical assistance to projects and interacting with owners and design teams. Because of this, a market transformation element as seen in the short and intermediate effects section was incorporated into the logic model to capture these expected changes.

The program was designed using the *International Energy Conservation Code IECC 2006* but switched to IECC 2009 when the new code was adopted at the state level.

Figure 1. ComEd New Construction Program Logic Model

Objective	Market Barrier(s) Addressed	Program Activities/ Outputs	SHORT TERM Effects (1 year)	INTERMEDIATE Effects (2-5 years)	SHORT TERM Effects (1 year)	INTERMEDIATE Effects (2-5 years)
					Metrics	Metrics
<p>Designers adopt HP buildings as the standard design process</p> <p>Targeted Market Actors</p> <ul style="list-style-type: none"> Architects Engineers Lighting Designers Design/build firms 	Lack of technical knowledge of design approaches	Provide design incentives	Participants will include HP design strategies in projects	Increase in A/E's stating experience in designing HP buildings	Reach x number of A/E directly	Reach x number of A/E directly
	Lack of ability to market to the client	Hold 10 technical and non-technical training	Increased knowledge of HP buildings	Increase of demand for HP in RFP's, building programs	Training attendees will include HP design strategies in a minimum of x buildings	Training attendees will include HP design strategies in a minimum of x buildings
	Lack of awareness and understanding of what HP buildings are and the potential savings	Identify key prof organizations	Increased requests for program information	Increased attendance at training events	Provide technical design assistance to x projects	Provide technical design assistance to x projects
	Lack of confidence/perceived risk in performance of design and/or equipment	Work with prof orgs and programs to disseminate information	Increased willingness of prof orgs to work with ComEd	Future projects done with same client will include HP design practices	Award x number of technical design grants	Award x number of technical design grants
	Preconceived notions regarding HP building design difficulty	Conduct targeted email communications on regular basis	Increased attendance at training events	Product manufacturers focus on how their products are HP	Increase in number of A/E firms offering HP design x% over baseline	Owner sees codes as the lowest performance level and requires state projects to perform x% above code
	Perceived risk of using new design practices and systems		Training participants will transfer knowledge to co-workers	Prof orgs offer more continuing education programs on HP building design	x% increase in number of buildings exceeding current energy code by x% over baseline	x% increase in number of buildings exceeding current energy code by x% over baseline
<p>HP Buildings will be requested by decision-makers</p> <p>Targeted Market Actors</p> <ul style="list-style-type: none"> Owner occupants School officials Facility managers Building operators 			Increase in A/E participation in trainings	State of IL continues to support energy efficiency		Site inspectors review building performance metrics in addition to basic code requirements
				University and technical college system adopt HP building standards		

Legend: Dashed boxes represent “Designers” and shaded boxes represent “Decision-makers”.

Integration of Training, Marketing and Field Implementation

Even though education and training is a market transformation activity, it can be integrated into a resource acquisition program as a marketing intervention. It is used to drive program enrollment and quicken the acquisition of the resource. Market transformation is defined as a strategic effort to intervene in the market, causing beneficial, lasting changes in the structure or function of the market leading to increases in the adoption of energy efficient products, services and/or practices. (Schlegel, J., et al. 1997). Resource acquisition emphasizes obtaining savings by subsidizing energy efficiency measures.

In commercial new construction programs, education and training activities are used to overcome barriers to program participation such as resistance in the design community to adopt new practices, reluctance by owners to accept increased first cost for efficient options, and tendency to design individual systems for worst-case conditions rather than efficiency of an integrated system over the range of expected operating conditions (Vogen et al, 2006).

However, because traditional incentive based utility programs have targeted their energy efficiency program offerings at lighting contractors, HVAC installers, etc. and not toward design professionals, their traditional marketing techniques did not reach the design professional.

To reach this audience, it is essential to take advantage of a critical element of the profession: design professionals must attend continuing education programs to maintain their credentials. Education and accreditation activities are so central to their practice that leveraging continuing education opportunities to provide utility program information is an effective means to increase program participation. In short, the training and education portion of the energy and efficiency program goes where the architects and engineers like to receive information, not necessarily where utilities typically deliver it.

