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Northwest Commercial Lighting Retrofit Market Characterization

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EXECUTIVE SUMMARY

As part of the evaluation activities for the Comprehensive Commercial Lighting Initiative (CCLI), the Northwest Energy Efficiency Alliance (NEEA) funded a commercial lighting retrofit market characterization study to identify and understand the market actors and product flows of the commercial lighting retrofit market in the Northwest region (Idaho, Montana, Oregon and Washington). Heschong Mahone Group, Inc. (HMG) conducted the study in coordination with NEEA. This report provides a representation of market actors and product flows in the retrofit lighting market, and identifies barriers to the implementation of utility retrofit programs, as well as opportunities for future energy efficient lighting retrofit program efforts.

The study consisted of four main tasks:

1. Conceptual Framework – establishing a set of hypotheses about the structure, market actors, and product flows of the commercial lighting retrofit market in the Northwest

2. Literature Review

3. Market Actor Interviews – a series of interviews with five sets of key market actors:

    a. Building Owners and Facility Managers
    b. Trade Allies (Contractors and Installers)
    c. Lighting Product Distributors
    d. Manufacturers' Sales Representatives
    e. Manufacturers

4. Commercial Lighting Retrofit Market Model – revising the hypotheses established in the Conceptual Framework, based on the results of the Literature Review and the Market Actor Interviews, to provide a full picture of the lighting retrofit market in the Northwest region

Conceptual Framework: The conceptual framework served as an initial hypothesis for the study activities. HMG created a hypothetical diagram of relationships between market actors in the lighting retrofit market, which assumed that the primary product flows passed from manufacturers and distributors directly to the contractors who installed the products in an owner's facility.

Literature Review: HMG reviewed a series of key sources that provided insights on the current state of the commercial lighting retrofit market and lighting retrofit programs. HMG used the findings of the literature review to inform the commercial lighting retrofit market model. Based on these sources, HMG identified the following key findings:

- T12s continue to represent a savings opportunity, despite new federal regulations
- Turnover in commercial lease space is an energy efficiency retrofit opportunity

- Energy use and savings potential can vary greatly by building type, depending on existing installed lighting technology and lighting energy use intensity
- Lighting controls are largely absent from the current building stock
- The retrofit market has already captured many of the most straightforward energy savings opportunities
- Light-emitting diode (LED) technology and performance are still improving, but products have very long life spans, which may lock in sub-par energy savings for decades to come

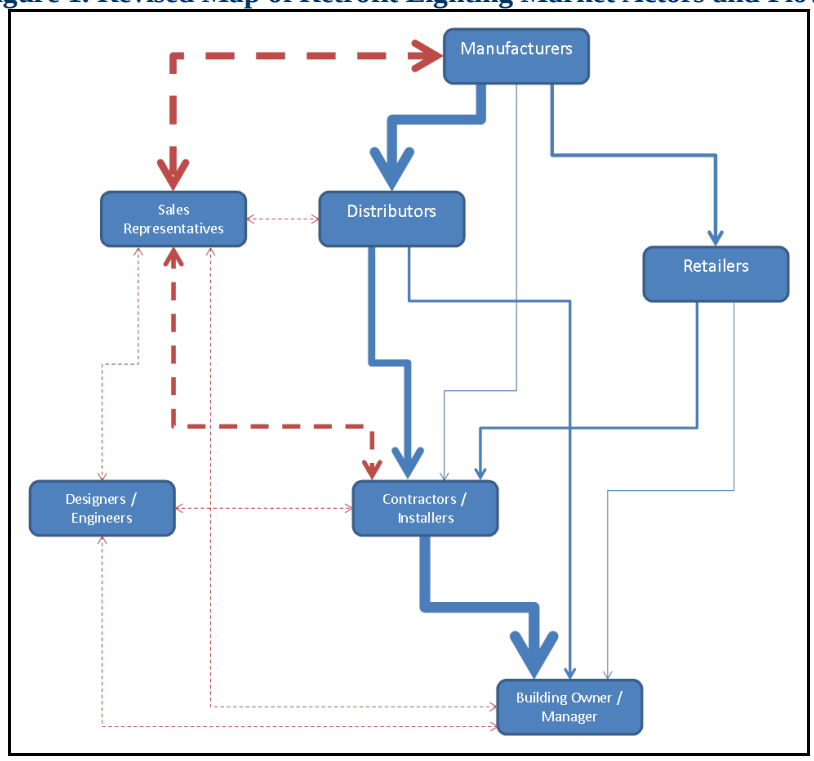
Market Actor Interviews: HMG also conducted interviews with the following market actor groups, in order to inform the commercial lighting retrofit market model:

- **Building Owners and Facility Managers** – an interview with one facility manager for a large national retail chain indicated that large companies with multiple properties often have staff dedicated to identifying retrofit incentive opportunities. In contrast, HMG expects that small businesses do not have the resources to track and identify retrofit incentive opportunities, and may not realize the same economies of scale as larger businesses with multiple properties.
- **Trade Allies** – key findings from interviews with eleven trade allies include the following:
  - Contrary to the original hypothesis, lighting retrofit installers do have interactions with sales representatives. Seven of the eleven respondents report having regular interactions with manufacturers' sales representatives.
  - Three respondents mentioned building types that were most favorable to retrofits. One respondent each mentioned manufacturing, large commercial, and retail.
  - By contrast, respondents mentioned five building types that were not favorable to retrofits. Respondents mentioned small business (two), retail (two), office (one), small grocery (one), and restaurant (one) as unfavorable.
  - All ten respondents (one respondent was unable to complete the full survey) were aware of utility incentive programs; nine of those ten had projects that had participated in those programs; and six of ten reported that at least ninety-five percent of their retrofit projects participate in utility programs.
- **Distributors** – key findings from interviews with five distributors include the following:
  - Respondents identified three building types favorable to retrofits: small commercial (two respondents), warehouse (one), and food processing (one).
  - Almost all respondents (four of five) expect LED products to have the biggest impact on their retrofit business over the next five years (due to the growth of LED in the lighting industry, HMG expects that the fifth respondent has already seen a significant impact on their business from the LED products).
  - Three of the five respondents reported experience working with utilities to provide incentives directly to manufacturers and suppliers to lower product costs.
- **Manufacturer Sales Representatives** – key findings from interviews with five manufacturer sales representatives include the following:
  - All sales representative respondents reported specific efforts geared toward the retrofit market, and all reported approaching the retrofit market differently than the new construction market. Two respondents reported more direct project or client interaction in the retrofit market, and two reported that retrofit projects more

frequently use a design-build project structure. One sales representative reported having dedicated marketing efforts or staff for the retrofit market, and another reported focusing on program and incentive eligibility for retrofit products.
    - Four respondents noted that the limited number of eligible products is a major challenge to utility programs for sales representatives.
- **Manufacturers** – key findings from interviews with four manufacturers include the following:
    - All four manufacturers surveyed reported developing products specifically for the retrofit market, and all four reported that they approach the retrofit market differently than the new construction market. Three respondents reported having dedicated marketing efforts or staff for the retrofit lighting market, one reported using different distribution channels for retrofit products, and one noted that the retrofit market is more cost-sensitive than new construction.
    - Although some manufacturers (three of four) stated willingness to develop products in response to specific market requirements, they tend to focus these efforts on large markets where code and program requirements affect large numbers of customers (such as California).
    - Respondents cited the complexity of programs, including cumbersome reporting requirements, as the most common challenge for utility programs (two respondents).

Commercial Lighting Retrofit Market Model: Not surprisingly, the results of the analysis revealed a much more complicated set of interactions than the initial conceptual framework hypothesis. Figure 1 presents a revised map of retrofit lighting market actors and flows, based on the results of the literature review and market actor interviews. Blue arrows indicate product flows, while dashed red arrows indicate information-only relationships. The thicknesses of the arrows represent relative product volume, in the case of the blue arrows, and the relative influence of each relationship in the market.

Figure 1. Revised Map of Retrofit Lighting Market Actors and Flows



Note: Solid blue arrows indicate product flows; dashed red arrows indicate information flows. Thicknesses of the arrows represent relative product volume and the relative influence of the relationship.

Although the analysis confirmed that retrofit lighting products typically flow through distributors, and then to contractors who install them in the building, the results of the study also indicate that sales representatives are much more involved in the retrofit lighting market than initially thought. These sales representatives could be useful partners to help utilities inform the market about program and incentive offerings.

Although the results do not indicate any distinct market flows for specific product types, responses did indicate a potential lack of awareness of the effectiveness of lighting controls in retrofits among trade allies, distributors, and sales representatives. Similarly, interview responses indicate that rural areas and certain utility territories with less favorable program offerings may be missing out on energy savings from lighting retrofits.

Recommendations: Based on the results summarized above, HMG developed the following recommendations for future energy efficient lighting retrofit efforts in the Northwest region:

- Simplify programs whenever possible – Interview respondents described a variety of complications with utility programs that present barriers to participation. As much as possible, programs should simplify. Specific examples include the following:
  - Encourage performance-based incentives instead of prescriptive product change-outs
  - Encourage regional coordination of program design and requirements

