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Northwest Regional Strategy for Commercial Lighting Energy Efficiency

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Northwest Regional Strategy for Commercial Lighting Energy Efficiency

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EXECUTIVE SUMMARY

The Northwest Regional Strategy for Commercial Lighting Energy Efficiency was developed through a collaborative stakeholder process for the purpose of identifying promising opportunities and strategic needs to support the region's future success in commercial lighting. The strategy's audience includes anyone seeking to support efficiency in the commercial lighting market in the Pacific Northwest, notably regional utilities, commercial sector program managers and staff, and NEEA management.

Commercial lighting has long been a key source of energy savings for the region, with successful utility incentive programs accounting for well over 50% of commercial sector savings in recent years. Despite this success, recent market developments including new federal standards, rapidly changing technology, and waning potential for simple retrofits portend a more difficult efficiency opportunity going forward in which more sophisticated "comprehensive" retrofits are increasingly needed. In light of this growing medium-term challenge, NEEA convened a group of regional stakeholder experts to examine needs and opportunities in this changing market going forward. Through a structured planning process, the group focused on a single question:

> *What will it take to ensure the region's efficiency success in the commercial lighting market is sustained and flourishes into the future?*

This strategy answers this question and demonstrates that despite market changes, there is still extraordinary untapped opportunity for new investment in commercial lighting efficiency that will build on the region's legacy of leadership in this market.

There are still untapped opportunities for savings in commercial lighting despite increasing market complexity.

Three major findings stood out in analysis of strategic needs and opportunities:

- Utility incentive programs are central to current savings deliveries, with little to no contribution from the codes, standards, or upstream channels that are prominent in other markets.
- Despite their central position and history of achievement, programs will be challenged to deliver continued high levels of savings as the remaining retrofit opportunity becomes more complex and difficult to capture.
- Other savings channels, such as upstream interventions and codes, offer untapped opportunity to save energy through new approaches.

These findings lead directly to two core recommendations:

Advanced Contractor Training: Limited technical knowledge among contractors was identified as a major barrier to programs capturing savings from more sophisticated advanced comprehensive techniques, and *the strategy recommends regional investment in an advanced contractor training initiative*. While there are other barriers impeding a shift to comprehensive programs, a base of highly skilled lighting contractors is a medium-term strategic need for the region.

Ensuring utility programs can capture more complex projects while building complementary upstream and codes/standards savings channels is the key to future success.

Upstream Platform Development: *The region should build the capacity to implement upstream interventions in the market*. Developing an upstream "platform" – savings reporting infrastructure, program processes, and relationships with manufacturers, distributors, and other market actors – will position the region to pursue new savings opportunities. Several specific initiatives could be pursued upstream, but the near-term strategic need is for an upstream channel that can leverage distributors and manufacturers through multiple interventions over time as efficiency opportunities and priorities evolve.

NEEA, in close coordination with stakeholders, will launch new initiatives in each of these areas in 2013.

In addition to these core recommendations, the strategy identifies a range of opportunities across five areas of market intervention: (i) advanced training, (ii) upstream initiatives, (iii) codes and standards, (iv) program coordination, alignment, and leverage, and (v) regional infrastructure. Conclusions from the broader strategy include:

- Current energy codes are not optimally effective in the retrofit lighting market, creating a missed opportunity for a coordinated approach to savings acquisition. Regional understanding of code performance is poor, and near-term research is recommended to inform a targeted strategy.
- Program alignment may reduce market confusion, but is likely to entail significant cost, and is not recommended. However, regional consistency in upstream programs is achievable and promises increase effectiveness. The strategy also identifies other opportunities to leverage regional activity.
- Current support for regional infrastructure, including contractor training, product approval lists, and emerging technology work, is critical to regional success and should continue.

The regional strategy envisions current utility programs, research activities, and infrastructure joined by new upstream efforts, advanced training, and codes and standards initiatives to more comprehensively engage the market. These multiple approaches will function as channels in a broader stream of savings, with each initiative benefiting others in addition to succeeding in its own right. In this future of broad engagement and greater market integration, diverse activities in coordination together create a market ecosystem that supports greater efficiency.

Adding new efficiency activities to an established market under the strategy's multi-channel approach highlights the growing importance of regional coordination.

The strategy identified key actions the region should take *now* to support commercial lighting success in the future. Importantly, strategy implementation is a collective regional task that demands ongoing commitment – no single entity can alone ensure a strategic approach to this large and critical market. Meeting this challenge, the region will be positioned to harvest a growing stream of energy savings from the commercial lighting for years to come.

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1. Introduction

The Northwest Regional Strategy for Commercial Lighting Energy Efficiency is the product of collaboration between the Northwest Energy Efficiency Alliance (NEEA) and a diverse group of regional efficiency stakeholders to identify promising opportunities and strategic needs that will support the region's future success in commercial lighting. This document traces the development of the strategy from its conceptual origins through market research, establishment of a consensus vision, vetting of potential market interventions, and refinement of key recommendations. We believe the strategy demonstrates extraordinary untapped opportunity for new investment in commercial lighting efficiency that will build on the region's legacy of leadership in this market.

1.1 The Commercial Lighting Efficiency Resource

Commercial lighting has been a mainstay of regional efficiency deliveries, comprising over 50% of recent commercial savings for many utilities. The Bonneville Power Administration reports total savings from C&I lighting programs of 56 aMW during the four years from 2008 to 2011, with regional totals expected to be more than twice this amount.[1] Despite aggressive acquisition over the past 10 years, the opportunity is far from exhausted and commercial lighting will remain central to success in meeting conservation targets for the foreseeable future.[2] The market is large – valued at roughly $8.5 billion annually in the US[3] – and the 6th Power Plan[4] estimates 20-year savings potential of 550 aMW exclusive of new construction. New technologies are contributing to still greater opportunity. The market's high achievable potential is unrivaled by other efficiency opportunities in the medium-term.

The nature of the lighting efficiency opportunity is evolving in complexity, with remaining potential increasingly sourced from new technologies installed in concert with complex control systems to achieve deeper savings from "comprehensive" retrofit projects. Our collective challenge is to assess this evolving opportunity and develop the approaches that will ensure the region's success in the commercial lighting market is sustained and flourishes into the future.

1.2 Current State of the Market and Emerging Challenges

1.2.1 Current Efficiency Activities

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[1] BPA's reported savings are attributable to less than 50% of regional consumers by electrical load. Other information corroborates strong program performance. Lighting accounted for 54% of Seattle City Light's 17.4 aMW of Commercial and Industrial savings between 2008 and 2012, during which time annual deliveries increased by 62%. The Energy Trust of Oregon

[2] Nationally, the commercial sector is responsible for roughly 50% of total lighting electricity consumption, not including outdoor lighting (p. xiii). Increasing lamp efficacy, including from LED sources, coupled with untapped potential for use of lighting controls, together create the technical potential to reduce this number by up to 50%. Source: 2010 U.S. Lighting Market Characterization, prepared for DOE by Navigant Consulting, January 2012. California's Energy Efficiency Strategic plan calls out a goal of reducing the electricity used in the lighting market by 60-80 percent by 2020. Source: Lighting Chapter, California Energy Efficiency Strategic Plan, p. 95.

[3] McKinsey & Company estimates the value of non-residential lighting market in the US at 6.7 billion Euro in 2012, approximately equivalent to $8.5 billion (p. 47). Pike research estimates the total lighting market across all sectors is valued at $13 billion (p. 4).

[4] Includes 20-year natural replacement and retrofit potential for lighting power density, daylighting, lighting controls, exterior building lighting, street and roadway lighting, and parking lighting. Does not include new construction. Source: 6th Power Plan Conservation Supply Curves – Commercial.

The efficiency community is currently engaged in the market in a number of ways. Incentive programs offered by most utilities in the region are central and have been the primary acquisition approach to date for commercial lighting. These programs typically include a core incentive offer, tools for calculating savings and incentives, processes for measurement and verification, and program marketing.

Key Concept: Utility programs are at the center of regional commercial lighting efficiency.

Other activities complement program efforts in the market. Utilities have also invested in shared contractor training through the Northwest Trade Ally Network and similar efforts focused on building efficiency skills. Current collaboration around shared infrastructure includes a qualified product list for LED technologies, development of regional energy savings calculations protocols, and a regional website. Stakeholders also share research on topics including emerging technology performance, market baseline efficiency, program design, and contractor skill levels. Joint marketing campaigns have also been used to promote regional efficiency priorities in the market.

Utility programs constitute the bulk of activity in the market. Collaborative regional efforts exist in some areas primarily focused on support functions. Efficiency initiatives do not touch the entire market; for example, the activities of industry associations or distributors have not been significantly leveraged to date in the region. Notwithstanding this sometimes limited reach, utility retrofit programs have been extraordinarily successful at capturing energy savings under the current approach.

1.2.2 **Market Trends**

The activities of the efficiency community take place in a broad and dynamic commercial lighting market that is undergoing rapid change. While current conditions vary somewhat across the region, common medium-term drivers are expected to influence the industry in all markets over the next five years.

Rapidly advancing technology (LEDs): Proliferation of new LED lighting products is driving fundamental change in the market, with LEDs projected to displace 52% of conventional lighting sales over the next decade, virtually eliminating incandescent and less efficient fluorescent technologies.[5] Where two years ago programs were focused on CFLs as an alternative to incandescent A-lamps, LEDs are now sought for higher quality light, better dimmability, and incremental wattage reduction. In downlights, reflector lamps, and other directional applications, LED is now the technology of choice. In outdoor lighting, skepticism over market readiness of products has given way to large-scale municipal investments in advanced street lighting over the last few years. Finally, while general commercial illumination is still dominated by linear fluorescent technologies,[6] LED products are increasingly entering this core market. These trends are expected to continue, with the industry focusing 85% to 95% of product and technology development resources on solid-state lighting.[7] LED installations have grown from essentially zero in 2008 to comprise 20% of savings for some programs in 2012.

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[5] Pike, p. 1, p. 5. Globally, sales-based LED market share of 8 percent in 2011 is expected to grow to 45 percent by 2016 and 70 percent by 2020. This shift to LED will reduce the total lighting market's growth rate through a shift to longer lamp life, with growth rates falling from roughly 4% currently to a projected 1% over the second half of the decade (McKinsey & Co. p. 27-28).

[6] Linear fluorescent technologies currently account for 62% of commercial floor space. (Pike, p. 9) They also comprise 80% of lamp inventory in the sector. (Navigant. 2012. p. 44)

[7] Pike, p. 2.

LEDs provide new opportunities for programs, including retrofit measures for reflector lamps and other applications that previously lacked a high-performance efficient option. Capturing these savings requires care to avoid missteps with a dynamic technology. Though improving, product performance concerns remain and program managers must determine product qualification for an array of new market entrants. Also, with prices expected to decrease by up to 90% over the next decade, incentive levels must be attentively managed to avoid overpaying.[8] More in depth insight into new LED products and applications is available through regional emerging technology efforts.

New federal standards: New efficacy standards for GSFL (general service fluorescent lamp) products went into effect on July 14, 2012, mandating greater efficacy levels for many common T12 and T8 lamps that have been a mainstay of program retrofits.[9] Initial expectations that a standard-driven baseline change would lead programs to cease incentivizing fluorescent retrofits have been revisited due to implementation delays for certain lamps and the emergence of new "compliant" T12 products (see section 5.1.2). This creates a dual challenge for many programs, which must plan for an eventual transition away from linear fluorescent incentives while simultaneously reengaging the market to limit penetration of "compliant T12" and other next generation inefficient technologies.

Waning potential for standard retrofits: Utility programs face dwindling opportunity for traditional retrofits that have long been the bulk of low cost commercial lighting savings. This reflects in large part program success promoting high performance T8 systems over the last decade; with higher market penetration comes reduced future opportunity. Federal standards may also play a role if they prompt conversions previously captured through programs. This reduced potential will require programs to pursue other approaches and different market segments.

An increasingly complex opportunity: Much of the remaining savings potential is complex relative to lamp-for-lamp approaches. Advanced control systems capture savings by confining the use of light to the times and places it is really needed, but require sophistication in specification, installation, and calibration. New technologies push lamp power to ever-lower levels but often demand careful selection to leverage their performance strengths. "Redesign" efficiency from reconfiguration of lighting systems requires design expertise and added expense. Together, these advanced techniques constitute a "comprehensive" approach to lighting efficiency in commercial buildings that is central to future success (see appendix 2, Defining "Comprehensive" Lighting Retrofits).

Economic conditions and government policy: The lagging economic recovery in many areas of the Northwest has hindered investments in lighting retrofit projects in some markets. State and federal government policy promoting energy efficiency has also been a recent driver, mitigating the effects of the sluggish economy on business spending in some states. Though uncertain, future economic conditions and efficiency related fiscal policy will play an important role in the market.

