

Staying on Top of Lighting Standards by Going Deeper with Design or How to Teach Old Dogs New Tricks

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ABSTRACT

The imminent changes to federal linear fluorescent product standards removing the majority of T-12 lamps from the US market, will increase the minimum baseline energy efficiency level for retrofit projects. This will dramatically reduce previously available commercial lighting savings, an important resource for energy efficiency programs. Program implementers will need other commercial and industrial lighting resources in order to meet rising electric energy savings targets and fill this void.

A comprehensive technique that combines advanced lighting equipment, controls and design principles yields more savings per lighting project (and provides better quality lighting), yet this method remains foreign to the contractors that provide much of the retrofit lighting services in the Pacific Northwest.¹ Program implementers find it difficult to promote this approach with trade allies because it increases project costs and requires more time for design. The Northwest Energy Efficiency Alliance (NEEA), in partnership with several utilities, and the Energy Trust of Oregon (ETO), is piloting this technique with increased program requirements and incentives, and by providing technical training, sales training, and project “coaching”. Pilot programs testing this combination (collectively referred to as the “comprehensive approach” herein) are being conducted between mid-2011 to mid-2012 and target known top-performing trade allies in several states.

Pilot program activities are providing a wide variety of insights into utility lighting program design and implementation. Lessons learned include: a) the necessity to provide detailed specifications and guidelines for project requirements; b) targeting trade allies that are already experienced with basic lighting design, or focus on energy efficient lighting as a large portion of their business; c) the importance of both technical and sales trainings to help trade allies develop and sell projects that meet standards; d) consideration of integrating some of the standards into existing programs and providing training to allies on how to implement these standards, and, e) owner marketing is needed to help the trade allies in the field.

Participating utilities have offered different incentive structures, and have learned the importance of rewarding increased effort and savings. It is important to note that comprehensive program options should be structured and tiered carefully within a utility’s portfolio so that trade

¹ According to interviews by Evergreen Consulting, who is on contract with Bonneville Power Administration, the Energy Trust of Oregon, Idaho Power Company and other northwest utilities to run their lighting trade ally networks.

allies and owners can easily choose the offer that best suits their needs and avoids confusion between offers. Results of the pilot programs will be solidified with both qualitative and quantitative evaluation by summer 2012.

Background – The Situation in the Northwest

The Pacific Northwest, like the rest of the country, faces the challenge of the new federal standards and their impacts on commercial and industrial lighting programs. T-8s fluorescent lamps will soon become the baseline efficient technology on which utility incentive programs are structured. The exact impacts are unknown and difficult to anticipate, but it is clear that the bar for retrofit incentives will be raised. Lighting equipment replacements, especially retrofit conversion to T-8s from T-12s linear fluorescent lamps have long been the “bread and butter” of realized kWh savings for commercial and industrial lighting efficiency programs in the Northwest.² As late as 2010, some service territories in the Northwest attributed over 50% of their commercial lighting savings to T-12 replacements.³

Electrical contractors and other lighting related trade allies have been doing these retrofit projects for the past 15–20 years and have ingrained, almost habitual practices, which includes counting fixtures, determining replacements, and presenting a simple payback proposal to the customer. These lighting retrofit projects typically do not take advantage of current lighting design best practices, do not aim to meet current IES recommended light levels and do not address all of the potential efficient lighting opportunities available in the space. There is great opportunity for program implementers to realize deeper savings and move trade allies toward best lighting practices in the retrofit market.

Changes in Technology

For many building types and applications, one of the next big jumps in lighting savings centers on combining advanced equipment, controls and best design principles that yield greater energy savings per project.⁴ Currently, there is not another market-ready technology to immediately fill the “one-for-one” gap that will be left when the current T12 to T8 conversions’ energy savings resource is no longer commercially viable. Northwest utilities have yet to agree on which emerging products are currently ready for program implementation.⁵ A comprehensive lighting redesign applying current best practices, is a logical component to achieve continued and deeper savings in future program portfolios. However, to be viable, the approach needs to balance contractor costs, owner resources, and utility program cost effectiveness requirements. Applying these techniques remains foreign to a large majority of electrical and lighting contractors that work in the retrofit market. In order to succeed, program implementers need to teach “old dogs” – lighting electrical contractors and trade allies who have been serving utility

² Based on the analysis of the Northwest Power and Planning Council’s 5 year plan.

