

Light-Years Ahead: A New Approach to Transform Commercial Lighting

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ABSTRACT

Vermont and New York are leading the nation with the first ever statewide efficiency utility and a central administrator for delivering systems benefits charge (SBC) funded efficiency programs. Under these efficiency frameworks has emerged an innovative new approach to transform commercial lighting practices. The two approaches are spearheading similar efforts that shift the traditional focus of promoting equipment to promoting — and providing the proper tools for — high quality efficient lighting design.

This paper describes and contrasts the two programs, the theory behind them, and provides limited results and lessons learned. Both programs target small- and medium-sized commercial new construction, renovation and lighting remodeling. They set stringent lighting performance standards for each building space type. In addition, they require that lighting systems be properly analyzed and assessed in terms of certain important metrics, including vertical and horizontal illuminance, visual probability factors (glare) and color rendering. Lighting designers, suppliers and contractors are provided with tools, incentives and assistance to perform these analyses that are currently often ignored, resulting in excess energy use, poor quality and concomitant reductions in productivity, or both. The goals of these programs are not only to acquire lighting efficiency savings, but also to transform the capabilities and common practice of lighting practitioners to ensure high quality, high efficiency and aesthetically pleasing spaces. While these programs are independent, they both coordinate with and enhance a regional effort at lighting market transformation currently underway in the Northeast, while going significantly beyond that effort.

Background

Vermont and New York are leading the nation with the first ever statewide efficiency utility and a central administrator for delivering system benefits charge (SBC) funded efficiency programs. Under these efficiency frameworks has emerged an innovative new approach to transform commercial lighting practices. The two approaches spearhead similar efforts that shift the traditional focus of promoting *equipment* to promoting — and providing the proper tools for — high quality efficient lighting *design*. Efficiency Vermont — Vermont's statewide efficiency utility tasked with delivering all of Vermont's SBC-funded programs — promotes high efficiency lighting design under the Comprehensive Track of its Commercial Energy Opportunities (CEO) program. The New York State Energy Research and Development Authority (NYSERDA) — New York's administrator for its SBC-funded programs throughout all of New York State except Long Island Power — targets the small commercial lighting market with its Small Commercial Lighting Program (SCLP).

Small Commercial Lighting Market

Lighting energy use represents approximately one-third of the New York commercial and industrial electricity use, nearly one-quarter of the State's total electricity use (EIA 1994, 1995, NYSERDA 1997). In Vermont lighting represents a similar share of electricity consumption (VT DPS 2002). Projects involving lighting change outs occur frequently, often without an emphasis on energy efficiency and lighting quality.

New York has an estimated 1.5 billion square feet of commercial space less in buildings less than 25,000 square feet (1.9 billion square feet including small industrial space). These buildings use an estimated 10,800 gigawatt-hours per year for lighting (EIA 1995, NYSERDA 2001). An estimated 200 to 400 million square feet (250 to 500 million square feet including small industrial) of this space is remodeled or renovated annually, and approximately 20 million square feet of new commercial space is built each year in New York (Steven Winter Associates, Inc. 1999). In Vermont, similar proportions apply, with approximately an additional 200 GWh of small commercial lighting energy use undergoing retrofit, replacement, remodel, or are installed in new buildings each year (VT DPS 2002).

In small commercial facilities, the vast majority of lighting is designed not by lighting designers, but by electrical suppliers or contractors (Opinion Dynamics 2002). Often, installations are based on outdated standard rules of thumb, and rely on standard fixtures and layouts without regard to such things as vertical and horizontal light distribution, reflectivity, glare, and color rendition. The result can be a loss of potential efficiency combined with poor lighting quality.

Both NYSERDA and Efficiency Vermont offer prescriptive incentives for customers to purchase and install high efficiency lighting fixtures at the time of new construction, renovation, remodel or replacement. Fixtures promoted include direct/indirect, low glare, and other high efficiency fixture types. Combined with proper design, these fixtures can substantially reduce lighting energy use and provide better lighting quality. For example, in one case study for SCLP, a typical 2 foot square electronically ballasted T-8 fluorescent system was originally designed for an insurance office. The equipment and standard design, in and of itself, are generally considered efficient and in fact promoted by many utility efficiency programs. However, in this project a manufacturer's representative and installation contractor together designed an alternative system. Using indirect/direct pendant mounted fluorescent fixtures, compact fluorescent wall-washing and occupancy sensors, the system saved 0.67 watts per square feet with minimal incremental cost.