1.2.3 **Summary**

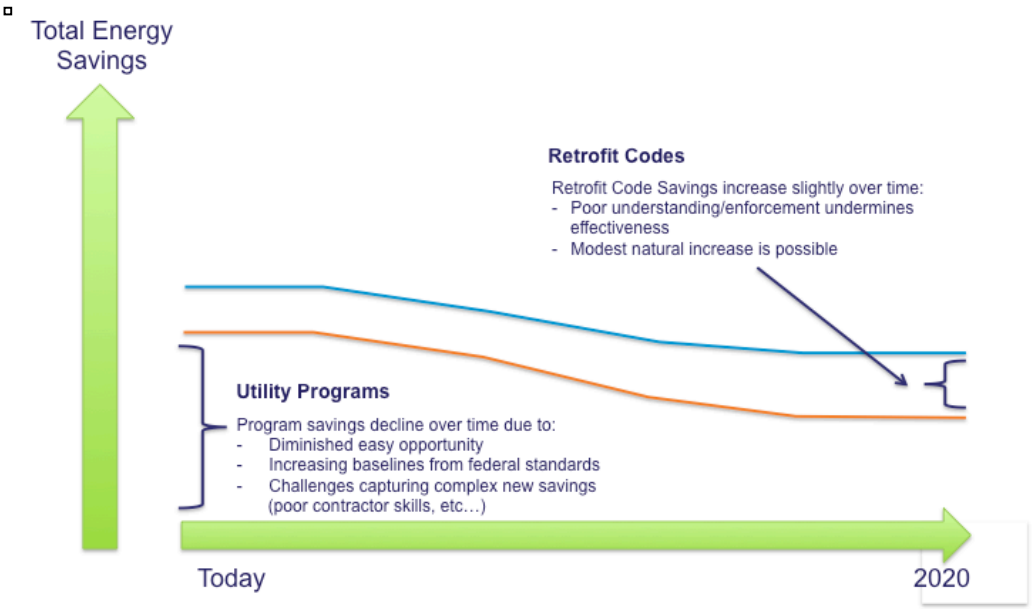
Current activities and market trends raise concern about the future of commercial lighting efficiency and provide the impetus for development of a regional plan for this strategic market. On the current path, two major factors are expected to drive a decline in savings over the medium to long term (i.e. three to ten

[8] Pike, p. 2.

[9] T12 retrofits with high performance T8s have been the most significant source of savings in the Energy Trust of Oregon's program, with an estimated 60% of T12 fixtures in ETO territory retrofitted between 2002 and 2012. (Navigant Consulting 2011, p. 5) Seattle City Light captured over 5 aMW of savings from a time-limited program specifically targeting T12s (this in addition to savings from SCL standard programs).

years out): (i) declining potential for traditional retrofits and (ii) the difficulty in capturing new savings from "comprehensive" sources.

Figure 1: Medium-term Savings Trajectory under Current Market Approach



This situation raises the question of whether medium-term erosion of savings can be avoided, and if so, by what means? This strategy answers an emphatic "yes"; a decline in savings is not inevitable, and new opportunities offer potential growth in commercial lighting efficiency going forward. The balance of this document presents a plan to support future success in this critical market.

1.3 Regional Planning

Recognizing the importance of this market, numbers of efficiency players and programs involved, and new challenges to traditional program approaches, the need for a regional strategy for future success in commercial lighting was apparent. At its core, the strategy seeks to answer a single question:

> *What will it take to ensure the region's efficiency success in the commercial lighting market is sustained and flourishes into the future?*

Consistent with this overarching question, this strategy has two key purposes:

- To determine what the region needs to do *now* to support commercial lighting success in the future and;
- To inform how NEEA can best shape its market activities to deliver value to its regional implementation partners.

Key Concept: The regional strategy is not an effort to centralize utility incentives or program implementation, and its initiatives are non-binding. Instead, the vision is of a natural migration towards more advanced lighting practices and increased regional market leverage.

The strategy is designed to recognize and respect ongoing efforts, acknowledge diverse objectives, and accommodate distinct constraints facing commercial lighting efficiency stakeholders. The effort has a broad scope focused on all market interventions in commercial lighting over a 10-year timeframe.

NEEA convened a group of stakeholder-experts to develop the strategy. This "development group" included utility program managers from across the region, representatives from the Northwest Power and Conservation Council, and NEEA employees working on lighting initiatives, emerging technology, and codes and standards.[10] The group assessed major barriers and opportunities in the market, identified the suite of strategies and tools the region needs to succeed in commercial lighting, and refined these findings into a strategy. The development process is presented in greater detail in appendix 1.

2. A Shared Vision for Commercial Lighting

The first step in a regional strategy was to establish consensus around a vision of the future. This vision informs shared goals, and specific market interventions are designed to address barriers to achieving those goals. This section presents the region's shared vision for the future of the lighting market, details goals, and sets the stage for exploring barriers and market interventions at the core of the regional strategy.

2.1 Vision

The development group identified the following shared vision for the commercial lighting market:

> Utilities, energy efficiency organizations, and market partners collaborate to move the market towards advanced efficiency practices in the Northwest.
>
> - For lighting manufacturers, distributors, and installers, profitability and business success are aligned with promoting continuous improvement in efficiency.
>
> - Ongoing successful utility programs are complemented by coordinated upstream and codes/standards approaches to effectively address the entire market.
>
> - Lighting remains a low-cost source of efficiency that is key to meeting targets.

2.2 Goals

The vision is supported by the following specific primary goals for the medium term:

- Advanced efficiency techniques have gained market penetration, including comprehensive retrofits, sophisticated controls installations, and high quality lighting that meets customer needs.

- Advanced products have gained market share, including linear fluorescent, interior and exterior LEDs, and controls.

- Energy codes are effective in increasing lighting system efficiency.

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[10] Development group members are David Cohan (NEEA), Suzanne Frew, Beth Robinweiler, and Trevor Welch (Snohomish PUD), Vic Hubbard (Franklin PUD), Michael Lane (PSE), Shelley Martin (Idaho Power), Elaine Miller (NEEA), Spencer Moersfelder (ETO), Nick O'Neil (NWPCC), Roger Peery (Tacoma Power), Mark Rehley (NEEA), Joe Vaccher (EWEB), John Wilson (BPA), and Jerry Wright and Art Conrad (SCL).

- Increased consumer awareness results in strong market demand for energy efficiency in lighting.

- Regional efforts establish a strong supply-side business case for efficiency that draws contractors, distributors, and manufacturers. Energy efficiency is profitable for supply-side market actors.

- All market channels are addressed.

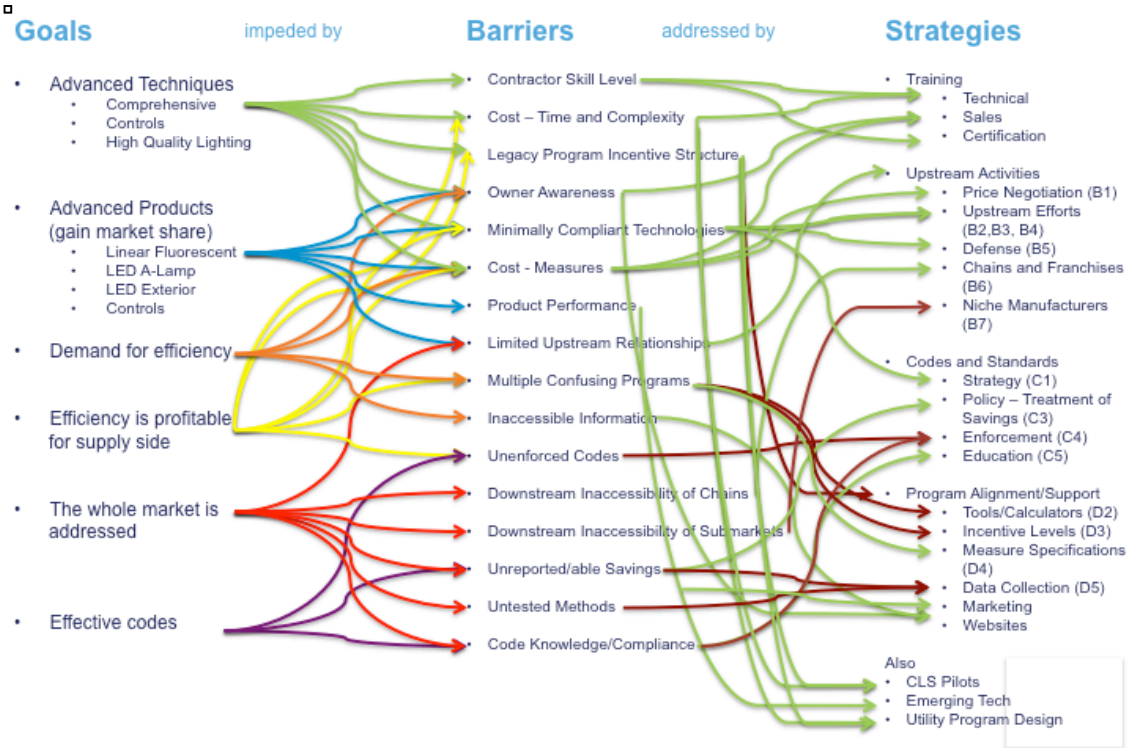
2.3 The Northwest Regional Strategy for Commercial Lighting

From this shared vision and goals for the market, the development group identified (i) key barriers impeding progress towards goals and (ii) promising market interventions that offered potential solutions. Given the large market and diverse goals, over 15 distinct barriers were found, including among others:

- Low levels of technical skills among contractors;
- The complexity and high cost of "comprehensive" retrofit projects;
- Contractors' lack of knowledge of energy codes;
- The high cost of some efficiency measures and;
- Poor performance of some new technologies.

Barriers were then mapped to market intervention strategies designed to address or mitigate the impact on efficiency deliveries. The result was a matrix illustrating how a given *goal* was impeded by a specific *barrier* that could be addressed by a market *strategy*. For example, the *goal* of increasing market penetration of advanced efficiency techniques is impeded by the *barrier* of contractor skill levels, which could be addressed through the *strategy* of training. The completed matrix provides a strategic map linking regional goals to intervention strategies.

Figure 2: Commercial Lighting Efficiency Strategies.



The matrix depicts a market characterized by enormous opportunity, but also extraordinary complexity, and the challenge facing the development group was how to focus. To begin, over twenty market intervention strategies were grouped into five major "intervention areas":

(i) Advanced Training
(ii) Upstream Interventions
(iii) Codes and Standards
(iv) Program Coordination, Leverage, and Alignment
(v) Regional Infrastructure

Each intervention area is explored separately in a chapter linking market background to recommended actions.

2.4 Core Findings and Recommendations

The regional strategy ultimately focused on a set of key findings and related recommendations with the most promise to support continued successful commercial lighting efficiency into the future. These key elements are introduced below and explored in greater depth in their respective chapters.

2.4.1 Key Initial Findings

Utility programs are essential, but cannot do it all. Locally-administered utility programs have been very successful and will remain central to regional commercial lighting efficiency efforts in the long term. However, increasing complexity of the opportunity will require new approaches that complement programs if the region is to capture the full potential of this market at a reasonable cost.

New savings channels offer untapped opportunity. Developing two new savings channels will be essential to comprehensively addressing the market going forward:

- Upstream programs and strategies that promise broader reach, new opportunities for leverage, and lower cost.
- Effective codes that can transform retrofit market practice and deliver savings at low cost.

Trade ally skills are a critical barrier. Both technical and sales skills of trade allies are not currently at the level needed to support comprehensive lighting retrofit projects at the scale needed to achieve goals.

2.4.2 Strategic Recommendations

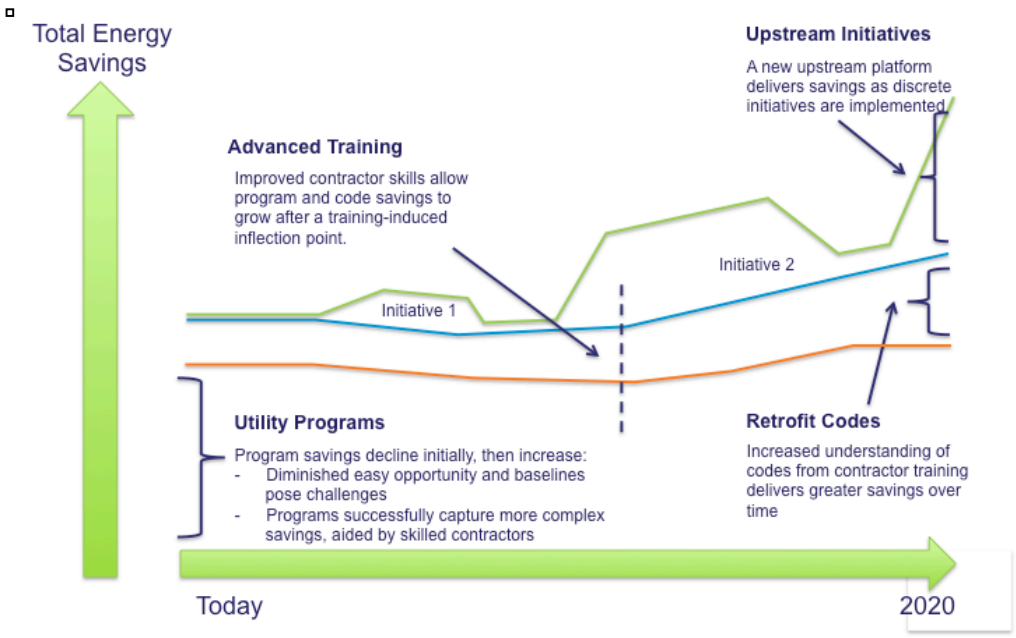
Based on these findings, the strategy recommends collaborative implementation of two efforts in the near term:

- *Invest in a regional advanced training effort for trade allies* to build the contractor capacity needed to implement redesign, advanced controls, and comprehensive retrofit projects. This would be in addition to current training and would focus only on a top tier of contractors.
- *Develop an upstream platform for market intervention*. Several promising upstream initiatives could initially anchor this effort, but the strategic need is an upstream channel that can leverage distributors and manufacturers over time as efficiency opportunities and priorities evolve.