Another significant element in reaching this audience is USGBC's LEED green building certification system. Currently LEED is the most effective tool in the marketplace for promoting sustainable building design. ComEd's New Construction program incorporates incentives for buildings achieving LEED Silver rating or better. For the design professional who is a LEED accredited professional, each training is approved for the continuing education credits necessary to maintain their LEED status. The LEED rating system is also incorporating into each curriculum presented.

The education component of ComEd's *Smart Ideas for Your Business* New Construction service targets people who can potentially make energy-related decisions or influence the use of energy. It is a strategy to advance knowledge and technical capabilities and inform a targeted audience about the new construction offering. A group of training attendees is a self-selected, pre-qualified pool of potential program participants. They are actively seeking information about an energy efficiency topic or skill they are not yet capable of doing themselves.

The new construction program uses live training events, presentations at architectural and engineering firms and development of strategic relationships with associations to drive program enrollment and project leads. All of the training offerings are approved courses by the American Institute of Architects (AIA) and the United States Green Building Council (USGBC). By attending the training workshops architects, engineers and LEED Accredited Professionals can meet their mandatory continuing education requirements for licensure. While no direct incentive is given to attend the training, participants learn about program design incentives they can take advantage of and fulfill their continuing education requirements, which are essential in their professional careers and can be a major motivation to attend training. This combination helps fill the project pipeline and provides a quick start approach for the program.

Design professionals and traditional utility trade allies often attend the same training programs as they seek to advance their practice and network with potential customers. Traditional trade allies are a good source for identifying projects with quick energy savings potential (those projects that are well into the design/construction process). Design professionals are a source of future potential projects that can be influenced earlier in the design process. Finally, in terms of changing the commercial construction design paradigm, there is an anecdotal networking benefit from having trade allies and professionals mix at the live events because they learn from each other. Typically there is no interaction in the field—trade allies work under the contractor and have very little contact with the professional design community.

The importance of connecting face-to-face with potential program participants at live events is supported by a recent study co-sponsored by the MPI Foundation, The Event Marketing Institute and George P. Johnson. The *EventView 2009 North America* “indisputably confirms the live experience as the marketing channel that best accelerates and deepens relationships. Respondents also recognize face-to-face interaction as key to events’ advantage in creating these relationships over other marketing disciplines.”

Results to Date

To determine how effective the strategy of integrating an education and training component into ComEd's *Smart Ideas for Your Business* New Construction service has been, we:

- Reviewed post-training evaluations (immediately after event)
- Conducted and analyzed follow-up evaluations (7 months and 2 months respectively after event)
- Analyzed program participation
- Analyzed correlation between training program participation and behavior change

Training Workshops Offerings

ComEd's *Smart Ideas for Your Business* New Construction program started in June, 2009 and workshops were offered in June, September and November. Each workshop was a skills-based program presented by experts in their respective fields. All were developed based on 'Best Practices' for adult learners. (Laurel, D. 2003)

Table 1 is a summary of the number of training attendees, the number responding to the evaluation and the overall workshop evaluation score. This evaluation was done immediately following each workshop.

Table 1. Training Attendance and Evaluation Summary

Date	Training	Attendees/ Respondents	Evaluation Score*
6/17/09	Lighting & Daylighting Design with Efficiency	108/58	4.66
9/23/09	Commissioning & Retro-commissioning	67/61	4.40
11/3/09	Energy Efficient Lighting: from Principle to Payback	74/39	4.41

*On a scale of 5.0

Training Evaluation

The Energy Center has been using a consistent evaluation protocol for over ten years. The standard program evaluation measures several dimensions of customer satisfaction (e.g. overall, faculty, amount learned, etc.) Over this time, the Energy Center has developed benchmarks for all training scores, and programs that do not meet this satisfaction baseline (currently 4.3 on a 5 point scale) are eliminated or re-designed. The evaluations also measure intent to implement changes. Two of the training workshops received follow-up surveys to assess changed behavior as well as program participation as a result of the training.