Efficiency programs that do not address lighting design are likely to find high efficiency fixtures installed on a one-for-one replacement with existing fixtures, or based on typical spacing criteria for older fixtures. Without attention to proper design and use, much if not all of this efficiency potential may be foregone. Worse, spaces may be poorly lit, potentially reducing user utility and discouraging future lighting efficiency investments.

In creating high quality, energy-efficient lighting in these spaces, decision makers face many barriers, including:

- lack of information, or easy access to it, on the reliability and performance of lighting products and systems and lighting's impact on other building systems; and
- a perception that efficient lighting results in poor aesthetics (Vorsatz et. al 1997).

Additionally, the industry market structure traditionally does not make it easy to compare combinations of lighting components and analyze system interactions. The development of standardized guidelines and tools incorporating high quality lighting design principles creates new opportunities to reduce these barriers.

To capitalize on these opportunities NYSERDA and Efficiency Vermont have developed market transformation initiatives primarily targeting mid-stream market actors, including electrical engineers, installation contractors, lighting suppliers and retailers, and manufacturer representative agencies. The initiatives require strict attention to important lighting design parameters, but also provide the tools and information to assist market actors in analyzing these parameters, and financial incentives to both the mid-stream market actors and the end-users to encourage adoption.

Program Summaries

NYSERDA's Small Commercial Lighting Program is one of a group of **New York Energy Smart** market transformation programs NYSERDA administers with SBC funds. In 2001, NYSERDA launched SCLP to offer an energy efficiency program to the small commercial market (buildings \leq 25,000 sq. ft.) not served by NYSERDA's Standard Performance Contract Program or by the more sophisticated approaches of the New Construction program. SCLP works in concert with the **New York Energy Smart** Smart Equipment Choices Program prescriptive lighting incentives by providing design tools and establishing specific design requirements that participating market actors must meet. These actors — suppliers and contractors — are eligible for financial incentives to cover their incremental design and administrative costs for a limited number of projects. These incentives are described in greater detail below in the Program Incentives section of this paper. The program design theory is that once these actors have participated in a number of projects they will incorporate these new skills in many future projects without the need for additional design incentives.

Efficiency Vermont's Comprehensive Track is promoted as a component of its Commercial Energy Opportunities (CEO) Program. CEO is a multi-end-use program that promotes efficiency at the time of natural market events (e.g., new construction, renovation, remodeling or equipment replacement on burn-out) to non-residential markets. It provides both financial incentives and technical assistance to customers. In 2001 Efficiency Vermont began development of the Comprehensive Track component to provide enhanced incentives and services to those customers willing to pursue more comprehensive, systems approaches to energy efficiency and address interactions between measures and end uses. While all non-residential customers are eligible for the Comprehensive Track, it is designed to target new construction and major renovation.

Customers can choose one of two approaches to participate in the Comprehensive Track. The "enhanced" approach requires customers to sign a memorandum of understanding (MOU) with Efficiency Vermont ensuring they are motivated to pursue maximum efficiency, and offers comprehensive building simulation modeling and design assistance and incentives to identify all potentially cost effective efficiency opportunities. Customers also receive enhanced financial incentives for installation of identified measures. Because of the high costs and time involved in the Enhanced approach, it is limited to large new construction projects.

The “Simple” approach was developed as a way to encourage a greater level of comprehensiveness among small and medium-sized commercial customers. It is initially targeted only at office and retail construction. It provides a prescriptive participation track with enhanced customer incentives combined with trade ally incentives, design assistance and tools to encourage high efficiency lighting design, and high efficiency HVAC equipment along with proper HVAC sizing based on calculated cooling loads. While customers must install high efficiency properly sized HVAC systems to participate, this paper addresses only the lighting portion of the Comprehensive Track.