2.4.3 A Future of Multi-Channel Success

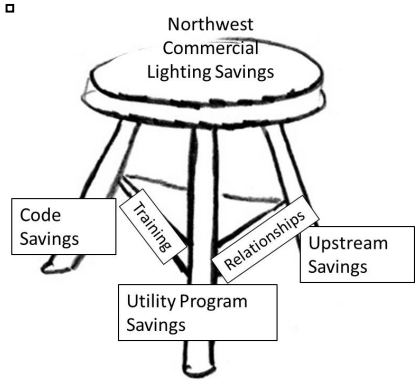
These and other strategic recommendations detailed in the rest of this document can shift the trajectory of commercial lighting efficiency in the Northwest, replacing the gradual decline in energy savings expected under the status quo with a growing stream of conservation from multiple channels.

Figure 3: Savings Trajectory Under the Regional Strategy



Adding upstream and codes/standards channels to complement utility programs moves the region towards a diversified "three-legged stool" approach to the market. This will provide multiple tools to apply to the diverse and evolving lighting conservation challenges of the future. The result over time will be more efficiency, delivered more effectively through regional collaborative efforts.

Figure 4: The "Three-Legged Stool" of Savings



3. Advanced Training

As efficiency efforts increasingly focus on advanced practices, training to build market capacity needed for complex projects is a key medium-term strategic need.

3.1 Current Situation and Barriers

Skilled contractors capable of designing, selling, and implementing high-quality lighting retrofits are essential to utility programs. Recognizing this, utilities have invested in contractor training sessions that have attracted trade allies to utility programs and improved the skill level of the average market participant. Building this capacity has supported the marked increase in program savings over the last several years. Despite this improvement, program manager experience and NEEA's Commercial Lighting Solutions pilots highlights that contractor skills remain inadequate to support program goals over the medium to long term in several areas. Specifically:

- Program mechanics: Many contractors active in efficiency programs fail to successfully complete required forms, applications, and energy savings calculator tools consistently.
- Comprehensive techniques: Few contractors have the mastery of comprehensive retrofit techniques and advanced controls that will be central to capturing efficiency potential in the future.
- Sales skills: Many contractors are not able to consistently persuade their commercial building owner clients to pursue lighting projects that require greater initial investment to maximize energy savings over the life of the project. This results in simpler projects that capture only the most cost-effective savings at a particular site, resulting in lost efficiency opportunity.

Although not all trade allies lack the required advanced skills, the region lacks skilled contractors sufficient to implement the quantity of advanced efficient projects implicit in conservation potential assessments and expected future utility savings targets. This capacity gap is a strategic barrier to regional success going forward.

Key Concept: Highly skilled contractors are needed to implement complex advanced efficiency practices.

Summary: Advanced Training

Priority: High

Current Situation

Contractor skill level is a barrier to success of regional lighting efficiency in the medium to long term as the opportunity becomes more complex.

Intensive courses, online training, and partnering with distributors and industry associations can complement current training and build advanced skills.

Strategic Recommendations

Invest in a regional advanced training effort for trade allies to build the contractor capacity needed to implement redesign, advanced controls, and comprehensive retrofit projects.

Next Steps

NEEA will lead collaboration to further refine the advanced training opportunity with a goal to begin implementation in mid 2013.

3.2 Potential

A cadre of contractors capable of executing advanced efficiency projects at volume will enable the region to meet its future programmatic efficiency targets.

- Operations: Skilled contractors increase program operational efficiency through better compliance with process and measure requirements, and also raise energy savings per project by addressing all lighting opportunities in a space (as opposed to the "low hanging fruit"), using more controls, and incorporating other advanced techniques.
- Comprehensive Program Design: Plans to shift towards comprehensive program designs will depend on contractor skill levels.[11] More capable contractors enable programs to adopt new designs on a more aggressive timeline with greater success.
- Code Effectiveness: A trained contractor base is also expected to increase energy code compliance and savings through improved knowledge of requirements.

Box 1: Contractor Skills – One Barrier Among Many?

Focus on contractor skills as a primary strategic barrier to comprehensive utility programs gives rise to two criticisms. First, that complex program design and related burdensome requirements are an equal, if not greater, source of difficulty. Second, the idea that contractors resist implementing comprehensive projects not because they lack skill, but because pursuing simple retrofits through utilities' standard programs is easier and often more profitable.

The development group recognizes that design complexity and unfavorable relative economics between programs are barriers, and the focus on contractor skills is not meant to dismiss these other challenges, nor to offend the dedicated trade allies who are critical to program success. However, improving contractor skills is a challenge that can be addressed through collective regional action, whereas program design is at its core a utility-specific issue. Utilities are focused on solving program design challenges within their local implementation context – as discussed in the program alignment chapter, addressing these challenges is key to future regional success (the strategy recommends supporting this through increased coordination and program sharing.) At the same time, lighting efficiency is becoming more complex *apart from any local program effects* and this makes advanced training a strategic regional need.

3.3 Plan

The scope and approach for advanced training efforts to improve contractor skills is presented below.

3.3.1 Scope

Advanced training is designed to build on current activities and develop advanced skills among contractors who will be key trade allies in future program implementation.

[11] In shifting program design to more comprehensive approaches, program managers face questions of both the timing and degree of any changes - when is the market ready to move towards comprehensive, and how large should initial steps be? At one end of the spectrum, incremental refinement to current approaches is already capturing additional potential with minimal operational disruption. At the other, an end game of truly comprehensive programs – decoupled from measure-specific incentives, and instead offering broad discretion over product and design choices to directly incentivize overall energy savings – relies critically on trusted, highly skilled trade allies that make a shift to more flexibility acceptable.

- Focus on advanced skills: To support comprehensive programs and advanced technologies training will focus on developing advanced skills needed to design, sell, and install complex efficiency projects that capture greater savings that conventional retrofits.[12]
- Emphasis on sales training and contractor profitability: Training should position contractors to sell investments in advanced lighting to commercial end users, with the goal of making efficiency profitable for contractors.
- An incremental investment: Regional advanced training is designed to be incremental to current training activities, which will remain in place.
- Coordinated implementation: Advanced training programs will be designed to complement current efforts, and may be jointly implemented where appropriate.
- A select audience: Training will focus on a top tier of contractors sufficient in number to support utility program objectives. Improving skills of all market participants is neither practical nor necessary, and is expressly not recommended.

3.3.2 **Approach**

While current trainings offer a potential template for implementation, the development group recommends an assessment of a broader suite of tools and approaches.

- Assess value of new training approaches: Additional half-day trainings similar to those currently used in the region provide one implementation path for advanced training, but there may be benefit to introducing a complementary approach.
- Intensive courses may hold potential: A multi-day class in the context of a certification program could designate contractors meeting certain skill levels. The development group disfavored certification itself on cost and complexity grounds, but an intensive hands-on course could be effective in improving skills and identifying contractors committed to advanced efficiency.
- A role for online learning: E-learning potentially offers a low-cost complement to in-person training sessions with broad market reach. Developing an online training platform that will meet evolving program needs is one potential approach.
- Leverage industry associations: Industry groups such as the National Electrical Contractors Association and assorted union training centers may have capacity and interest in supporting efficiency training. These organizations are active in training their members, but thus far efforts have not been integrated with efficiency programs. This offers a new partnership opportunity.
- The untapped distributor channel: Collaboration with distributors provides a potential new point of contact through which to educate contractors on products and utility program requirements (as well as a new channel for program implementation). Training should be incorporated as part of an effort to develop an upstream lighting efficiency channel (see chapter 4).
- Emphasis on codes: Training is identified as a near-term priority action in support of effective codes (see chapter 5).

[12] For example, assessing the promise of a Northwest implementation of the California Advanced Lighting Controls Training Program (CALCTP).

4. Upstream Interventions

Building an upstream savings delivery channel is a second central priority of the strategy alongside advanced training. Establishing ongoing relationships and program partnerships with key players in the upstream market[13] – composed of distributors, manufacturers, and other market actors one or more steps removed from retail sales to commercial customers - creates a foundation of trust and collaboration needed to identify opportunities and enable initiatives in the medium to long term.

Summary: Upstream Interventions

Priority: High

Current Situation

The lack of a cohesive regional strategy for upstream intervention is a missed savings opportunity.

Collaboration with key upstream players can complement utility programs and deliver significant savings through initiatives.

Uncoordinated upstream programs risk creating confusion among the limited set of market actors.

Strategic Recommendations

***Invest in a regional platform for upstream market* intervention** to both support utility programs and establish a new channel to deliver incremental savings.

Next Steps

NEEA will lead a three-phase scoping, platform development, and pilot testing effort to move towards full program implementation by 2014.

4.1 Current Situation and Barriers

Downstream utility programs working with contractors, suppliers, and building owners on site-specific retrofit projects are the source of most commercial lighting savings regionally, with any upstream activity very limited. Distributors and select manufacturer representatives occasionally attend trainings or regional program manager meetings, with their participation focused on staying apprised of utility program developments and providing market trend information. Upstream markets have historically been engaged as ancillary actors in downstream programs, rather than as key partners in specific upstream initiatives.[14]

Upstream market actors and developments are exerting a growing influence on efficiency outcomes.[15] The replacement lamp market is a key example; although growing in importance as low wattage fluorescent and LED replacement lamps gain acceptance, traditional programs can only partially access

[13] The supply chain map in appendix 7 illustrates the "watershed" of the commercial lighting market, with "upstream" constituting market actors on the wholesale side of contractors (above them in the graphic). The distributor level is sometimes referred to as "midstream" relative to "upstream" manufacturers, but this strategy deemphasizes those semantics.

[14] The success of downstream program obviated the need for a multi-channel approach.

[15] Marketing and guidance the manufacturers and distributors give consumers facing T12 replacement is another example where upstream actions impact regional efficiency outcomes.

this opportunity.[16] NEEA's CLS pilots offer another instance, finding that upstream market actors can play a key role in comprehensive programs because of the lighting design capacity distributors can provide. Finally, interest in claiming the (currently unaccounted for) savings resulting from upstream market activity provides another motivation for engagement.

Box 2: Federal Standards for Fluorescent Lamps – A Case for Upstream Market Intervention?

Recent federal GSFL standards (see section 5.1.2) present a possible opportunity for upstream market intervention. Many in the region feel that compliant T12 lamps threaten program strategies that planned to shift emphasis to new technologies, relying on standards to shepherd the final transformation of the linear fluorescent market.[17] Without effective standards, millions in High Performance (HP) T8 retrofit incentives may still be needed annually to prevent compliant T12s from gaining a market foothold.

To meet their objectives, utilities must influence purchasing decisions made upstream in the replacement lamp market that is beyond the reach of many utility programs.[18] Collaborative relationships with upstream market actors may set the stage for intervention in this decision, potentially bolstering the market's transition away from inefficient T12 systems.

Critical Barrier:

The *lack of working partnerships* with upstream market actors limits the region's access to some opportunities and results in a missed opportunity to capture additional savings.

The increasing strategic importance of upstream market conditions and events has highlighted a lack of regional capacity to intervene upstream as a key barrier. Some utilities in the region have started work upstream. Since 2011 Puget Sound Energy has run a markdown program for qualified LED screw-in, CFL screw-in and low wattage linear fluorescent lamps at the distributor point of sale, and other regional utilities are looking into similar programs. However, these are emerging efforts operating on a modest scale relative to the significant interest and opportunity of a broader region-wide initiative.

4.2 Potential

Upstream program success in other regions and regional experience in lighting and other markets demonstrates the potential of a shared platform for upstream intervention.

4.2.1 Upstream Incentive Programs

Programs offering lamp incentives through distributors have been effectively implemented in both Vermont and Massachusetts. Sometimes referred to as "midstream" approaches, these efforts target low wattage linear fluorescent and LED replacement lamps by offering point of sale discounts on efficient products. In the case of low wattage T8s, incentives of $2 per lamp are sufficient to offset the incremental

[16] Downstream programs are designed to incentivize site-specific retrofits of multiple lighting systems within a building or facility, and often offer replacement lamp incentives as part of a larger project. However, most lamp replacement activity occurs through routine maintenance activity that utility programs do not touch unless they are coupled with a larger upgrade.

[17] Some utilities are disinclined to transition away from the T12 retrofits – for them, ineffective standards are less disruptive.