³ Based on reports of Northwest utility incentives.

⁴ Per CEE’s 2011 review of lighting retrofit potentials, for example

⁵ LEDs are advancing very quickly, but according to DOE’s CALiPER reports, may not be ready with qualified, cost-effective products for many applications.

lighting programs for years, “new tricks” – the basics of lighting design best practices and the integration with controls. The region is grappling with this challenge through a variety of strategies.

Controls

The integration of controls into lighting retrofits forms another component of the comprehensive lighting design approach, with large savings potential.⁶ Northwest commercial and industrial lighting programs have been trying to promote controls with varying levels of success for almost a decade. Trade allies have increased their installation of controls, but it has been “spotty.” Utility lighting specialists need to encourage trade allies, with varying abilities, to consider using and specifying controls more frequently, and then work with the allies to ensure that the controls are operating properly when they are installed.

Some allies have actively embraced controls as a strategy and consider them when they specify projects but this is still shy of a truly comprehensive approach on all of the lighting elements that could be included in any given retrofit project. Moreover, there are trade allies who will deliberately not propose controls because controls increase project costs and increase the likelihood of customer call-backs to adjust and fine tune controls to meet occupant needs. It is clear that controls are not being installed in every project that warrants them, and, in fact, they are often overlooked even when code requires them for retrofit applications.

The Target Audience – Trade Allies

Trade allies who work on energy efficient lighting retrofit projects are a diverse cast of market actors with differing business models. Some contractors in the larger markets specialize in retrofit work full-time. Smaller, more rural markets in the Northwest tend to be served by electrical contractors and distributors that provide lighting services as a portion of their electrical contracting business. Some lighting contractors simply focus on changing out lamps and ballasts with old “rules of thumb” that may have only changed slightly over the years. Lighting design is definitely not part of their skill set.

The immediate goal of comprehensive pilot efforts is to focus on allies who are motivated to learn new methods and to give them the right combination of technical and sales training and project coaching balanced with project requirements that they can actually meet. Some electrical contractors or distributors who work in the retrofit market already have design services within their companies but the lighting designers focus on new construction or tenant improvements and typically don’t cross over into retrofits.

The program’s goal with these companies is to help both areas of the company see the business opportunity associated with applying lighting design to retrofit projects. Distributors typically do have at least one designer on staff and comprehend the pilot’s objectives for applying a comprehensive approach to a project. Distributors are a much smaller subset of the Northwest regional trade ally networks and have the capability to provide designs that can be handed off to the broader group of electrical and lighting contractors. Manufacturer representatives are another potential resource, but this group of trade allies is generally more narrowly focused on sales of new fixtures and products versus retrofitting.

⁶ According to a number of reports, including LBNL’s in 2012 the savings can range from 20% to over 40%.

Design Training for Trade Allies

For trade allies to be able to implement higher quality, more comprehensive retrofit projects that deliver deeper saving, some basics of design need to be taught and required as part of the overall incentive application for utility incentives. Emphasis needs to be placed on delivering lighting retrofit projects that match the quality and quantity of lighting required for new buildings. To do so, trade allies need to have access to design tools or resources that provide a design for them, and know some basic design skills and principles, including:

- Current Lighting Power Density (LPD) code requirements by building type
- Take foot candle readings, in some cases use a light meter
- Be aware of IES lighting level standards
- Include controls in all aspects of their proposals to customers
- Look at all of the efficient lighting opportunities in the space, not just the low hanging fruit

Despite widely varying enforcement of the energy codes for these applications, trade allies should be able to apply code whenever possible in retrofit applications. This has been a tricky situation in the Northwest, as utilities do not want to become responsible for enforcing codes. These standards have been adopted as requirements for pilot efforts but this information has been presented as “lighting best practices” and bringing new construction best practices to the lighting retrofit market.