Because the lighting portion of the Efficiency Vermont Comprehensive Track Simple Approach is quite similar to NYSERDA’s SCLP, and because SCLP has been available to customers longer and has more results and implementation experience than Efficiency Vermont’s program, the remainder of this paper describes first NYSERDA’s approach and results, with explanations of where the Efficiency Vermont approach diverges.

Program Descriptions for SCLP and CEO

Guidelines for Efficient and Effective Lighting

High quality lighting can deliver many benefits. In addition to energy efficiency and operating cost savings, these can include: increased functionality, visual appeal, productivity, safety, retail sales, and business profitability (See for example Heschong Mahone Group 1999; 2002; The Lighting Research Center 1999; The Rocky Mountain Institute 1994). By focusing on lighting systems as opposed to individual components, SCLP and CEO (the Programs) have the opportunity to promote both efficient components *and* ensure that the customer receives a high quality system that optimizes the inherent component benefits, avoids the pitfalls that can be associated with inappropriate use of high efficiency fixtures, and enhances aesthetics and productivity. The Programs incorporate the following six lighting performance metrics to ensure high quality design.

Energy use. SCLP requires that the lighting power density (LPD; in watts per square foot) must be at least 10% lower than the ASHRAE/IES Standard 90.1-1999 using the Building Area Method. SCLP allows for incorporating lighting controls to reduce the lighting power density. CEO requires a more stringent 15% minimum improvement, and also requires a slightly more stringent use of the “space-by-space” method. In addition to the LPD requirements, CEO requires a minimal level of lighting control methods

Luminous intensity. This parameter addresses glare and acceptability of view of light fixtures at two critical angles: 55 and 65 degrees. The SCLP metric requires 300 candelas at 55 degrees for open office plans and 600 candelas at 65 degrees for all other applications except for low/high bay installations where the requirement is 1000 candela at 65 degrees. CEO does not have specific requirements for this and the next three factors, but requires analysis and consideration, as described more fully below. This value is found in fixture photometric/specification sheet candela distribution tables or charts.

Illuminance uniformity. This refers to the variation in light levels across the space. SCLP requires that light fixtures be installed within the spacing criteria specified by the

manufacturer to ensure even light levels throughout the space. This information is derived from the fixture photometric report.

Vertical illuminance. Light levels on vertical surfaces, such as on walls. SCLP calls for uniformity specifications for light on vertical surfaces based on the spacing criteria listed on the fixture photometric report.

Horizontal illuminance. Light levels on horizontal surfaces, measured in footcandles for various space categories. SCLP requires varying illuminance values depending on space type, based on published values by the Illumination Engineering Society of North America.

For the last four metrics, CEO does not mandate specific values like SCLP. Rather, it suggests typical expected ranges and requires that each of the metrics are analyzed and reported on based on photometric data. Based on these results, Efficiency Vermont may flag certain parameters that fall outside normally acceptable ranges and work with the customer to ensure that they fully understand the visual impact of their design, and may suggest improvements. In many cases it is expected this will result in a redesign and better lighting quality. However, customers may have good reason to diverge from standard IES recommendations – CEO simply ensures that this is only done intentionally. For all the lighting analyses, CEO specifies a number of required default values for things like lamp lumen, luminaire dirt, and luminaire surface depreciation factors as required standardized assumptions to ensure consistent and appropriate analyses.

In addition to the above, CEO also requires a minimum level of efficiency for lighting controls. While additional financial incentives are available for things like occupancy sensors and automatic daylight dimming (based on an average of 75% of the incremental cost over standard practice), all participants must meet the following:

- Multi-level switching: All office applications must include multi-level switching.
- Individual controls: All private offices and conference rooms must have separate lighting controls.
- Perimeter circuits: All fixtures within 10 feet of perimeter windows must have separate controls from interior space fixtures, as well as multi-level switching.