[18] Utility programs generally have not worked on lamp replacement with facilities not otherwise doing lighting retrofits (see footnote 16).

cost of the efficiency investment. For screw-in LEDs incentives varied, but did not fully offset incremental cost. Distributors' staff promote sale of the efficient products and ensure their use in appropriate applications. These programs have produced impressive results, with Vermont's effort converting essentially 100% of the market to low wattage lamps for a savings of roughly 15-20% over the installed baseline, in addition to capturing savings from LEDs.

Key Concept: Upstream incentive programs are not suited to all measures, but they can complement downstream utility programs to generate savings through high market penetration of simple measures.

Upstream programs rely on market penetration to deliver large volumes of savings from straightforward measures. Lamp replacement offers modest savings per site relative to a full-scale retrofit (which might include delamping, fixture removal, advanced controls, and other measures), but decoupling simple measures from capital-intensive projects allows upstream approaches to achieve relatively high market penetration. In contrast, achieving the impressive project-level savings of traditional retrofits requires process complexity and capital investment that limits uptake.

Figure 5: Comparing Utility Programs with Upstream Incentives

	Utility Programs	Upstream Incentives
Eligible Measures:	**All measures** - Lamp or fixture retrofit - Delamping and fixture removal - Design-based savings - Complex controls	**Straightforward measures only** - Lamp replacement/retrofit only
Market Penetration:	**Low** Barriers: - Capital investment - Contractor capacity - Program administrative capacity	**High** (Efficient process creates potential to capture entire market for some measures)
Aggregate Potential Savings:	**High**	**High**
Savings Channel:	**Narrow and Deep**	**Wide and Shallow**

The table above illustrates some general differences between upstream and downstream programs in commercial lighting. Traditional utility programs can accommodate the full range of efficiency measures and can function as a stand-alone acquisition approach, as is evidenced by their extraordinary success in the region. While upstream programs are more specialized and can only address a portion of the market, they can be a very effective complement to utility efforts.

4.2.2 Other Regional Experience

Regional experience in other markets – notably residential lighting and televisions – provides additional insight into upstream intervention. The region's history of retail markdown residential lighting programs

illustrates (i) ways of counting savings at the measure level, (ii) methods for allocating saving to multiple participating utilities, and (iii) regional implementation designs that allow utilities flexibility around participation levels. NEEA's recent work in the television market demonstrates the potential cost savings of incentive structures that target upstream actors, leveraging expenditure through wholesale economics. Finally, collaborative development of a retail "platform" is relevant to commercial lighting, where there is a similar strategic need to shape the market upstream through repeated intervention over time.

4.2.3 **Broad Potential for Market Intervention**

Potential activities of upstream market intervention include the following:

- Shaping product mix: Collaboration with manufacturers and distributors to bring more efficient products at lower costs to the supply chain in the Northwest.
- Supporting utility programs: Upstream support of programs through product marketing, promotion of incentive opportunities, and design assistance for comprehensive retrofits.
- Offering incentive programs: Creation of an upstream program directly incentivizing efficient lamps at the distributor level.
- Enabling bulk purchases: Negotiated bulk purchases of priority technologies on behalf of utility programs or other conservation buyers.
- Lowering costs: Leveraging wholesale "market lift" incentive structures[19] paid to upstream actors to reduce costs of efficiency.
- Reducing market confusion: The limited current upstream activity creates an opportunity for a coordinated regional approach that will reduce confusion and deliver a simple, understandable, and unified message to the market. Given the small number of distributors active in the region, uncoordinated separate programs risk burdening key program partners with the complexity of the utility industry, threatening success.

Key Concept: The number of distributors in the region is relatively small, and multiple uncoordinated programs risk creating market confusion that could undermine collective success.

4.3 Plan – An Upstream Platform

This diverse potential makes developing *the capacity* to work upstream in the commercial lighting market so critical – while the goals of specific initiatives will evolve, the ability to complement successful downstream utility programs with upstream market intervention is a key strategic need. The strategy therefore focuses on building a "platform" of manufacturer and distributor relationships and related infrastructure needed to support multiple different upstream initiatives over time.

4.3.1 **Scope**

The scope of the upstream strategy includes three broad areas:

[19] Market lift or channel incentive designs pay incentives to supply chain market actors, such as distributors, when their sales hit certain targets (which can be specified in many different ways). Rather than motivating the purchaser by reducing the incremental cost of measures, channel approaches incentivize the seller to promote efficient product.

- Foundational relationships: Developing trust and maintaining productive relationships with manufacturers, distributors, and other market actors is critical to working upstream. These relationships are foundational to implementing initiatives, but also foster the trust and mutual understanding that leads to new opportunities, innovative solutions, and shared success.
- Downstream program linkages: Establishing connections between upstream market actors and utility programs is core to the strategy. These linkages will range from the straightforward – like basic marketing of utility programs by distributors – to the comparatively complex – such as connecting distributor design expertise to contractors installing comprehensive retrofits.
- Upstream program capability: Delivery of incentive-based upstream efficiency programs, including tracking product sales, distribution of incentives (regardless of specific design), and reporting verified savings, is core to upstream effectiveness.

4.3.2 **Approach**

The strategy's approach to entering the upstream lighting market is grounded in the following guidance:

- Develop relationships, then initiatives: The needs and opportunities of relationships with upstream market actors will shape implementation more than the specifics of a preconceived plan.
- Invest for the long term: The ability to intervene upstream in the commercial lighting market will be strategically important over the medium term, and investments should reflect this timeframe.
- Solicit market feedback: Feedback from manufacturers and distributors is essential to developing program approaches that are grounded in market realities.
- Consider both distributors and manufacturers: While most upstream programs involve working with distributors, the strategy recommends also exploring opportunities with manufacturers.
- Assess innovative incentive structures: Upstream programs should consider channel or lift incentive models that have been successful elsewhere and may offer significant cost savings.
- Conduct pilots: Pilots will provide experience either (i) establishing and testing processes for a multiple-utility upstream program or (ii) testing channel incentives or lift model designs.
- Prioritize consistency: Utilities should commit to work towards regional implementation where appropriate to minimize the burden of participation for upstream partners, with the understanding that upstream programs will be designed to accommodate local needs.

5. Codes and Standards

Effective codes and standards are a key pillar of efficiency success in the commercial lighting market. At the same time, limited visibility into energy code compliance in existing buildings and scant coordination between program strategies, code development, and federal standards processes are barriers in the market. There are opportunities to increase effectiveness of codes, including investments that will yield co-benefits to utility programs. The region can also influence federal standards development in the long term.

Summary: Codes and Standards

Priority: Medium

Current Situation

There is no research on current code compliance in the retrofit lighting market, though many stakeholder experts believe that codes are not effective.

Code savings are not currently reported in the retrofit lighting market.

Strategic Recommendations

Establish a focused codes and standards strategy and action plan through additional scoping, stakeholder engagement, and research.

Research code effectiveness, support code education, and develop the capacity to measure and report code savings.

Next Steps

The region will include code education in advanced training efforts and will develop code savings reporting.

5.1 Current Situation and Barriers

Though both are regulatory approaches to acquiring efficiency, codes and standards rely on different authorities and mechanisms in achieving their goals. They are therefore presented separately below.

5.1.1 Codes

In recent years, state and local energy codes have increasingly applied to the alteration and retrofit market. Codes generally are structured so that replacement of a certain percentage of fixtures triggers a compliance obligation, and these thresholds have been tightening.[20]

A lack of information and market visibility: First and foremost, there is a lack of reliable information on the role and effect of codes in the retrofit lighting market. There have been no recent studies of code performance region-wide in existing buildings. As a result, developing a strategy to support codes will necessarily require research and adaptive management as understanding of the market increases.

Ineffective codes: Despite this lack of research, most program managers believe codes are ineffective in the retrofit market based on their experience in incentive programs. Several reasons are identified:

[20] The detail of these provisions varies by jurisdiction. In Washington, replacement of 60% of fixtures requires compliance, while Idaho and Montana use a threshold of 50% (though local variations and exceptions abound). In Oregon, replacement of 50% of *lamps and ballasts* triggers code. The City of Seattle requires compliance if 20% of fixtures are changed.

- Limited understanding: Codes are increasingly complex and hard to understand, and contractor awareness of their applicability to retrofit projects is limited.
- Ambiguous requirements: Triggers for code applicability to retrofits are ambiguous or subject to interpretation.[21]
- Little enforcement: Critically, code enforcement for retrofits is scant in most parts of the region.

Code design: Each jurisdiction has a single energy code for lighting used both in new construction and for code-impacted retrofits. Because codes are generally designed for new construction applications, they can be an awkward fit for retrofit projects in some cases. This can result in high compliance cost that may lessen compliance and undermine savings.

Key Concept: Energy codes are developed for new construction applications and can be a poor fit for retrofit applications, potentially hindering compliance.

No savings reporting: NEEA's codes work is primarily focused on the new construction market and the region currently does not track or report savings attributable to codes in retrofit commercial lighting.

Limited coordination: Coordination between utility program managers, planners, code developers, and the market is limited. Program managers have not been engaged in the codes process and there is no real forum to examine the interaction between codes and other market interventions in commercial lighting.

Box 3: Codes in the Retrofit Market – A New Driver for Programs

While the interaction between programmatic and code savings is nothing new to efficiency professionals, lighting retrofit codes pose some interesting potential challenges.

First, because compliance requirements are determined using thresholds, codes often apply only because a utility program incentivized replacement of enough fixtures to trigger the requirement. Program managers argue then for an "existing condition" baseline notwithstanding the code obligation – a practice that may become more controversial over time as thresholds triggering compliance are lowered. Utilities also confront legal and customer service issues around what role to assume in ensuring compliance – to date, most programs have intentionally kept code issues at arm's length.

Code impacts on project cost-effectiveness are a second concern for programs. Program managers report that in some cases, projects specified to meet code fail the cost-effectiveness tests required to receive incentives due to high cost of compliance. This leaves program managers in an awkward position, where insistence on code compliance would both preclude them from paying incentives and, paradoxically, result in lost savings (because customers are not expected to proceed with the retrofits absent incentives).

Concern over code effectiveness also obscures matters. So long as compliance is believed to be poor, program managers are engaging planning and policy staff to ensure that they retain the ability to incentivize retrofits, regardless of code requirements on paper (and particularly absent a mechanism to claim code savings). While these factors have not yet significantly impacted program operations, they do contribute to an increasingly complex and uncertain operating environment.

[21] For example, do lamp and ballast upgrades count as fixture replacements? At what level is the fixture threshold to be applied – the room? The rental unit? The entire building?

While there is surely some compliance and associated savings, codes are currently not optimally effective in catalyzing investment in retrofit lighting efficiency. Also, uncertainty around impacts of codes on the market is significant, and research is needed to bring better information to design of market interventions.

Critical Barriers:

A *lack of reliable information* on code compliance in lighting retrofits hinders development of an informed market strategy.

Overly complex, poorly understood, and largely unenforced codes are believed to be relatively ineffective.

There is *no regional reporting process* for code savings from lighting retrofits.

5.1.2 Standards

Federal standards for the efficiency of lamps, ballasts, and other lighting components also increasingly affect the commercial lighting market. Notable recent standards include Energy Independence and Security Act (EISA) rules for incandescent A-lamps and requirements for ballasts and linear fluorescent lamps pursuant to the Energy Policy Act of 1992 (EPAct). The latter impacts retrofits of T12 systems, a mainstay of program deliveries, though the actual impact of the standards is unclear at present due to implementation delays and new compliant T12 lamps.[22] At issue is how current T12 systems will be managed (or replaced) given a new set of products in the market.[23] Initial expectations that remaining potential savings from upgrading T12 systems would be harvested through standards now appear overly optimistic, but given changes in the standards, the best way to proceed is unknown. This contributes to an uncertain operating environment for utility programs.

Ongoing development cycles: Federal standards are developed and implemented in repeated cycles roughly every six years, with the first three years generally used to develop new standards that are then noticed in the federal register. The new standards become effective anywhere from two to five years after the notice date. Recent GSFL standards were published on July 14, 2009 and made effective on July 14, 2012, while new ballasts requirements published on November 14, 2011 will be effective in November 2014. Because the Department of Energy sets standards for many types of lighting equipment in overlapping cycles, standard setting is ongoing, with different product classes at various stages in the process concurrently. This regulatory activity is expected to increase over time as DOE expands the numbers of products subject to standards.

Broad savings potential: Standards apply to products rather than systems, and therefore are intrinsically limited in the scope of efficiency they can capture. For example, they cannot effect the adoption of controls or capture savings from other comprehensive techniques. Nor can standards promote emerging or

[22] Compliant T12 lamps are T12 lamps that conform to the new federal standards, providing a replacement lamp option for building owners with T12 systems. These lamps generally meet efficacy requirements through either (i) an exception to the standards allowing lower efficacy for high-CRI products or (ii) by increasing lumen output at constant wattage. These lamps allow T12 systems to remain in place under the standards, undermining prospects for efficiency resulting from forced conversions to new systems.

[23] See Wilson et al. 2012 for an overview of the standards and their potential impact on the market and efficiency programs.

unproven technologies. However, like some upstream approaches, standards can capture basic efficiency across the whole market, yielding significant savings.

A reactive stance: As with codes, program managers and planners have not engaged in the standards development process. The result is a potential missed opportunity to influence standard specifications, as well as delayed consideration of the implications of standards for programs and efficiency objectives.