Each workshop identifies what the participant can expect to learn or do as a result of the training and the follow up evaluation measures the success in accomplishing that goal. An example of what someone who attended the 'Lighting and Daylighting with Efficiency' training could expect to learn is listed below:

- Evaluate lighting designs in existing buildings for quality and energy efficiency
- Explain daylighting strategies to meet LEED™ standards
- Identify lighting strategies for net zero energy buildings
- Describe the latest lighting technologies to ensure energy efficient design
- Identify daylighting principles for future projects

The typical training workshop is primarily made up of architects and engineers with most of them being LEED-AP. This group has the most influence in design of buildings and therefore training that can be directly applied to their building projects have the most impact in the market.

Since the value of most education and training lies not in the immediate reactions of trainees, but in changed practices, attitudes, or preparedness, the Energy Center developed customized evaluation methods to meet ComEd's needs. This customization ensured that the full outcomes of education and training events were captured and documented.

For each training workshop the Energy Center provides a summary report that captures attendee scores. At a minimum the following categories are evaluated:

- Training objectives
- Overall grade
- Training content
- Presentation of content
- Training logistics
- Learning satisfaction
- Implementation of ideas presented

At the two lighting workshops presented in June and November, 2009 participants were asked two questions that measured their intent to explore or implement ideas presented at the training. This is a critical piece of information because it helps measure how effective the training workshop was and serves as a baseline for future evaluations and explorations. Below is the summary of their responses:

- I picked up ideas my business will *explore further* - 91% and 85%, respectively answered positively
- I picked up ideas my business will *implement* - 81% and 68%, respectively answered positively

The two lighting training workshops were particularly effective in getting the attendees to explore and or implement new ideas presented.

Follow up Evaluation Survey

Another critical element in evaluating training programs is to determine behavior changes and program participation as a result of the training offerings. The Energy Center implemented a follow-up survey with attendees from the two lighting training workshops. We selected the lighting programs because high efficiency lighting projects are a cornerstone of all new construction programs, especially those that have just been launched. High performance lighting projects provide a significant portion of the electricity savings goals in a compressed time

frame—on average 6-12 months as opposed to the average new construction project timeframe of 12-30 months.

Additionally, lighting is a highly nuanced, design driven energy efficiency measure where the educational component can be tailored to address that perspective. By aligning the lighting training with the unique traits of the design professional community; focusing on a reduction in total lighting power densities (watts per square foot) instead of lighting technology; and providing achievable targets to encourage adoption has helped build the pipeline of projects and quick savings in the new construction program’s first year. All of the projects in the program have addressed lighting as an energy efficiency strategy among other measures.

An on-line follow-up survey was sent to all qualified participants. Utility representatives, including program managers were removed from the list in order to focus on those who specify, design and implement lighting projects in the field.

Survey Evaluation Results

The follow-up survey for attendees of June's *Lighting and Daylighting Design* training had responses from 13 of the 103 attendees (12.6% response rate) and November’s *Energy Efficient Lighting* training had responses from 14 of the 66 attendees (21.2% response rate).

Below are select questions and responses from the follow up evaluation.

Question 1: Which of the following statements best reflects whether and how you applied the training information in your job?

Response	June 2009	November 2009
Didn't do anything with the information presented	0%	0%
Filed away for future reference	15.4%	21.4%
Passed along ideas/information to colleagues	46.2%	35.7%
Tried out an idea I picked up	15.4%	0%
Made an on-going change to my approach to lighting	23.1%	42.9%

Question 2: How influential was the training in your decision to try this idea or make a change?

Response	June 2009	November 2009
Provided a small nudge	0%	16.7%
Was a significant factor among several	100%	66.7%
Played the biggest single role	0%	16.7%
Don't know	0%	0%

Question 3: How likely is it that you will apply information from the training in the future?

Response	June 2009	November 2009
Very likely	25%	50%
Somewhat likely	62.5%	50%
Very unlikely	12.5%	0%
Don't know	0%	0%

Question 4: How influential were other aspects of ComEd's *Smart Ideas for Your Business* program (incentives, program information, etc.) in your decision to try this idea?