NYSERDA offers a web site tool to qualify projects and quantify program electrical savings based on information supplied by project applicants. Efficiency Vermont may do this in the future, but currently requires a hard copy or electronic submission of worksheets. In addition, CEO offers to perform the photometric analysis for the customer in lieu of its engineer, vendor or contractor, if desired (see below).

Lighting Market Infrastructure

The Programs build upon existing relationships between suppliers, distributors, contractors and customers. The distributor is seen as able to exert a strong influence on the electrical contracting community. The contractors in turn have the most direct influence with their customers when lighting project designs are being developed. SCLP enlists distributors to host and conduct lighting and program training sessions for contractors. This has proven

an effective strategy in reaching out to the contracting community. SCLP has established a statewide network of over 70 participating lighting supplier locations to support participating contractors. Suppliers' in-house lighting specialists and sales staff are trained to provide technical support to contractors on project design. Distributors are offered incentives to host contractor training sessions, which NYSERDA delivers. This strategy has resulted in a cadre of lighting suppliers and contractors in New York that have bought into the program, and have learned the tools and techniques to begin to analyze the lighting metrics above. In some cases, we find that these market actors rely on manufacturers' representatives to perform the lighting analysis.

CEO is generally designed to also work with, and build on this similar infrastructure. However, in Vermont we find that the level of sophistication, even among electrical engineers doing lighting layouts for new construction projects, is lower. As a result, the early experience CEO has had has been working with engineers to assist them in performing the necessary lighting analyses. It is anticipated that as the program ramps up greater outreach and training to distributors and contractors will take place. This should provide long-term market transformation benefits to the remodel and replacement markets as well as new construction.

A fundamental market transformation strategy of the Programs is to: 1) work with the upstream market actors to provide the tools and develop the skills to properly analyze lighting quality and optimize design; and 2) create demand for these services, both from customers (with financial incentives) and from the upstream actors (with trade ally incentives). It is hoped that once some actors begin to incorporate these procedures into their toolbox, they will offer them as a way to differentiate their services and offer their customers both better lighting systems and the opportunity to receive lower bills and program incentives. In fact, we are finding indications that this is happening. A SCLP Ally Contractor designed and installed an unconventional and upscale lighting system for a furniture store. A highly efficient, direct pendant mounted fluorescent system was installed in lieu of a standard incandescent track system that is typical of furniture store lighting. The storeowner was so impressed with the system performance and appearance that he is incorporating the same design at his other two stores.

Program Materials and Marketing

The Programs use a number of tools for training, delivery and marketing. In addition to the above contractor training, SCLP provides education for contractors, designers, distributors, manufacturers, building owners, tenants and trade associations on the benefits of effective, energy-efficient lighting, the program design requirements, and techniques for selling better lighting.

The Programs are designed to build on, and enhance the Northeast Energy Efficiency Partnership's (NEEP) DesignLights™ Consortium (DLC), which both NYSERDA and Efficiency Vermont participate in. The DLC *KnowHow™ Series* design guidelines and case studies support the basic program message by providing general education on how to achieve high quality design. As part of DLC, lighting suppliers and contractors in NY and VT are also receiving these materials and training on high efficiency lighting through separate channels. SCLP has also made extensive use of Lighting Resource Center technical materials.

To date, CEO has marketed the Comprehensive Track primarily to trade allies by leveraging other activities, including newly developed statewide building code training, and its recent Building Solutions conference. Customer marketing has been primarily personal contact. Outside of trade ally driven projects, it is expected that most other Comprehensive Track projects will be identified through the existing business development channels Efficiency Vermont uses to bring customers into CEO. Essentially, project managers will encourage participation when working with an appropriate candidate in other areas. Because of the energy requirements of Vermont's unique Act 250 land use legislation, Efficiency Vermont is often able to engage directly with a high proportion of commercial and industrial new construction projects.

The Programs also uses a variety of additional marketing strategies, including: direct mail to both trade allies and end users; presentations at association meetings; web site; video news releases (VNR) (SCLP only); and case studies (SCLP only).