5.1.3 Policy Factors

Policy and regulatory factors can create preferences for one savings channel over another, as when utilities have no motivation to support codes because they are not credited for savings. These distortions are a distraction from the task at hand – that of capturing low cost energy savings as effectively as possible– and will be a potential barrier as codes and standards assume a greater role in the commercial lighting market.

Critical Barrier:

Policy distortions that create preferences for one savings channel over others may hinder effective integration of codes and standards into a regional efficiency strategy.

5.2 Potential

Despite challenges, effective codes and standards have potential as a third channel for acquiring savings in the commercial lighting market alongside utility programs and upstream market interventions.

5.2.1 Basic effectiveness

Codes and standards that are complied with will deliver incremental regional savings. For codes, any compliance from projects that do not access utility incentives represents currently uncounted energy savings for the region. Also, projects that come through utility programs will also see some increase in average savings as codes require replacement of greater numbers of fixtures.[24] Achieving this potential requires only that market participants comply with code requirements and savings are measured. Federal standards can of course also capture significant savings by increasing product efficiency, and there can be an additional effect if standards for one component of a lighting system spur a broader upgrade.[25]

5.2.2 Strategic development and coordinated execution

A more profound opportunity involves strategic coordination of codes and standards with other lighting market interventions, notably utility programs. Though programs have effectively navigated the introduction of codes and standards with minimal disruption to operations, broader opportunities to harness regulatory drivers in support of program aims have been largely ignored. Some ideas include:

- Utility experience could provide new information to established regional efforts to influence codes and federal standard development:

[24] This outcome will vary depending on the specific requirements of the code and any impact that has on building owner decisions to implement the project. Building owners may choose to delay the project or implement it at a smaller scale that does not trigger code. The interplay of utility program rules and code thresholds will determine the prevalence of this "code disincentive", but it is expected to decline in importance over time (because lighting investments cannot be deferred indefinitely).

[25] For example, if T12 lamps were no longer available, building owners would be forced to upgrade ballasts and lamps.

    - Projects accessing incentive programs could bring information on code compliance in one market segment and interactions between codes and program design.
    - Program managers could provide another perspective on the specification of standards.
- Incentive programs could be harnessed to prove feasibility of future code requirements or federal standards, providing implementation experience into a data-driven development process.[26]
- Utilities could incorporate future code changes in strategic program planning.

Box 4: Could coordination with codes assist the transition to comprehensive program implementation?

NEEA's CLS pilots identified competition from standard lighting retrofit programs as one obstacle to comprehensive programs. Even with premium incentives for advanced retrofits, lower costs made basic projects more appealing despite saving less energy. Addressing this dynamic entails difficult tradeoffs for programs. Boosting comprehensive incentives might work, but raises cost to unsustainable levels. Lower incentives in standard programs could also be effective, but might jeopardize savings from basic projects.

Codes potentially offer a solution to this impasse. If codes can reliably capture savings that are currently pursued through basic incentive programs, then utilities can afford to reduce or eliminate incentives for basic efficiency measures. In addition to lowering the costs of savings acquisition, this would strengthen the relative economics of comprehensive incentives, bolstering their effectiveness. Through strategic coordination, codes could both capture basic savings and support comprehensive retrofit programs.

5.3 Plan

The development group did not identify codes and standards as a near-term priority in the strategy. However, they are one of the three channels needed to comprehensively address commercial lighting efficiency, and several near-term activities are identified to support eventual further intervention.

5.3.1 Scope

The development group identified six intervention areas relative to effective codes and standards:

- Research: Research will play a key role informing market interventions in light of the dearth of information on code effectiveness in the retrofit market.
- Education: Lack of understanding of requirements is the most easily addressed barrier to code effectiveness. In addition, because many comprehensive programs reference codes, there is a co-benefit when contractor familiarity with codes improves.
- Design: Code design was identified as a potential area of intervention around the question of whether a separate code designed for the retrofit market could increase effectiveness.
- Coordination: Coordination between code developers, program managers, efficiency planners, and the market is prerequisite to both establishing basic effectiveness and identifying opportunities for strategic collaboration.
- Reporting: Infrastructure for measuring and reporting savings will be a critical part of any investment in capturing efficiency through codes.

[26] The federal standards development process is anchored in data. However, reliable data documenting the viability of widespread market adoption of more efficient technologies is often unavailable. This generally leads to less aggressive standards requiring lower levels of efficiency. By virtue of their long history operating programs, utilities in the Northwest may have access to critical data that could support raising efficiency levels required by federal standards.

- Enforcement: Credible enforcement is central to the effectiveness of codes in delivering real savings; however, utility involvement in supporting enforcement would be contentious and would risk collaborative relationships with contractors or building owners.

5.3.2 **Approach**

The intervention approach for codes and standards proceeds in two phases. In the near term, four actions are identified:

- Pursue foundational research and report savings: Research is needed to understand current existing building compliance levels and inform future investments in supporting codes. This compliance information also enables the region to claim savings from codes. For federal standards, the schedule for developing new product requirements should be examined for intervention opportunities so that an appropriate strategy can be developed.
- Promote code education: Contractor training on code requirements will be incorporated into the advanced training initiative (see chapter 3) and materials will be shared with existing training networks.
- Invest in coordination: A framework for increased regional coordination around developing and supporting effective codes and standards is needed. For codes, a working group led by the NEEA codes and standards team will assess how to efficiently leverage untapped stakeholder resources in support of more effective code development. Stakeholders in the federal standards process will convene to identify objectives for future standards and explore options for supporting those goals. These efforts are aimed at developing a roadmap for medium term strategic coordination.
- Address policy gaps: There is a need to begin stakeholder dialog about reconciling policy drivers of preferences for specific savings channels so that codes, standards, and programs can be equally embraced in a strategic approach to the lighting market.

The strategy identifies three further actions that will be deferred for medium-term exploration:

- Enforcement: Consideration of code enforcement has been deferred until education and savings tracking efforts confirm potential and regional interest in bolstering codes for the retrofit market.
- Retrofit-Specific Code Development: A retrofit-specific code could retain aggressive efficiency requirements while balancing and incorporating the constraints of existing buildings, potentially increasing effectiveness.
- Strategic Integration: Strategic coordination of joint code and program strategies is also deferred until the groundwork for effective basic codes is in place. Strategic integration opportunities are inherently long-term in nature.

6. Program Coordination, Leverage, and Alignment

Program coordination and alignment is a fourth area of regional opportunity in commercial lighting. Alignment focus is on voluntarily increasing strategic consistency and leverage across programs over time, including facilitating consistency between strategic objectives, macro-level program incentive structures, regional training messages, and upstream activities. Coordination of activities around shared needs is expected to leverage regional resources and reduce market confusion, both increasing effectiveness and lowering costs of market interventions.

6.1 Current Situation and Barriers

Over the past several years, utility programs have grown in size and prevalence in the market, with incentives now available in virtually all utility territories throughout the Northwest. Programs have been extraordinarily successful and regional savings have more than doubled.

6.1.1 Individual programs, with emerging coordination

The array of programs is striking. Regional utilities operate distinct offerings, and while program approaches are similar, variation in the details of design is ubiquitous. Several examples are illustrative:

- Incentive levels vary between programs for similar measures.
- Measure specifications and requirements are inconsistent across utility territories in many cases.
- Programs have unique forms, incentive applications, and process requirements.
- Programs employ over ten distinct excel-based calculators to estimate project savings and determine incentives.
- Marketing and promotional efforts are generally pursued separately.

Summary: Program Coordination, Leverage, and Alignment

Priority: Low

Current Situation

Variation in incentive levels, measure requirements, tools, and forms across programs can sow confusion in the market and potentially hinder success.

Greater program consistency can improve market-friendliness, reduce costs, and reveal new opportunities.

Costs of aligning programs can be significant and may outweigh benefits.

Strategic Recommendations

Prioritize regional consistency in upstream efforts.

Focus on strategic program alignment in the medium term.

Continue exploration of regional leverage opportunities.

Next Steps

Upstream platform development will prioritize and facilitate regional consistency in the upstream market.

Despite this variation in program detail, there has been some increase in program alignment and regional coordination over the last several years. Examples include:

- Increased coordination among BPA, ETO, NEEA, and individual utilities to maximize the value of contractor training investments.
- Ongoing collaboration to develop shared lists and consistent specifications for LED products.
- Meetings of utility program managers and planning staff to coordinate efforts.
- Shared marketing campaigns focused on common priorities though broad messaging.
- Market research and planning collaboration.
- Development of a regional protocol for calculating lighting upgrade savings led by the Regional Technical Forum (RTF) and the Northwest Power and Conservation Council.

Altogether, regional collaboration is primarily focused on support functions while programs continue independent operation without significant emphasis on developing consistency. Widespread program success demonstrates that the current approach is functional, but questions remain of whether and in what form there may be opportunity in greater alignment.

Critical Barrier:

Variation between utility programs operating in close proximity can cause confusion for market actors and may impede program effectiveness.

6.2 Potential

Greater alignment across utility incentive programs has the potential to deliver diverse benefits:

Market Friendliness: Alignment can increase the market friendliness of programs, attracting participation, improving results, and reducing administrative burden. Where closely-packed utility service territories result in contractors working in multiple programs, variation between offers can produce confusion. This occurs in several parts of the region, and is notably pronounced in the Puget Sound where Snohomish PUD, Seattle City Light, Tacoma Public Utilities, and Puget Sound Energy all operate programs alongside several smaller public utilities. For contractors, changing terms, requirements, and forms can be hard to manage and the perceived hassle may suppress interest and result in lost project opportunities.[27]

This potential for increased market friendliness through alignment is not universal; in areas where fewer program operate, inconsistencies are not perceived to significantly burden the market (e.g. Boise, and to a lesser extent Portland.) Also, while greater market friendliness is expected to improve program success, there is no objective measure of the magnitude of this benefit, and reasonable stakeholders disagree on the promise of this opportunity.

Cost Reduction: Greater program alignment also can avoid duplicative labor and reduce costs. Just as regional investment in shared training is more efficient than uncoordinated stand-alone efforts, numerous other opportunities could yield savings on program design and implementation costs.

Scale Opportunities: Alignment can increase program effectiveness through the effects of scale and critical mass in the market. BPA's recent "Get the Skinny" T8 marketing campaign was more effective because it operated across multiple service territories. In a crowded market, the efficiency community can be more effective speaking with a single voice. Shared LED product lists both avoid duplication and create critical mass that attracts manufacturer participation. Pooling resources around certain opportunities can provide opportunities that are inaccessible to individual utilities; together utilities could develop a lighting calculator with more features than any single program could afford independently.

[27] Some contractors have mentioned that the confusion can be so onerous that they won't work with programs despite available incentives.

For all of the benefits of program alignment, it is important to acknowledge some of the reasons why aggressively pursuing consistency may not make sense. Different market conditions, reporting and regulatory obligations, and program objectives are at the root of much of the variation between programs. For example, matching incentive levels is difficult because of variation in cost-effectiveness criteria, retail rates, and market conditions between utilities. Also, programs are implemented in a dynamic context that puts a premium on flexibility, and managers need to quickly adapt to evaluation findings, target or budget changes, or utility legal policies, all of which makes program alignment challenging.

Coordination to increase and maintain consistency can entail significant costs. Creating shared LED standards has required significant staff time, despite being relatively straightforward among alignment opportunities. Uniform incentive levels or a shared lighting calculator would entail significant costs.

Key Concept:

Due to uncertain benefits and potentially significant costs, program alignment is not a central priority of the strategy. However, there are opportunities to increase near-term coordination and focus on achievable consistency in select areas.

In summary, increased consistency, leverage and alignment between utility programs can deliver benefits in terms of increased effectiveness, lower cost, and access to new 'scale' opportunities. Examples from collaborative efforts to date provide some precedent for success, but there are real questions about whether the potential benefits of pursuing further alignment outweigh associated costs. This concern is notably pronounced with respect to matching program design details, incentive levels, and lighting calculator tools, all of which are expected to be difficult relative to collaboration to date on approved products and training curricula.

6.3 Plan

There is not consensus regionally on the importance of pursuing greater program alignment, nor is it clear where the benefits of doing so would outweigh the costs; as a result, the strategy does not prioritize work in this area. However, there is opportunity both to increase near-term coordination and to focus on achievable consistency in certain strategic areas in the medium term.

6.3.1 Scope

The development group identified the following parameters that bound alignment work:

- An investment perspective: Due to a real risk of disrupting of established programs delivering savings, it is critical that any new 'alignment' effort include a strong expectation of significant future benefits. Quantifying costs and benefits of pursuing consistency is difficult, but the broader principle is that such efforts should be pursued as clear-eyed investments.
- High-level focus: Alignment should occur at the level of strategic objectives rather than technical program detail. High-level consistency is sufficient to maximize effectiveness of regional investments in marketing, training, and other areas, and is also relatively achievable.
- Medium-term timeline: Alignment requires navigation of established programs, practices, and contracts that are 'fixed' in the near term. A longer time horizon provides natural opportunities to refresh program approaches and establish consistency of design.
- Voluntary approach: Efforts to increase program consistency will be voluntary, should be flexible and must consider the constraints facing program managers.