The Northwest utility programs have learned over the years that the trade ally audience is very “hands on” and there is a limited amount that can be taught in a classroom setting with business competitors in the room. Some Northwest utilities and energy efficiency organizations have coupled training with coaching in the field where lighting specialists provided by the utilities walk the proposed site with a trade ally and “coach” them through the opportunities and make suggestions for improvement. These utility lighting specialists have been a vital link in the field and at trainings to help improve the quality of projects.

Customer Awareness and Sales Training

Most customers are unaware of the added productivity and comfort benefits associated with a quality lighting system.⁷ Some are knowledgeable and are self-motivated to pursue quality designs, but typical customers in the retrofit market only know they need new lighting. Additionally, a lighting project that takes a comprehensive approach and aims to incorporate current lighting best practices is often more expensive, making it more difficult to sell to customers, especially when customers are conditioned (and sometimes forced) to think in simple payback terms. The sales arena is intensely competitive for a trade ally trying to convince a customer to invest in a higher quality project and is often going against another ally who offers the customer a less expensive, lower quality offer.

⁷ See, for example, “Lighting the Way to Best Practices” or “New York Energy SmartSM Small Commercial Lighting Program” – both are ACEEE Summer Study papers on the subject.

To help combat these barriers, trade allies require sales training. They need to learn how to devise quality proposals that sell both the short and long term value of a more comprehensive and expensive lighting retrofit project. They need to develop skills that will help them articulate the benefits of quality lighting beyond energy savings, and sometimes these benefits are specific to the type of customer and building type. This sales approach is a much more sophisticated sale than they are accustomed too. In addition to more sales training, the trade allies need third-party marketing help. They need the efficiency business to provide them with simple marketing tools that help them convince the customers that they should choose the more energy efficient, comprehensive lighting offer.

Added Incentives

The Northwest offers a diverse array of programs and incentives for commercial and industrial retrofit projects. There also is a variety of program lighting calculator tools that trade allies use across the region to calculate incentives, document project details and submit applications for program incentives. Utility program structures broadly fall into prescriptive and custom incentive categories, each with a wide range of requirements that determine a project's classification.

Many of the current lighting incentive models are based on “one-to-one” retrofits of replacing existing equipment with new equipment (regardless if new fixtures are involved). If fixtures are eliminated due to redesign efforts, this “extra savings” may or may not receive an incentive depending on the utility program requirements. Some utility programs offer a “custom” or “site specific” set of incentives that will pay based on a \$/kWh or percentage of installed cost for either a combination of lighting measures that reach a target or for technology applications that are not covered by the one-to-one approach. A new way of addressing the incentive design is needed in order to motivate both trade allies and businesses to make the investments needed to sell and install comprehensive projects.

Leverage Trade Ally Networks

The Northwest is fortunate to have regional utilities and energy efficiency organizations, such as the ETO, who have long supported trade ally lighting technical training. This effort has succeeded in developing close working relationships between the efficiency program staff and the electrical and lighting contractors who bring in lighting efficiency projects. The Northwest Trade Ally Network (NW TAN), a regional training and resource hub for lighting trade allies who serve the region's public utility programs, have conducted training throughout the region for the last five years. The NW TAN and the ETO also provide lighting specialist support and coaching, as well as help trade allies use the lighting calculator tools and sell projects.

Additionally, some of the region's investor-owned utilities have leveraged the work of the NW TAN, providing supplemental trainings and support to their trade allies. In total, the Northwest utility industry works with over 1200 electrical and lighting contractors, distributors, and suppliers to deliver energy savings from commercial and industrial lighting retrofit projects.⁸ Through contact with the trade ally networks, electrical contractors, distributors, and manufacturer representatives are accustomed to engaging with utilities and see the utility-funded

⁸ Current information can be found at the NW TAN Website (www.northwest-lighting.org).

trainings as valuable, not only providing quality technical information, but also providing valuable business development opportunities. These trade ally networks have been an ideal platform from which to leverage and launch comprehensive lighting redesign training.