Program Incentives

The Programs use somewhat different financial incentive structures to encourage participation. They both offer participating trade ally incentives to “push” the market, while only CEO offers customer incentives designed to “pull” the market by enhancing customer demand for better lighting. By convincing their customers to adopt effective, energy-efficient lighting projects, contractors can typically sell higher margin projects, and better differentiate their services. As a result, the SCLP strategy concentrates on short term, limited trade ally incentives — combined with education, design support, and sales tools and techniques — to influential mid-stream players that are time or number limited and phased out relatively quickly. CEO does not have any time or numerical limits on trade ally incentives, although it will monitor the response and adjust or eliminate incentives as appropriate — the basic program theory remains the same.

SCLP incentives include:

- Ally Distributors are offered \$500 cash incentives to host and promote SCLP qualification training seminars. Distributors interact daily with the contractor target audience and are a strategic avenue to recruit contractors for training sessions.
- Contractors who complete the SCLP qualification training and complete eligible lighting projects receive \$500 per project, up to a maximum of \$5,000 for the first 10 qualifying projects submitted. This incentive is offered to primarily cover the time spent designing and documenting the qualifying project and filling out SCLP evaluation worksheets and application forms.
- Design and implementation competitions provide cash awards and publicity for outstanding designs. Each year, the most active project participants will also receive cash awards and recognition.
 - The Lighting Design Competition will award applicants who submit and complete the most effective, energy efficient lighting projects in two separate categories: Office Lighting and Retail Lighting. First Place Awards are \$5,000, Second Place \$2,000, and Third Place \$1,000 each.
 - The Participating Contractor and Supplier Competition will award money to the contractors and distributors/suppliers that install or sell the greatest

number of eligible effective, energy-efficient lighting installations. Because larger Ally organizations have an advantage of being able to submit greater numbers of qualifying project, SCLP offers two competition categories: large (30 or more full-time employees) and small (< 30 employees) contractors. The awards for each category are \$10,000 and \$5,000 for first and second place.

CEO incentives include:

- The lighting designer (engineer, supplier, or contractor) receives a \$250 incentive for each qualifying project. As with SCLP, this is primarily intended to cover the time to perform the lighting analysis and submit the appropriate CEO paperwork. There are no limits to the number of projects a designer can receive incentives on. Efficiency Vermont has also provided an additional \$250 when more than one party was involved in the design. For example, both an architect and contractor collaborated on a project and both received the design incentive. Efficiency Vermont recognizes that some contractors may be unwilling or unable to perform the lighting analysis – even with help – despite a customer’s interest in participating. In this case, Efficiency Vermont offers the lighting analysis service in lieu of providing the design incentive.¹ To date, trade allies have seemed satisfied with this level of incentive.
- Customer incentives of \$1.00 per watt/sq. ft. improvement over ASHRAE 90.1 1999 levels for each participating square foot. Efficiency Vermont estimates that this incentive covers, on average, approximately 80% of the incremental cost efficiency improvements. Of course, depending on the design and the likely alternative, in some cases customers may incur no additional cost by reducing fixture counts.
- As mentioned above, CEO will also pay approximately 75% of the incremental cost of advanced control strategies that go beyond the minimum control requirements, such as automatic dimming to respond to daylight and lumen maintenance.

Implementation Experiences

As mentioned above, SCLP’s primary strategy is premised on the recruitment of Ally Distributors who in-turn market the Program to their contractor customers. Initially, outreach was focused on a few select distributor organizations. We found that smaller distributors are also effective in delivering participating contractors and qualifying projects and so SCLP now focuses its outreach attention on a larger pool of distributors through regional coverage.

It was thought that the SCLP Ally Distributor lighting specialists would be the primary technical resource for Ally Contractors, with NYSERDA Account Managers primarily supporting the Ally Distributor lighting specialists. However, Account Managers have found it necessary to provide direct technical support to participating distributors and contractors to familiarize them with the project qualification process. It is hoped that once the Ally Distributor lighting specialists become more familiar with the process, and the Ally

¹ The CEO Comprehensive Track also provides a similar \$250 per project incentive to the HVAC contractor or engineer for performance of the cooling load calculations.

Contractors have performed one to two projects, the Ally Distributor lighting specialist support will be sufficient.