6.3.2 **Approach**

- Commit to near-term consistency in upstream programs: The platform to support upstream initiatives is a promising program alignment opportunity, and utilities should commit to a regional approach to this market, consistent with local needs, that will increase market friendliness, participation, and program success (see chapter 4).
- Focus on strategic program leverage and alignment in the medium term: Program leverage and alignment efforts should concentrate on establishing strategic-level consistency on a three- to five-year timeline. This focus avoids the difficult, costly and possibly futile focus on program detail. More critically, it concentrates on the factors that allow other regional efforts to be more effective. For example, if most programs emphasize comprehensive retrofits, then marketing, training, and upstream partnerships can better support these shared objectives. While there have been periodic calls for standardizing incentive levels, lighting calculators, forms, and processes across utility lighting incentive programs, reducing this micro-level variation in programs is not a strategic priority.
- Leverage scheduled calculator upgrades: New lighting calculators offer another 'blank slate' opportunity to work towards consistency. Regional tools are now based in Microsoft Excel, and most programs plan to adopt new, web-based tools over the next several years. BPA's planned calculator development provides an opportunity for NEEA to gauge the scope and incremental cost of regionalizing a tool without requiring utilities to commit to a shared calculator.
- Pursue regional leverage: Untapped opportunities remain to leverage resource sharing, including developing building owner marketing and facilitating more robust regional input to national standards setting processes.[28]

[28] There is often regional representation at national conferences and advisory meetings of groups like CEE, the West Coast Utility Lighting Team (WCULT), and the DesignLights Consortium, but processes for defining and communicating regional priorities do not generally exist, resulting in a missed opportunity to promote a Northwest agenda. With coordination, single individuals attending these events could more aggressively provide regional perspective, leveraging a minor investment to capture value.

7. Regional Infrastructure

Although this strategy focuses on new areas of market intervention, ongoing support for regional infrastructure remains an important factor in leveraging commercial lighting efficiency successes. A regional foundation of collaboration around high value opportunities is in place, and this chapter highlights links of these ongoing activities with new efforts.

7.1 Current Regional Infrastructure Investments

The following activities provide core infrastructure for collective regional lighting efficiency efforts.

7.1.1 Product Support

Facilitating the development and program integration of new products and practices is a core shared regional need. Specific current efforts in this area include:

Summary: Regional Infrastructure

Priority: Medium-High

Current Situation

Established LED product list support, training, market assistance, and research efforts provide foundational infrastructure in support of utility lighting programs.

Shared needs can be more efficiently and effectively met through coordinated infrastructure development.

New initiatives identified in the strategy assume ongoing infrastructure support will be in place.

Strategic Recommendations

Maintain and enhance current regional infrastructure.

Product Qualification: NEEA and regional utilities have long been collaborating for years in support of LED product qualification lists. NEEA funds the DesignLights Consortium (DLC) on behalf of the region and also partners with individual utilities to support the Lighting Design Lab's work assessing products. Discussions are underway about how the region can more actively engage with DLC to shape standards to meet Pacific Northwest program needs (see chapter 6). Product qualification is an ongoing need and continued support is critical.

Emerging Technology Research: NEEA's emerging technology group and BPA's energy efficiency emerging technology (E3T) investments identify and test products that will fill the future efficiency "pipeline", providing insight into technical performance, savings potential, and program integration challenges for technologies in all stages of development. For example, NEEA's "proof of savings" validation of "Enlighted", a luminaire level fixture-mounted controls system, will establish the viability and performance of a product that has the potential to increase near-term market access to controls. E3T's roadmapping identifies key technology developments that are likely to impact efficiency over time, providing important insights into longer-term strategic planning.

Design Support: The Lighting Design Lab has provided access to expert guidance on advanced efficiency design for many years. More recently, NEEA collaborated with LDL and Northwest Trade Ally Network lighting specialists to develop lighting layout guides in support of comprehensive retrofit approaches.

There are now 19 different building types complete.[29] The guides provide broad, low-cost access to advanced efficient lighting design in support of programs focused on advanced retrofits.

7.1.2 Contractor Training

Contractor training is a second regional infrastructure focus area. The strategy recommends incremental investment in advanced training in support of future program needs (see chapter 3).

Contractor Training: Training through the Northwest Trade Ally Network and other efforts has improved skill levels of regional contractors over the past five years and will continue. More recently, NEEA has developed online courses to complement live sessions and extend the reach of basic training. Over time, this is expected to make training more effective and more administratively efficient.

Enhanced Website: Over the past year, BPA and NEEA have built an improved contractor-facing website in support of the Northwest Trade Ally network (http://nwlightingnetwork.com/). The new website, slated for full deployment during the first quarter of 2013, will serve as an online "hub" to connect contractors with programs and efficiency resources. The website will provide:

- Access to all regional lighting programs and their tools
- A central point of contact for contractor lists and training registration
- A gateway for online courses
- Information on efficient products and practices, including the LDL lighting design guides
- Sales tools and business tips
- Feature stories on contractors, utility programs, and market developments

Along with continued training sessions and increased e-learning resources, the website is part of an effort to extend the reach of current infrastructure efforts through a multi-channel approach.

7.1.3 Market Assistance

Shared Marketing: Marketing will be integral to the new initiatives recommended in this strategy, and campaigns can be key infrastructure in support of programs as illustrated by BPA's T8 Lighting Campaign (see chapter 6). Initiatives designed to build demand for efficient lighting may include owner-facing marketing materials, trade ally campaigns, and greater integration of commercial lighting best practices into NEEA's Commercial Real Estate and Building Operator Certification initiatives.

Field Support: Utilities, BPA, and ETO have supported field staff as an important component of the lighting efficiency ecosystem. Lighting specialists or other "boots on the ground" have both guided projects through programs and served as trainers/coaches. This strategy recommends maintaining this core capacity as regional infrastructure. At the same time, given the significant costs involved, the region should also leverage other approaches to project support where possible so that lighting specialists can focus on high value advanced efficiency opportunities instead of basic support.

7.1.4 Research

Research also serves as core regional infrastructure. Active work is focused on comprehensive programs, with NEEA researching contractor skills and utility program baselines to identify gaps and opportunities.

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[29] Templates for offices, schools, warehouses, gyms, gas stations, and cold storage facilities are available online at: http://lightingdesignlab.com/publications. Additional templates and a guide to using advanced controls are in development.

Other NEEA efforts include a market characterization survey that will improve understanding of the primary channels through which products flow into our region. BPA is researching the changing linear fluorescent baseline that is expected to impact program strategy within two years. Compliance studies for energy codes in the retrofit market are a priority for 2013 (see chapter 5). Research constitutes a classic shared need and there is opportunity to share research and leverage resources through collaboration.

7.2 The Future of NEEA's Commercial Lighting Solutions Initiative

NEEA's CLS initiative has yielded insight into the challenges of incentive programs focused on promoting "comprehensive" retrofit practices (see appendix 3). Lessons learned from the CLS pilots are reflected in the strategy's recommendations, including the emphasis on advanced contractor training.

This leaves the future of CLS in question. Originally, the initiative focused on program design – building approaches focused on comprehensive retrofits that would then be deployed by utilities. This focus now seems less appropriate for two reasons. First, the pilots illustrated that contractor skills and marginal economics, rather than program design, were the key barriers. Second, program managers are better positioned to develop program designs that target comprehensive techniques while also addressing utility-specific planning or administrative requirements. These two factors raised real questions about whether a program design focus is the best way for NEEA to add value in comprehensive lighting.

Reevaluation of NEEA's role has led to a recommended shift in focus towards:

- Facilitating regional collaboration on comprehensive program design and implementation and;
- Investment in training and infrastructure to support comprehensive program efforts.

This shift has two near-term implications. First, NEEA will plan and host an event in early 2013 to (i) share lessons from the CLS pilots and other "comprehensive" programs from around the country, (ii) facilitate exchange of ideas on comprehensive program design, and (iii) develop a near term plan for collaboration. Second, NEEA will incorporate comprehensive program needs in its new advanced training initiative and regional infrastructure support, including the regional web site. CLS's new focus on developing the infrastructure needed for comprehensive programs will leverage NEEA's core competencies to maximize value for the region.

8. Summary

Principal recommendations of the regional strategy for the commercial lighting market are summarized below by intervention area.

- Advanced Training: *Invest in a regional advanced training effort for trade allies* to build the contractor capacity needed to implement redesign, advanced controls, and comprehensive retrofit projects.
- Upstream Initiatives: *Develop a platform for upstream market intervention* in commercial lighting and commit to near-term consistency in upstream programs.
- Codes and Standards: *Establish a focused codes and standards strategy and action plan* through additional scoping, stakeholder engagement, and research. Research code effectiveness, support code education, and develop the infrastructure capacity to measure and report code savings.
- Program Coordination, Leverage, and Alignment: Develop *near-term regional consistency in upstream program efforts*, focus on migrating to *strategic alignment between utility programs in the medium term*, and continue exploration of new opportunities for regional leverage.

- Infrastructure: *Maintain and enhance market and efficiency infrastructure* in support of utility programs, research, and emerging technologies. *Transition CLS* to focus on (i) facilitating regional collaboration and (ii) training and infrastructure to support comprehensive programs.

Key recommendations will be implemented in early 2013 following strategy approval. The initial focus will be on advanced training and upstream platform development initiatives, with other efforts potentially following (see appendix 6: Implementation Plan).

This strategy envisions adding several new market interventions to the region's commercial lighting efficiency portfolio. Current utility programs, research activities, and infrastructure are joined by new upstream efforts, advanced training, and codes and standards initiatives to more comprehensively engage the market. These multiple approaches will function as channels in a broader stream of savings that is characterized by interdependency and mutual reinforcement, with each initiative benefiting others in addition to succeeding in its own right.

These relationships highlight the strategy's integrated vision for the market where diverse activities in coordination together create a market ecosystem that supports greater efficiency. Maintaining this vision is a group task that demands ongoing vigilance and commitment – no single entity can ensure a strategic approach to this large and critical market. Together, the region is poised to continue its leadership in commercial lighting efficiency through a coordinated approach to the opportunities of the future.

Northwest Regional Strategy for Commercial Lighting Energy Efficiency

Appendices

February 7, 2013

Northwest Commercial Lighting Regional Strategy Development Group

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Contents

Appendices

Appendix 1: Regional Planning Process

In June, NEEA convened a "development group" of stakeholder-experts to explore the region's positioning in commercial lighting and assess future needs and opportunities. The group included utility program managers from across the region, representatives from the Northwest Power and Conservation Council, and NEEA employees working on lighting initiatives, emerging technology, and codes and standards. Through a series of in-person meetings, phone conferences, and individual correspondence, the group assessed major barriers and opportunities in the market, identified the suite of strategies and tools the region needs to succeed in commercial lighting, and refined these findings into a strategy.

Process

The development group used a staged planning process to first undertake a broad survey of market opportunities and then quickly focus on discrete actions recommended for implementation:

1. Survey current activity: *Current regional market intervention activities* were surveyed and approaches used in other regions were researched.
2. Establish vision and goals: The group identified a shared *vision and goals* for the lighting market that would form the basis for a consensus strategy.
3. Identify key barriers: *Key barriers* to achieving consensus goals were identified.
4. Prioritize market interventions: The group identified *market interventions* to address key barriers. The group ranked the interventions in terms of priority though a survey.
5. Identify key recommendations: The group then identified *key recommended market interventions* based on strategic importance, market feasibility, and implementation capacity.
6. Develop strategy: Key recommendations were then integrated into in the *strategy document*.
7. Review and Finalize: NEEA drafted the actual strategy document, collaborating closely with the development group on the *review process*.

The process was designed to first identify needs, then determine how best to meet them. This approach was designed to anchor the process in market reality rather than current efficiency community activities.

External Input

The development group was assembled to ensure broad representation, leveraging the experience and expertise of leading practitioners while maintaining an efficient process to develop a strategy on an aggressive timeline. This approach requires tradeoffs between efficiency and the breadth of participation. The effort also required a major time commitment that not all stakeholders were positioned to make.

To provide more opportunities for feedback, the NEEA team updated a broader group of stakeholders through presentations at the lighting "Summer Summit" meeting in June, at the Commercial Advisory Committee meetings in September and December, at the Regional Portfolio Advisory Committee (RPAC) meeting in October, and via webinar to a broader group of program managers in November. At these events and through informal communication, the team invited additional input and participation from interested parties.

Collecting input from contractors, distributors, and other market actors was challenging given the broad scope and aggressive timeline of planning efforts. This need for market input is addressed in three ways. First, the development group included practitioners with extensive market knowledge to ensure that discussions were grounded in market reality. Second, NEEA researched implementation experience in other parts of the country, further anchoring the strategy in the perspective of market actors. Finally, implementation plans include additional market actor outreach in near-term planned activities.

NEEA's Role

NEEA has six strategic goals for its activities during the 2010-2014 funding cycle. These include:

1. Increase market adoption of energy efficient products, services and practices.
2. Help Northwest utilities and other energy efficiency organizations achieve their energy efficiency goals.
3. Build regional market capability via education, training and technical support.
4. Facilitate emerging technologies and solutions.
5. Promote energy efficiency.
6. Facilitate regional energy efficiency planning and implementation.