Overall, there are a variety of components that influence the lighting retrofit industry and there are significant opportunities for increased energy savings. In a growing number of applications, a complete lighting redesign is both possible and economically feasible. The region has several important leverage points and platforms from which to build a structure to drive change, like the Northwest's Trade Ally Network. If the market can be encouraged to embrace a more comprehensive approach as part of their business model, and design and install projects to such a set of specifications, then part of the gap left by the 2012 federal lamp standards could be filled. Admittedly this is a big leap for most contractors in the lighting retrofit industry, but it's critical to build the capability quickly to plan for future savings acquisition.

Given all of the complexity, what does should this new program's structure look like and what are the components? This is the question that NEEA, the ETO, Idaho Power Company, Northwestern Energy and a smaller Bonneville Power Administration (BPA) utility – Idaho Falls Power, set out to answer in 2011 and the first half of 2012, as participants in a comprehensive lighting pilot.

Summary of Pilot Strategies

In May of 2011, a partnership between ETO and NEEA commenced a pilot program to encourage increased energy savings through a comprehensive approach to lighting retrofit projects. Evergreen Consulting Group was engaged to help design the pilot program. Together, Evergreen and NEEA refined the approach, and pilot projects were implemented in the fall of 2011 with Idaho Power in the Boise market (ID), NorthWestern Energy in the Billings (MT) market, and Idaho Falls Power in Idaho Falls (ID). In each market, the program focused primarily on building the skill sets of a select group of trade allies – typically the more active contractors who participate in energy efficiency programs.

The ETO and utility program managers invited a variety of familiar trade allies and looked for a mix of electrical contractors and distributor representatives. This pre-selected group was already dedicated and trusted lighting retrofit companies in the market and had often built their business models by leveraging utility incentives. These allies were also motivated by the awareness that incentives for lighting retrofit projects may be undergoing some significant changes. In addition, it was assumed that these different groups would learn from each other, and partnerships between contractors and their lighting distributors (who do know lighting design basics) could be encouraged.

In developing the pilot program[s], the partnership focused on developing the following program components:

- **Tiered incentive structure:** Starting with ETO, Evergreen and NEEA developed a tiered incentive structure that rewarded the ally and customer for reaching LPD levels below standard practice.

ETO - Incentive structure (capped at 50% of project cost)	
Incentive/kWh	% beyond program LPD requirements
\$0.20	Up to 29%
\$0.25	Up to 39%
\$0.35	Beyond 40%

Idaho Power opted to offer a flat \$0.15 per kWh saved, not a tiered structure, but they did add LPD to their lighting calculator tool to strongly encourage participants to meet or beat local codes.

- **Design Bonus:** The program wanted to reward participating allies for the extra effort to undertake lighting design for a comprehensive project. For example, ETO offered an extra \$200 to each ally who submitted an accepted project with a lighting design and an additional \$300 if the project was sold and completed. The design bonus originally was paid to the trade ally company. However, it became apparent that the bonuses were not being passed through to the individuals promoting the projects, and so were modified to go to the individual in the form of a gift card. Idaho Power gave a \$300 gift card after the completion/inspection of the project.
- **Project requirements:** In ETO territory, trade allies were required to submit evidence of a lighting design that: 1) addressed all of the lighting efficiency opportunities in the space; 2) met or beat lighting power densities requirements, and 3) demonstrated that lighting levels met or beat current IES recommendations. Controls needed to be included and one of the pilot locations required a discussion of “non-lighting” opportunities as well. Idaho Power opted to not require the projects to beat LPDs, but did require some evidence of a lighting design.
- **Target well-known trade allies:** The program leveraged the existing trade ally networks, especially the trade allies who deliver the bulk of saving in the areas (OR, ID, MT) where the pilot was operating. An “exclusive” invitation was extended to these allies to participate in the pilot, as it was assumed that they would be very interested and active in promoting the pilot.
- **Training:** Attendance at a full-day training to participate in the pilot was required. The training included information on project requirements and defined “comprehensive approach” for trade allies. It also focused on the basics of lighting design, highlighting project examples best demonstrated the program’s goals. There was an extensive section on controls and their proper applications. This section was subsequently shortened for later trainings because the original content was determined to be overwhelming. Trainings also featured a sales specialist and included a one-hour segment on how to sell more expensive, higher quality lighting projects.
- **Additional training sessions:** In the Boise training for Idaho Power, the one hour sales training was so well received by the trade allies that they asked for additional sales training. A supplemental half-day sales session on the additional benefits to energy efficiency and making the business case beyond simple payback was added. In the ETO’s territory, the program included two additional trainings; one on the use of the lighting