To date, CEO's limited field experience has indicated the program application process may be somewhat burdensome to some trade allies. However, others have found it relatively straight forward, and indicated the \$250 incentive was sufficient compensation for the extra effort. Some cases will likely require handholding by project managers. To a certain extent, this has been expected and sometimes may offer additional opportunities for informal education. Because CEO's Comprehensive Track is targeted to new construction, and CEO has done limited outreach to lighting contractors to date, the early CEO participants have generally been using electrical engineers to do lighting layouts. As a result, CEO has worked with trade allies that have a high level of analytical capability than SCLP has.

Project Qualification Challenges

For SCLP, the chief hurdle in qualifying lighting projects has been the high bar that the six performance metrics establish. Before introduction, few contractors were familiar with these quality metrics. Lighting designs in many cases are based on rules of thumb and historical knowledge, whereby contractors draw on previous lighting installations — good or bad — to apply to the next project. Participant contractors that have limited knowledge of lighting design can become frustrated by the specific attention and design consideration process necessary to analyze and meet the metric requirements. SCLP designers foresaw this and allowed Ally Distributors and Ally lighting design organizations to split the incentive if they complete the application process on the Ally Contractors' behalf. This has helped but there are instances where projects meeting the energy efficiency requirement were disqualified for other reasons. For example, there are a number of cases where fixtures not meeting the luminous intensity (glare) criterion are requested by the end-user or are specified because they are cost-effective and appropriate for the application. When these projects are disqualified it has been frustrating to the project team. Another challenge is taking the time to find compliant fixtures. To remedy this NYSEDA, with the help of Ally manufacturer representative agencies, have developed a list of fixtures that meet the luminous intensity (glare) criterion for Allies to draw upon. This list has been received most favorably and is posted on the SCLP web site at www.nyserda.org/scplp under Program Resources in Design Tools. Anecdotal evidence that SCLP is beginning to have an impact on the lighting industry is that in two cases, fixture manufacturers are incurring the expense to have a number of their fixtures tested so that they can be listed on the SCLP qualifying fixture list.

Efficiency Vermont has found that the required lighting photometric analysis is not only new to contractors, but is new — or at least not standard practice — even to electrical engineers performing lighting designs for new construction in Vermont. As a result, a greater level of technical assistance has been needed. It is hoped that over time, this assistance and training will build capability among the market actors to perform these analyses on their own. While CEO requires more stringent efficiency criteria than SCLP, it does not mandate any particular level of performance for the other lighting metrics (with the exception of CRI). Rather, CEO's focus is on building the capability to perform the analysis, and educating practitioners to ensure that they make appropriate design choices. As a result, projects have not been disqualified as has happened in SCLP. Efficiency Vermont also maintains lists of qualifying fixtures meeting RP-1 Preferred luminous intensity criteria as well.

Program Findings

As mentioned above, the CEO Comprehensive Track has just recently been deployed, and has not undergone any form of mass marketing. As a result, only a few projects have been completed and very limited results or lessons learned exist. From the handful of projects completed or in progress, we find that the concept has been well accepted, and the analyses has helped to ensure quality installations and provide the end-user with additional comfort that they are getting a quality job. Because the CEO projects to date have involved electrical engineers, we have not yet tested the acceptance of the lighting analysis requirements among contractors. Finally, we have found that while the measure level incentives (\$1.00/w/sq. ft. improved) have caused the end users to initially push the participation, the trade allies involved have been pleased to participate, and found the contractor incentive sufficient. It is hoped that these trade allies will now encourage other clients to participate.

Below is a summary of SCLP program quantitative activity.

- 195 Ally Contractor businesses have received Program training.
- 35 Ally Distributor organizations have been recruited
- 69 Ally Distributor locations have received Program training.
- 576 Total Ally affiliated individuals have received Program training. Includes the staff of Ally Contractors, Ally Distributors, and Allies.
- 514 End-user and technical/trade association members have received Program training.
- 790,000 square feet of small commercial space (135 facilities) are active in the program.
- 127,000 square feet of small commercial lighting projects (32 facilities) have been completed.
- 837,000 kWh and 123 peak kW of estimated annual energy savings from complete or active projects.