NEEA has taken on a central role in development of the regional strategy, including facilitating the process and writing the strategy document. Given the complexities and overlap in the commercial lighting market this activity is seen as delivering on several of NEEA's strategic goals, but primarily facilitation of regional energy efficiency planning and implementation.

Although NEEA's future market engagement will be guided by the regional strategy, a predetermined implementation role was not contemplated. The strategy identifies diverse potential roles for NEEA that are consistent with its organizational strategic plan; *advanced training* supports goals of (i) helping Northwest utilities and other energy efficiency organizations achieve their energy efficiency goals and (ii) building regional market capability via education, training and technical support. *A platform for upstream programs* can shift the product mix of technologies that come into the Northwest and change business practices of distribution channels. Renewed codes and standards efforts can not only (i) promote energy efficiency but also (ii) facilitate regional energy efficiency planning and implementation.

Appendix 2: Defining "Comprehensive" Lighting Retrofits

There is widespread regional interest in developing effective approaches to capture savings from advanced efficiency techniques in the commercial lighting market. Focus on these "comprehensive" retrofits was central to both NEEA's CLS initiative (see Appendix 3: NEEA's Commercial Lighting Solutions Initiative) and discrete regional utility efforts – it is also central to the regional strategy. For all this attention, there is no single definition of what makes a retrofit comprehensive. Some of the different regional approaches are presented below:

- CLS: The CLS pilots used specific minimum criteria to define eligibility for projects:

    1. The project delivers an *integrated lighting system* that takes into account basics of lighting design and controls.
    2. The *lighting performance / quality* matches the *application per IES light level recommendations*.
    3. Utility incentives based on *total kWh reduction***.**
    4. Product is sold and delivered by a *trusted agent*.

Together, these requirements were designed to promote a focus on lighting and energy performance rather than specific components.

- PSE's Enhanced Lighting Program (i.e. the "Whole Enchilada"): Puget Sound Energy has used a definition of comprehensive that prioritizes retrofit of greater numbers of fixtures over design and light levels. Qualified projects that address the entire opportunity in a facility are eligible to receive higher incentives under the "whole enchilada" program. The PSE approach seeks greater site savings not through new measures or techniques (e.g. redesign), but through greater penetration of site opportunities using conventional fixture retrofits.

Other definitions are of course possible. For purposes of the strategy, the concept of comprehensive includes maximizing savings from diverse advanced efficiency practices deployed in combination. Specific practices include (i) the use of advanced products, (ii) installation of control systems, (iii) delamping and fixture removal, and (iv) redesigning the building's lighting system. Recognizing the diverse needs of local utilities, the strategy recognizes a continuum of "comprehensiveness" and works to identify activities that can support a general transition to advanced efficiency techniques.

Appendix 3: NEEA's Commercial Lighting Solutions Initiative Findings

NEEA's first foray into the market was the Commercial Lighting Solutions (CLS) initiative, a series of pilot efforts with the goal of gaining experience in the development and administration of efficiency programs focused on comprehensive savings. While regional strategy development is distinct from CLS, both efforts share focus in exploring how to move the market forward to capture deeper, more comprehensive savings.

The CLS pilots delivered mixed results but have yielded critical insight into the challenges of comprehensive retrofits that informs the strategy. Key lessons include (with apologies to Sergio Leone):

- The Good: Qualifying projects (see Appendix 2: Defining "Comprehensive" Lighting Retrofits) deliver 25-30% more savings than standard retrofits, confirming the potential of comprehensive retrofits.
- The Bad: Contractors require significant support and additional training to effectively sell and deliver qualifying projects. Further, incentives from standard offer programs often successfully compete with special offers focused on comprehensive projects, undermining numbers of advanced projects.[1]
- The Messy: The comprehensive opportunity is complex, with many moving parts requiring coordination in a very dynamic current market.

[1] Standard retrofit incentives were able to effectively compete with premium offers of comprehensive programs for two reasons. First, comprehensive projects were significantly more costly to install, and the premium incentives, though higher, were insufficient to fully compensate for higher expenses. Second, the payment of incentives on a per fixture basis under standard programs created motivation to increase the total rebate amounts (and total product sales) simultaneously by installing more equipment than was strictly needed in some project. Gamesmanship exploiting this flaw in standard program design made it more difficult for comprehensive projects to compete.

Appendix 4: Strategic Integration and the Potential of Regional Collaboration

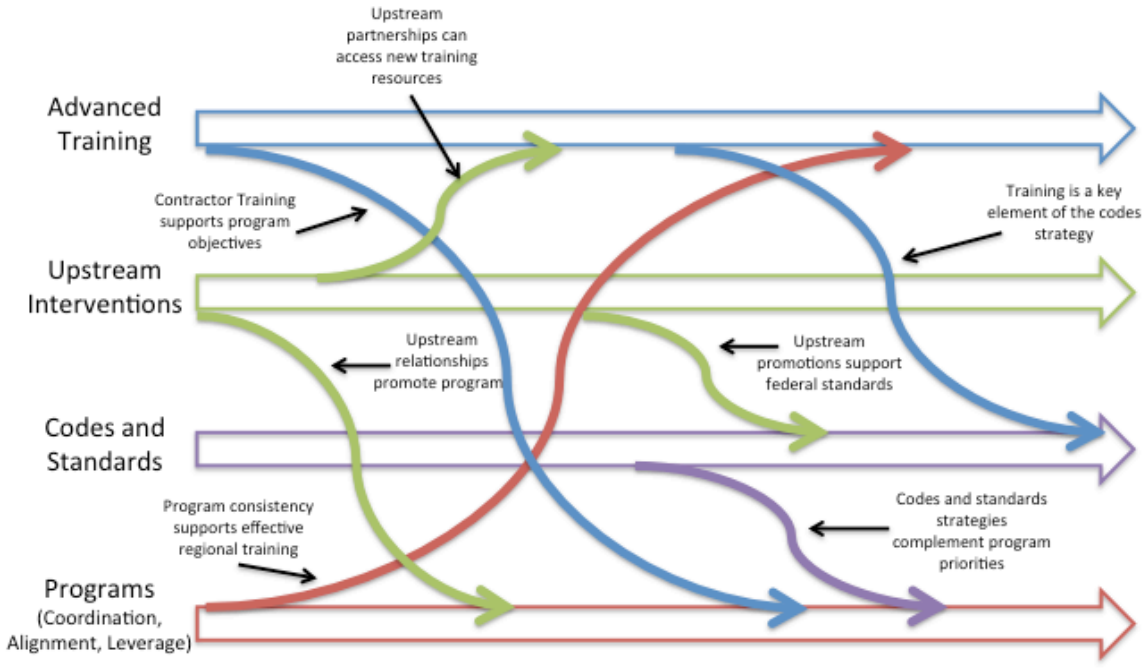
This strategy recommends adding several new market interventions to the region's commercial lighting efficiency portfolio. This will result in a larger efficiency "footprint" in the market, with a new presence in several previously untrodden areas. Current utility programs, research activities, and infrastructure are joined by new upstream efforts, codes and standards work, and advanced training to more comprehensively engage the market.

Coordination between these activities will be critical to success. While new advanced training could be pursued in isolation from other market interventions, such a siloed approach would be ineffective. Instead, integration of training with the needs of utility programs, upstream initiatives, and codes can maximize value. Many other examples illustrate this:

- Collaborative relationships with upstream market actors can provide new training opportunities.
- Upstream initiatives can be designed to support federal standards.
- Marketing through upstream channels can promote utility programs.
- Regional codes and standards strategies can complement program objectives.
- Program consistency can increase the effectiveness of contractor training.

Altogether, different types of market approaches serve not in isolation, but rather as channels in a broader stream of savings that is characterized by interdependency and mutual reinforcement. The diagram below illustrates some of these connections.

Figure 6: Interdependency and Mutual Reinforcement Between Market Approaches



These relationships highlight the strategy's integrated vision for the market where diverse activities in coordination together create a market ecosystem that supports greater efficiency. This layering of complementary efforts is depicted below.

Figure 7: An Integrated Landscape of Commercial Lighting Efficiency

Cross-cutting relationships between activities show the importance of efforts complementing each other to deliver maximum value to the region. This is a collective task that demands ongoing commitment – no single entity can ensure a strategic approach to the market, and ongoing collaboration will be important.

Appendix 5: List of Market Barriers

The complete list of market barriers identified by the development group during the strategy development process is presented below.

- Contractor Skill Level: Electrical contractors (installers) lack expertise to conduct a comprehensive redesign effort in advanced lighting efficiency.
- Cost - Financial and Time: Comprehensive lighting solutions cost contractors/customers more as they take more materials, time, and skills.
- Simplistic Program Incentive Structure: Utilities offer incentives based on individual measures - not integrated designs of equipment, placement, and controls.
- Multiple Confusing Programs: Utilities offer an array of lighting programs that can be perceived by trade allies as confusing and onerous.
- Owner Awareness: Owners lack awareness of benefits of comprehensive redesign projects, and are unaware of T12 phase out.
- Code Knowledge/Compliance: Codes are poorly understood by contractors and compliance is poor.
- Unenforced Codes: Codes enforcement is weak.

- Measure Cost: Emerging efficiency technologies are expensive and may not be cost-effective.
- Minimially Compliant Technologies: Manufacturers and distributors continue to sell inefficient technologies, including minimally compliant products that exploit loopholes in federal standards.
- Increasing Program Costs: Incentive costs are increasing in utility programs.
- Downstream Inaccessibility of Chains: Individual utilities have difficulty influencing chain and franchise efficiency practices through local programs.
- Downstream Inaccessability of Submarkets: Some lighting is used in submarkets that are not treated through retrofits.
- Unreported Savings: Utilities cannot receive credit for efficiency delivered through all channels.
- Inaccessible Information: Information on efficiency, lighting technology, utility programs, and training is available from an array of unrelated sources and can be hard to access.
- Limited Upstream Relationships: The efficiency community has very limited working relationships with upstream market actors.
- Inconsistent Data: Data on regional efficiency activity is collected in a variety of incompatible formats.
- Undeveloped Regional Prioritization: Regional consensus on priorities for commercial lighitng efficiency has not been developed.
- Untested Methods: Information on the impact of different market interventions is limited.

Appendix 6: Implementation Plan

The following is a preliminary, high-level implementation plan and timeline for activities under the regional strategy. More refined work plans will be developed through the course of 2013.

Timeline

Regional strategy implementation will initially focus on advanced training and upstream platform development. Exploration of codes and standards, program alignment, and additional infrastructure work will follow contingent on resource availability.

Advanced Training: NEEA will launch an advanced contractor training initiative in early 2013. The initial focus will be on additional scoping of new training channels to better understand (i) the set of available approaches, (ii) how different approaches can meet priority needs, and (iii) what opportunities exist to leverage existing platforms or efforts. As part of this effort, we will collect feedback from contractors and other market actors. Collaborative stakeholder discussions will then inform the choice of approach, with the goal of implementation in mid 2013.

Upstream Platform Development: NEEA will also expedite upstream platform development using a three-phased process:

1. Initiative scoping (Q1 2013): NEEA will conduct additional research and concept development through outreach to utilities and upstream market actors. The goal of this scoping will be to find areas that offer the best opportunity for an initial "lead" upstream initiative. The implementation of this lead initiative, in turn, will anchor development of the upstream platform.
2. Platform development (mid 2013): Following definition of the lead initiative and objectives, NEEA will contract for upstream platform development. The contract will develop the framework to support cost-effective implementation of upstream interventions, with initial focus on the lead initiative requirements. With successful platform development and acceptable projected initiative costs, this would set the stage for full regional implementation.

3. Pilot development (Q1 2013): NEEA and utility partners will administer a group of coordinated upstream pilots and demonstration projects designed to explore promising upstream opportunities including (i) channel or "market lift" incentives, (ii) multi-utility regional implementation, and (iii) methods for "normalized" savings calculation methods in dynamic markets.

Codes and Standards: Codes and standards efforts will ramp up in late 2013 once training and upstream initiatives are in motion. Research on code compliance will help inform development of a strategy through a stakeholder process. Subject to developing the ability to report savings, a codes/standards intitiatives may follow in the medium term.

An exception to this deferred timeline is code education and training, which will be integrated with the advanced training work scheduled for 2013.