Response	June 2009	November 2009
Provided a small nudge	0%	16.7%
Was a significant factor among several	50%	66.7%
Played the biggest single role	0%	16.7%
Don't know	50%	0%

While the response rate was relatively low the given results suggest that the training program is contributing to market transformation. Results show that the likelihood of applying the information gained from the training to future action is extremely likely. Follow up research will continue with the next level of questions to help determine if intent becomes reality.

Program Participation and Results

Each week program participation is measured by applications accepted and received, MWh reserved and installed and incentives paid (Figures 2-4). This gives a clear picture of how the program is doing towards meeting its savings goals. The program is on track to meet its reserved goal by the end of February and the installed goal by the end of April. The reserved goal reflects projects with technical assistance completed and energy measures agreed upon. Installed goals are projects completed with on-site verification to ensure energy measures were installed.

Figure 2. MWh as of February 13, 2010

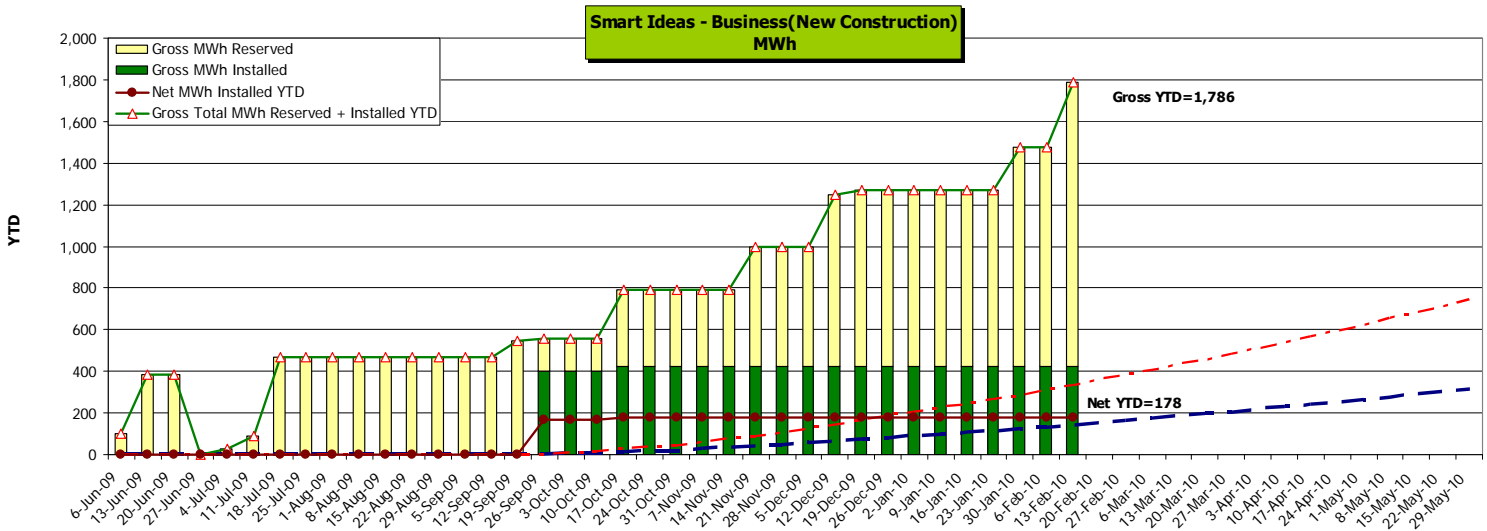


Figure 3. New Construction Applications as of February 13, 2010

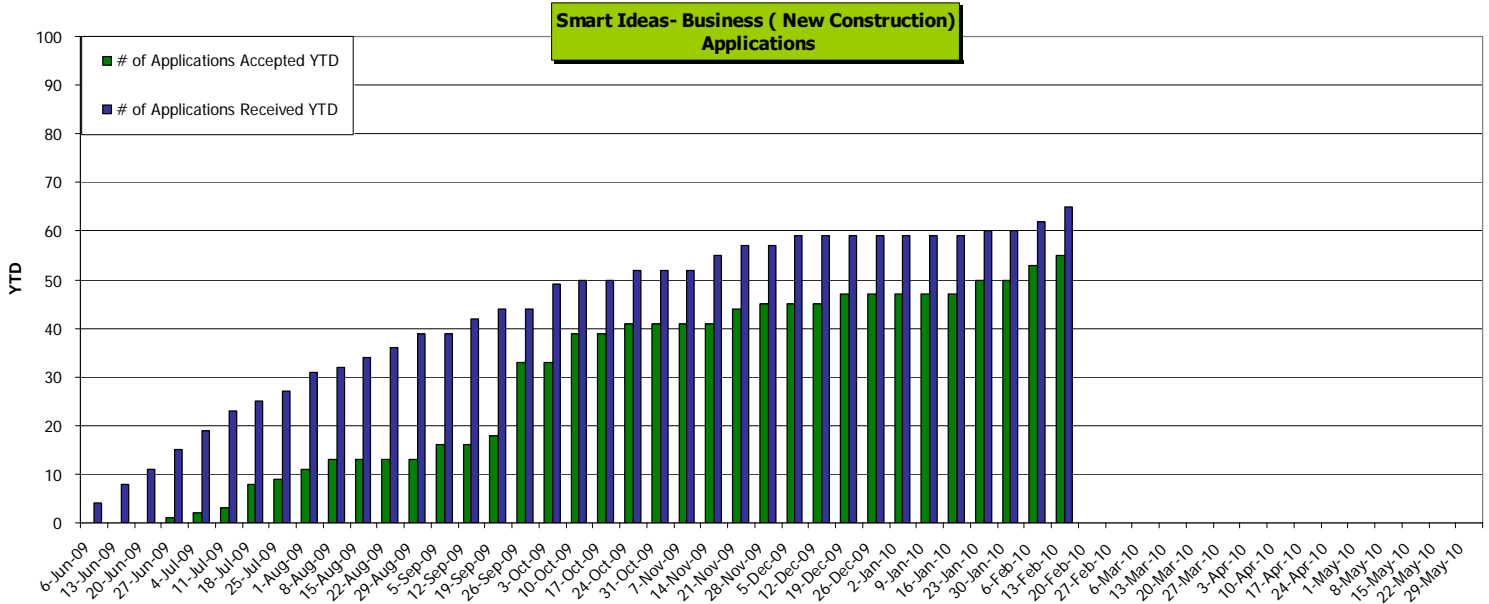
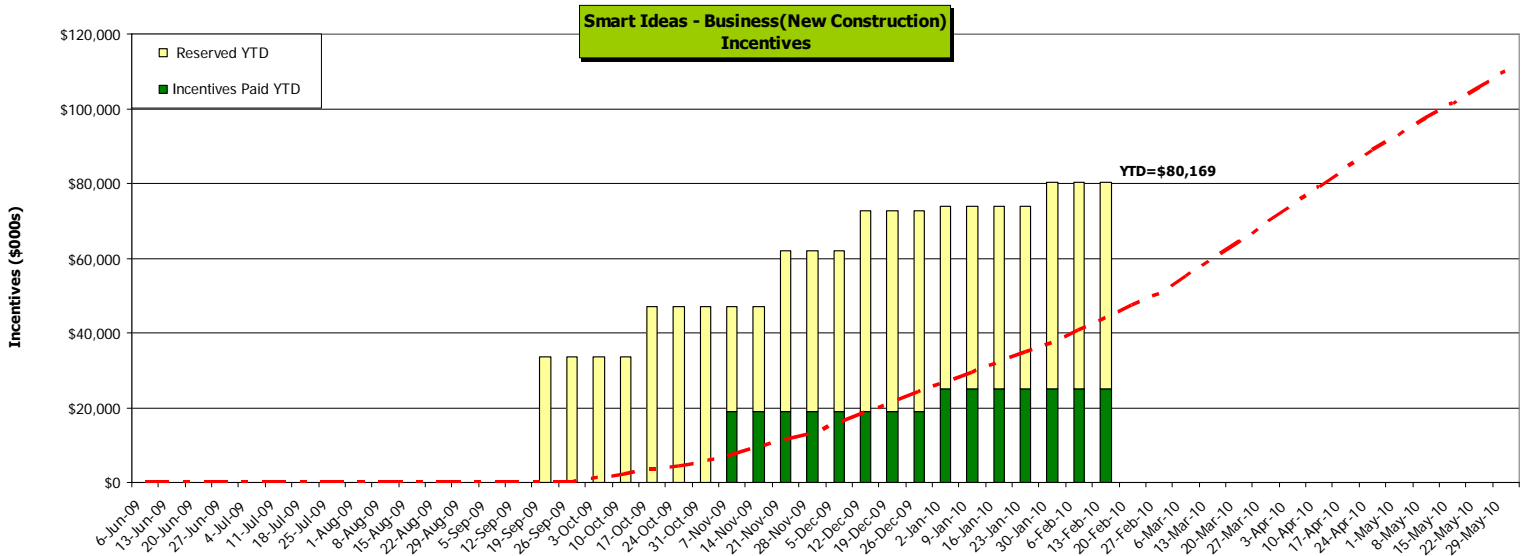