SCLP Preliminary Qualitative Findings

NYSERDA hired an outside party to perform an early process evaluation of SCLP (Opinion Dynamics 2002). Key findings from this review include:

- The SCLP has been successful in tapping into upstate New York's existing small commercial lighting networks and leveraging these relationships to promote and build the Program. New York City's market structure, however, has been more difficult to penetrate and requires additional research efforts and perhaps an altered program model.
- Distributors, the main targets of the program, are an important focus for the SCLP because they interact regularly with contractors and manufacturer representatives, but they play a limited role in the design of most lighting projects. Most lighting distributors supply a variety of electrical equipment and are not viewed as lighting specialists.

- Manufacturer representatives are excellent targets because they are often involved in the lighting design process. Their objective is to interact with as many lighting distributors, contractors, engineers, and architects as possible in order to get these actors to specify their product line.
- Educating contractors is critical in order to ensure that the small hard-to-reach projects are included and that all jobs are properly installed.
- Contractors state that architects, engineers and lighting designers are also involved in the design of many small commercial lighting projects. This confirms the Vermont experience.
- In the early stages of the program, participants have found that some of the metrics and paperwork are slightly confusing, but they state that the program requirements become easier as they gain experience.
- The current incentives are perceived to be low compared to the additional costs of installing effective, energy efficient lighting. However, the current program structure successfully encourages market actors to attend the trainings and become educated about effective, energy efficient lighting designs. After joining the Program, participants repeatedly interacted with SCLP Account Managers and received a monthly newsletter that continues to educate them about effective, energy efficient lighting practices.
- The SCLP has led to additional energy savings beyond SCLP specific projects because it serves as a conduit for the promotion of other energy efficient opportunities. Through training sessions, Account Managers educate market actors about multiple NYSERDA programs.
- Participants indicate that they are most comfortable with traditional incentive programs, which tend to be easy to understand and participate in. Steps to modify the SCLP to fit familiar easy-to-use processes — such as developing a list of fixtures that qualify — have been done or are being investigated to reduce the perceived burden of the Program.
- Since most participants already work on projects of multiple sizes, raising the size restriction (which had originally been $\leq 10,000$ sq. ft.) to $\leq 25,000$ sq. ft. has allowed contractors and distributors additional opportunities to participate in the SCLP without requiring additional training of these program participants.

Conclusions

The current generation of efficiency programs attempts to promote the latest generation of high efficiency lighting technologies, including such things as high efficiency 2 and 3 lamp fixtures with low power ballasts, deep-cell parabolic fixtures, and indirect lighting. While these technologies can save considerable energy and provide higher quality light, they often require new design tools to realize these benefits. In the worst cases, program participants have simply replaced existing fixtures on a one-for-one basis, or designed new lighting systems using standard rules of thumb designed for different fixture types. This can result in a loss of efficiency or worse, very poor light quality and a perception that energy efficiency is too blame.

The Programs have begun to address this concern by raising awareness of, and building capability for, better design and analysis techniques. What the early experience has

shown is that this is not an easy task. It will require significant effort, outreach, training and intervention, over a period of time to successfully transform practices to the point where contractors, suppliers, or even engineers and architects routinely perform photometric analyses and optimize lighting systems.

At the same time, the early results are encouraging. We have learned that there are significant numbers of market actors interested and ready to learn these new techniques, and that practices and capabilities can be changed over time. Through continued efforts, combined with additional regional and national efforts (e.g., NEEP's Design Light Consortium, Federal Standards, manufacturer influence, etc.), significant improvements in lighting practices can be realized. Without these efforts, the learning curve of better lighting practices will undoubtedly be delayed. This will severely limit the ability of existing and planned efficiency programs to capture potential lighting efficiency lost opportunities, and also limit the market acceptance over time of newer, higher efficiency fixture types. Finally, failure to transform these practices would destine more commercial space to suboptimal lighting quality and potential losses of productivity.

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