- design tool, Visual Basic and another on walking through sample project proposals and better articulation on what is meant by a “comprehensive approach” to lighting retrofits.
- **Development of lighting “templates”:** Some of the trade allies who participated in the pilot had design experience (distributors) or access to design tools, but most did not. In order to fill the gap in this capability turnkey “templates” for common retrofit scenarios, especially in office and warehouse applications, were development. To date ten templates have been developed (office, warehouse and school applications) and these were introduced in the trainings.⁹
 - **Lighting coaching:** Program lighting specialist who conducted the trainings also provided one-on-one, in the field coaching. Coaching engagements ramped up quickly after the trainings and lighting specialists went to customer sites with the trade allies to conduct “pre-inspections”, and walked through pilot project proposals and the accompanying lighting calculator.
 - **Marketing materials:** In each pilot area we developed and distributed a marketing piece via the trade allies that was branded with the local utility. The goal was to give the trade ally a third-party tool that detailed the benefits of quality lighting retrofits.

Pilot Results

The pilots have not yet concluded, but there are some preliminary results worth noting. The projects range from commercial to manufacturing, while savings achieved are generally above the levels that can be achieved by just one-to-one replacements. In addition, each of the piloting utility had at least one project accepted in their service territory.

Utility / Energy Efficiency Organization	# of Projects Proposed	# of Projects Accepted	Projected kWh Savings 1:1	Accepted kWh Savings with CL
Energy Trust of Oregon	26	10	2,476,087	2,885,549
Idaho Falls Power	12	4	321,321	428,976
Idaho Power	20	6	273,488	427,882
NorthWestern Energy	11	2	21,578	25,482
TOTALS	69	22	3,092,484	3,767,889

A comprehensive evaluation is underway to document and verify the results of the pilots. It is scheduled to be complete by September 2012.

⁹ These templates were developed in partnership with the Lighting Design lab. Please go to their web site to see the templates. www.lightingdesignlab.com

Lessons Learned

Despite consideration to program design options, incentives and training approaches by experienced team members, the pilot program(s) did not instantly transform the participating lighting retrofit companies into “full-believers” and implementers of this new, more comprehensive approach. We are confident that in most cases, lighting retrofit projects submitted by pilot participating trade allies were high quality projects (achieving deeper savings) than before the running of the pilot, regardless if they took a comprehensive approach or, instead, opted for the more traditional program. This will be verified in the evaluation. Consideration was given to appropriate light levels, more controls were installed, lighting retrofit applications were “tuned” to gather more kWh savings, and other recommendations by lighting specialists were included in the final completed projects. Final results are still pending, but early indicators show that an additional 25–40% kWh savings over simple retrofits is possible, depending on the application and building type.

Changing industry “rules-of-thumb,” business practices, and utility incentive design in the region will take time and will need to incorporate a number of approaches to be successful. Specific items that merit further evolution include:

- Enhance utility program and incentive designs for comprehensive lighting projects while maintaining an option (that does not necessarily compete for attention) for trade allies to use some of the traditional mix of prescriptive and custom incentives.
- Provide targeted training and coaching, both technical and sales, to meet needs of trade allies.
- Develop a targeted marketing and communication strategy to help business owners see the value of participating in incentive programs.
- Streamline training, marketing and program requirements and strategies across the region to help trade allies navigate the complexities of the diverse Northwest programs.

The more specific observations and lessons learned from the pilot program(s) are summarized below, as well as some general conclusions on program design considerations.