Figure 4. New Construction Incentives as of February 13, 2010



The new construction offering has to overcome many challenges to meet its goals:

- In 2008 Northern Illinois entered the DSM market with its first programs, so there was no awareness of locally available incentives to support energy efficiency.
- Program goals required energy savings from new construction projects in the first year. This is problematic because the average new construction project timeline spans 12-30 months. Many of the projects accepted in 2009 will not be complete until 2011.
- An increasingly stringent code (IECC 2009) has raised the baseline for the program which simultaneously reduces potential energy savings and increases the cost to achieve remaining savings measures.

- Incentives are limited to electric (kWh) savings. (Refer to Figure 4. Incentives)
- Lastly, the economic recession has slowed the new construction market by constricting available capital and increasing commercial vacancies (which reduces the need for new facilities). The savings goals are appropriate given the market conditions. (Refer to Figure 2. MWh)

Despite the hardships, the new construction program accepted 30 (46%) new projects for the first year, and has an additional 35 (54%) projects in the pipeline for the second year. (Refer to Figure 3. Applications)

The integrated education and training component of the program provides additional support toward meeting program goals by raising awareness of the benefits of energy efficiency in the design community. Where incentives provide direct influence (money) for achieving efficiency, education and training provides the indirect influence (behavioral change) to achieve the goals. To further leverage limited resources the education and training offerings have used both local and national expertise and partnered with established market leaders with like minded goals. For example, the American Society of Heating, Refrigeration, and Air-conditioning Engineers, the American Institute of Architects, United States Green Building Council, Illinois Department of Commerce and Economic Opportunity, and Illinois Clean Energy Foundation have all contributed to promoting the programs, trainings, and services for the benefit of their constituents.

Correlation between training and program participation

Tracking program activity and performance is extremely important and extremely challenging particularly for a new construction program; however the evaluation results to date are very encouraging. 337 total people have attended training workshops including attendees from six firms with a total of 11 projects in the New Construction program.

Conclusion

Education and training is a powerful tool that can help meet both short term energy savings goals and longer term market transformation goals. It has proved particularly effective in programs targeting energy savings in new building construction.

ComEd's *Smart Ideas for Your Business* New Construction program employs education and training to drive program participation. It offers a series of technical training workshops, presentations at architectural and engineering firms, and materials that complement the design assistance and incentives offered through the program. The combination of these interventions is the framework for market transformation. Program participants learn the strategies, skills and techniques that will help them create more energy efficient buildings in the future, long after ComEd has ceased to offer incentives.

In year three of the New Construction program (starting June 2010) five more training workshops will be offered along with the design assistance and program incentives. New construction projects in the pipeline now will be completed, giving opportunities to document their results and to encourage additional projects to be submitted to the program. Additional

follow-up evaluation will also be conducted to determine behavior change as a result of the training efforts. These results will be critical as we examine the success of the program and identify changes needed to measure the long term market effects.

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