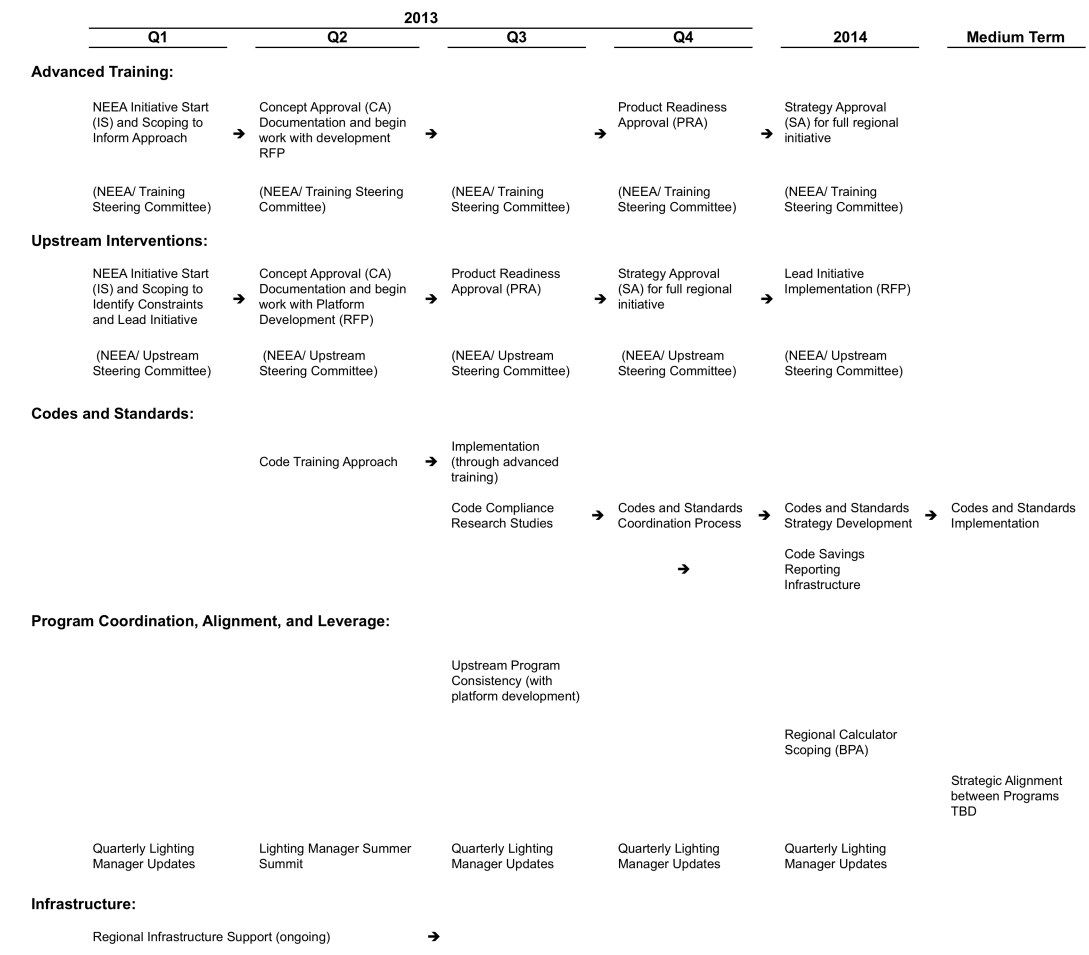
Program Coordination, Alignment, and Leverage: Coordination, alignment, and leverage opportunities are on a similarly relaxed timeline. The focus will be on general coordination, leverage, and sharing program practices, but pursuit of time-bound opportunities is also anticipated. Specific activities include:

- Pursuing a regionally consistent approach to the upstream market as part of the strategy's platform development work. Platform development is accelerated to maximize the opportunity for a consistent approach and will begin in early 2013 (see chapter 4).
- Assessing the potential of a regional lighting tool. This will be informed by BPA's calculator development timeline and is projected for 2014 at the earliest.
- Further exploration of opportunities to increase program consistency will be deferred until after scoping for other intiatives.
- Ongoing NEEA-hosted regional meetings of lighting program managers will provide a forum to address other leverage and coordination opportunities.

Commercial Lighting Market Infrastructure: NEEA will continue to support existing market infrastructure including Product Qualification Lists, a regional web site hub for trade allies (www.nwlightingnetwork.com) and the Lighting Design Lab. Additional infrastructure items that will be explored in 2013 include an online training platform for trade allies and a owner-facing marketing toolkit of owner-facing marketing materials designed to support utilities and trade allies.

The figure below depicts the implementation timeline for the major initiatives of this strategy.

Figure 8: Implementation Timeline for Regional Initatives



Implementation Framework

By design, strategic planning focused on identifying regional needs and opportunities without concern for implementation mechanics. This section turns to these mechanics, particularly initiative funding and management roles. Tentative plans are described below, though adaptive management is anticipated as resources, market conditions, and strategic focus evolves.

Development, Funding, & Roles

Recommended initiatives can be pursued at different scales – the size of the required regional investment is still to be determined and will be a function of the expected return on investment, stakeholder interest, and available resources. Establishing funding and implementation roles is impractical before defining intiative specifics, and therefore questions of stakeholder roles will be addressed during scoping.

As part of its commitment to regional planning and other intersecting NEEA strategic goals (see appendix 2), NEEA will fund and staff development of advanced training and upstream initiatives in 2013. NEEA will also continue coordinating stakeholder exploration of strategic opportunities in codes/standards and program coordination and alignment, two areas where in-depth exploration was deferred.

Funding and implementation roles will vary with initiative design. For modest efforts – marketing, online training platform development, or development of industry partnerships, for example – NEEA may have funding available under its current commercial lighting activities. Larger regional programs involving incentive payments would likely incorporate cost allocation to participating utilities. We anticipate regional discussions around initiative funding in mid 2013, following further scoping.

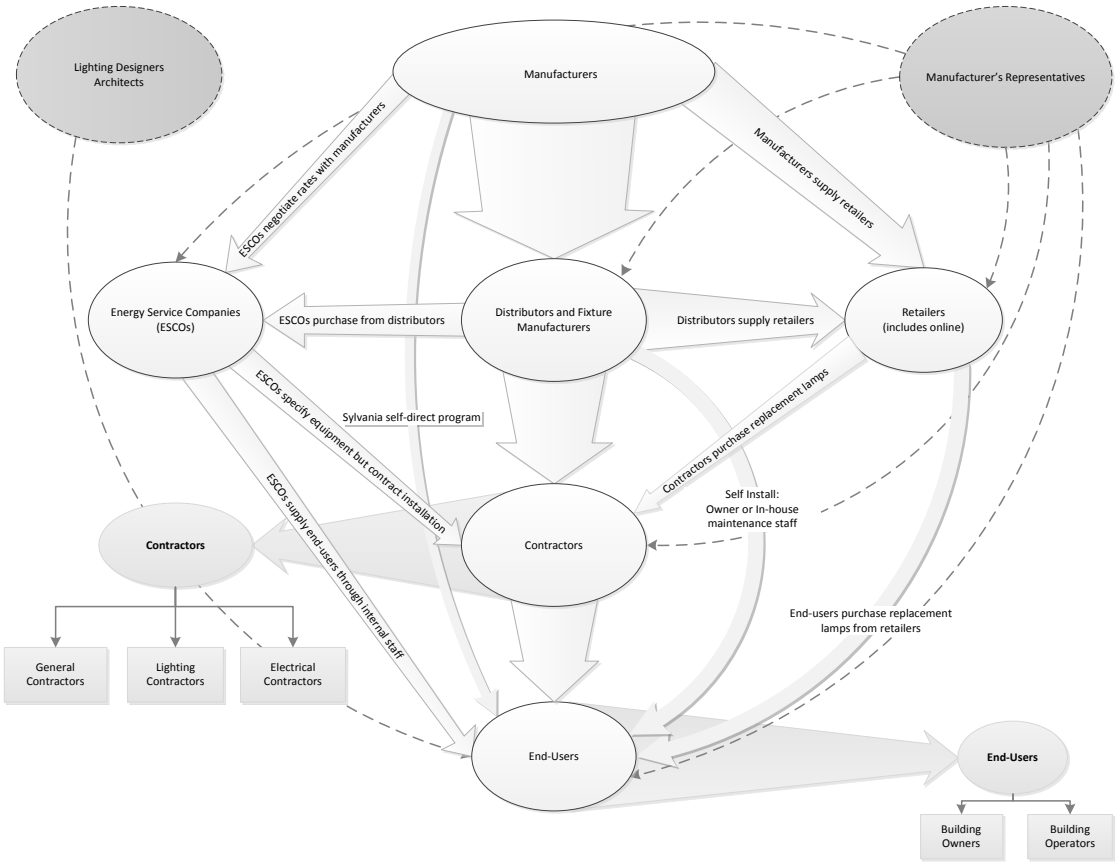
Steering Committees

The strategy proposes using a steering committee in both development and ongoing guidance of regional initiatives. While operational efficiency dictates the initiatives be managed in a central fashion, stakeholder committees will guide implementation and ensure coordination with other efforts.

Committees will be established in early 2013 to help guide NEEA's initiative development efforts for advanced training and an upstream platform. The steering committees were conceived as an ongoing role for the development group, and development group members are likely to remain involved. Using multiple committees, however, will allow the region to leverage a broader group of stakeholder experts without compromising process efficiency. A committee structure will also be used to further explore and refine opportunities related to codes/standards and program alignment. This steering committee structure will also fit within NEEA's revised commercial advisory committee stakeholder process and structure being launched in Q1 2013.

Appendix 7: Commercial Lighting Supply Chain Map

Market map courtesy of BPA. Source: Navigant Consulting



Appendix 8: Works Cited

California Public Utilities Commission. 2008, September. California long term Energy Efficiency Strategic Plan: Achieving Maximum Energy Savings in California for 2009 and Beyond.

McKinsey & Company. 2012. Lighting the way: Perspectives on the global lighting market. Second Edition.

Northwest Power and Conservation Council. 2010, February. 6th Northwest Power Plan. Available online: http://www.nwcouncil.org/energy/powerplan/6/default.htm

Pike Research. 2011. Energy Efficient Lighting for Commercial Markets: Global Outlook for LED Solid State and other High-Efficiency Lighting Technologies in Commercial Buildings: Market Analysis and Forecasts.

Wilson, J., Cobb, C., Hartwell, R., Daykin, E., and D. Gidding. 2012. Guiding Light: Implementing the EPACT Standard for Non-residential Lighting Offerings. Proceedings of the Association of Energy Services Professionals National Conference, Orlando, FL, January 2013.

US DOE. 2012. 2010 U.S. Lighting Market Characterization. Prepared by Navigant Consulting, January 2012.

Appendix 9: Research Conducted

References

The following sources were reviewed during strategy development:

Arnold, G. Understanding the Impact of Recent GSFL (T12/T8/T5) Federal Lighting Standard on the Lighting Market and Commercial Energy Efficiency Programs. Presentation: January 25, 2012. CEE Winter Program Meeting.

Bend, Dave. Lighting Market Transformation: A California Perspective. Presentation.

California Energy Commission. 2012, December. Final Staff Report: Voluntary California Quality Light-Emitting Diode (LED) Lamp Specification.

California Public Utilities Commission. 2008, September. California long term Energy Efficiency Strategic Plan: Achieving Maximum Energy Savings in California for 2009 and Beyond.

California Statewide Lighting Market Transformation Program Report. 2011, June.

ERS, April 20, 2012 Memo to RTF Lighting Subcommittee regarding Review of Regional Lighting Savings Protocols.

ERS. Standard Savings Estimation Protocol for Lighting Measures: Drafts (various dates 2012). Submitted to the Regional Technical Forum.

Mellinger, D. Efficiency Vermont Perspective: *C&I Lighting Program Results & Plans.* Presentation: January 25, 2012. CEE Winter Program Meeting.

Navigant Consulting. 2011 Commercial Lighting Market Transformation Model Development and Market Research, Phase I: T12 Retrofit and Replacement. Prepared for the Energy Trust of Oregon: September 8, 2011. Available online at: http://energytrust.org/library/reports/110908_CommLighting__MarketTransformation.pdf

Pacific Gas and Electric Emerging Technologies Program. 2009. High Efficiency Office: Low Ambient/Task Lighting Pilot Project. Application Assessment Report #0820.

Sandahl, L., Gilbride, T., Ledbetter, M., Steward, H., and C. Calwell. 2006, June. Compact Fluorescent Lighting in America: Lessons Learned on the Way to Market. Prepared for the US DOE by the Pacific Northwest National Laboratory.

Smalley, Edward. The U.S. DOE Municipal Solid-State Street Lighting Consortium. Presentation: May 9-10, 2012. LightFair 2012 Las Vegas.

US DOE. 2011, January. Energy Savings Estimates of Light Emitting Diodes in Niche Lighting Applications. Prepared by Navigant Consulting, Washington DC.

US DOE. 2012, February. Energy Savings Potential of Solid-State Lighting in General Illumination Applications, 2012 to 2030. Prepared by Navigant Consulting, Washington, DC .

Winch, R., Hannigan, E., and M. Curtis. 2011, May. Higher Savings Goals and the Rebate/Buy-down Elephant in the Room – Recognizing When and How to Move On to Market Lift. Wisconsin Energy Conservation Corporation.

Expert Interviews

Special thanks to national experts who lent their insight to our initial market research.

Efficiency Vermont: Dan Mellinger, Lighting Strategy Manager. April 25, 2012.

Pacific Gas & Electric: David Bend and Carolyn Weiner. April 25, 2012.

Southern California Edison: Doug Avery. April 30, 2012.

MassSave: Kevin O'Brien, Ecova. September 27, 2012.

NEEA Residential Upstream Program Experience: Neil Grigsby, Ty Stober, Phill Guay, and Alexis Allan, NEEA. October 3, 2012.