The Opportunity is There... with Help

- There is opportunity for significant additional kWh savings for lighting projects that incorporate comprehensive attributes, in the range of 25–40% compared with typical projects. Although the pilot projects are still in the implementation stages, early indicators show increased savings can realistically be achieved with incentives that are cost-effective using standard utility tests.
- There are some trade allies that will embrace the piloted approach, will integrate the comprehensive attributes into their business model, and will successfully sell projects, if the incentive structure supports a strong business proposition. The pilot’s expectation was that a large number of active trade allies would embrace this approach and promote the pilot. In reality, activity was less than anticipated. At least one ally in three of the four pilot markets “got it” and is now incorporating comprehensive attributes into new project proposals.

- A combination of classroom training and coaching in the field with “interested” trade allies by qualified lighting specialists will result in more comprehensive projects. Even in cases where a project did not meet all the full comprehensive requirements, the final installation resulted in more energy savings and better quality lighting than what was previously proposed. The pilot projects are still in process, but many beneficial effects have been noted, including more controls installation, reduction in fixtures or “fine tuning” of lamp and ballast applications for specific areas, higher lighting quality, and appropriate light levels.
- Comprehensive project opportunities exist, although not in every application. Early indicators show that office, warehouse and retail facilities have been successful applications for a comprehensive approach. It is unclear whether this approach is worth the added incentives in low-tech manufacturing where LPD requirements remain high and are easy to outperform. Each application is unique, but the value proposition of dramatically improved lighting with appropriate return on investment approvals, made sense to many business customers.

Ongoing Challenges

- Comprehensive approaches demand more work, specialized skills and training for both trade allies and utility representatives. Training needs to include information on the myriad of technology options/combinations, day lighting, current lighting codes and standards, proper applications of technologies to space requirements, as well as Illuminating Engineering Society (IES) recommended light levels. There is more “art” and sophistication to this than a traditional lamp/ballast/fixture replacement approach.
- Incentive and sales strategies need to be elevated to capture the attention of allies and business customers. Utility incentive design for standard programs should not “compete” with the higher level of incentives needed to promote the more sophisticated effort involved with a comprehensive project. This may necessitate a restructuring of how utility and energy efficiency programs are designed. For example, the ETO released the pilot incentive structure and then went on to release a year-end lighting bonus in order to make annual savings goals. Trade allies that were promoting the pilot were left making comparisons between incentives for the pilot and incentive for the year-end bonus in an effort to find the best incentives – incentive “shopping”.
- Allies and program representatives will learn, over time, which types of facilities, owners, trade ally personnel and other program attributes are required for this type of program to work. Not all trade allies will want to learn, and many are already making money with regular lighting retrofit projects so they are reluctant to change. Careful selection of which trade allies to invest training and coaching is critical. Trade allies may put a great deal of work into a comprehensive project design only to have the owner select another contractor’s proposal that is considerably less money but does not have the inherent value of the comprehensive approach.

It is a “Messy” Market Out There

- Changing the traditional approaches that allies and utilities have used for decades is challenging and will take time. Traditional incentive approaches and utility bonus incentives competed with the piloted comprehensive approach, and won in a number of cases! Utility approaches to review project proposals are already complicated and require various calculators, paper proposals, or even just hand written ideas that utility representatives used to determine savings and incentives. The comprehensive approach will require additional changes in incentives, project caps, new tools, training, marketing, support to trade allies, and other market actors; and all this takes time.
- Lighting technology is changing rapidly, further confusing the choices and best practices for projects. Not only is the world focused on the quickly emerging acceptance of LED applications, but other technologies, such as controls, are evolving as well. Efficient lighting choices are getting more complicated for the market, and utilities need to stay abreast of these changes and determine how they impact a comprehensive approach to lighting retrofits.
- There are other actors that can enter this market. Trying to find the right combination of traditional trade allies (generally sales and installation folks), manufacturers and their representatives, utilities that are committed to their own program and incentive design, various levels of code interpretations and enforcement by numerous jurisdictions, influences of federal lumen efficiency standards, US Department of Energy involvement and communications regarding technology all play a role in the potential outcomes with this approach. There are also many channels through which customers consider and select appropriate lighting retrofit options. A successful program will need to properly identify the right connections for a specific market at given point in time.