- Where possible, continue to encourage early T12 replacements – T12 lamps in the market continue to present energy savings opportunities. Wherever possible, utilities should continue to encourage T12 replacements.
- Provide more education and training for contractors/installers – NEEA and the utilities need to provide installers with more education in order for those installers to be able to implement the strategies and technologies necessary to achieve deep energy savings through lighting retrofits. This is especially true for lighting controls.
- Provide more education and training for customers – NEEA and the utilities need to better inform customers in order for them to understand the values and benefits of energy efficient retrofits.
- Build relationships with manufacturer sales representatives – NEEA should build relationships with manufacturer sales representatives, and utilize them to promote retrofit opportunities. Because of their existing connections and relationships, sales representatives can serve as sources of information to customers on utility programs, as well as on energy efficient products, technologies, and strategies.
- Take advantage of synergistic opportunities – Owners and tenants typically renovate commercial office space every ten years and retail space every fifteen years. Utilities should capitalize on these opportunities, or on similar intervals such as tenant turnover, to encourage energy efficient retrofits.
- Focus efforts on as-yet untapped savings opportunities – Trade allies already focus on opportunities in cities and urban areas; generous utility territories; and large building types with simple retrofit solutions. Utilities may need to encourage future program efforts in more difficult and previously-unrealized savings opportunities, such as rural areas and small businesses.
- Encourage the use of lighting controls – Interview results indicate a general lack of awareness of the energy savings potential of lighting controls in the retrofit market. Utilities need to continue to encourage the use of lighting controls through incentives and training. Energy performance-based incentives, or tiered incentives that increase along with energy savings, may encourage the use of more lighting controls.
- Continue to be cautious with LED –Due to the fact that LED performance remains inconsistent across products, NEEA and utilities should take a cautious position and incentivize only those products that have the best performance, although it may frustrate manufacturers, sales representatives, and distributors. Utilities should continue to use product performance standards or third-party certifications such as the DesignLights Consortium (DLC).
- Consider “upstream” incentive efforts – NEEA should consider developing “upstream” incentive relationships with distributors, manufacturer sales representatives, and manufacturers to provide lower cost energy efficient products to consumers. Three of the five distributors interviewed in this study reported experience working with utilities to provide incentives directly to manufacturers and suppliers to lower product costs. Two of these three considered these efforts to be very effective, while the third noted it is effective only if the product volume for end-users increases.

1. INTRODUCTION

As part of the evaluation activities for the Comprehensive Commercial Lighting Initiative (CCLI), the Northwest Energy Efficiency Alliance (NEEA) funded a commercial lighting retrofit market characterization study to identify and understand the market actors and product flows of the commercial lighting retrofit market in the Northwest region (Idaho, Montana, Oregon and Washington). Heschong Mahone Group, Inc. (HMG) conducted the study in coordination with NEEA.

This report provides a representation of market actors and product flows in the retrofit lighting market, and identifies barriers to the implementation of utility retrofit programs, as well as opportunities for future energy efficient lighting retrofit program efforts.

The study established a set of hypotheses about the retrofit lighting market, as described in the Conceptual Framework (Section 3). The study then tested these hypotheses through a literature review (Section 4), as well as with interviews with lighting manufacturers, manufacturer sales representatives, lighting product distributors, trade allies (contractors and installers), and building owners and facility managers (Sections 5 through 10). HMG then revised the model of the lighting market established in the Conceptual Framework based on the results of these study activities (Section 11). Finally, this report provides recommendations for future energy efficiency lighting retrofit program efforts, based on the results and findings of this study.

As part of the evaluation of this initiative, HMG evaluated the initiative's pilot program, and conducted a study to establish the current state of lighting retrofit programs and standard project practice in the Northwest region. Findings from both of these efforts are in separate reports (Comprehensive Commercial Lighting Initiative Pilot Evaluation Report, and The Current State of Lighting Retrofit Programs and Standard Project Practices in the Northwest Region)

2. METHODOLOGY

This study involved four main tasks:

1. Conceptual Framework – establishing a set of hypotheses about the structure, market actors, and product flows of the commercial lighting retrofit market in the Northwest

2. Literature Review

3. Market Actor Interviews – a series of interviews with five sets of key market actors:
   a. Building Owners and Facility Managers
   b. Trade Allies (Contractors and Installers)
   c. Lighting Product Distributors
   d. Manufacturers' Sales Representatives
   e. Manufacturers

4. Commercial Lighting Retrofit Market Model – revising the hypotheses established in the Conceptual Framework, based on the results of the Literature Review and the Market Actor Interviews, to provide a full picture of the lighting retrofit market in the Northwest region

The subsections below describe the methodology for each of these tasks.

2.1 Conceptual Framework

The conceptual framework served as a hypothesis of the lighting retrofit market, based on HMG's existing knowledge.

2.1.1 Map of Lighting Market Actors and Flows

HMG developed a basic map of the lighting market, identifying key market actors and the relationships and flows of information and products among them. This map served as the framework for the development of the market characterization model as described in Section 2.4 below. Over the course of the study HMG refined the relationships and flows identified in the map via interviews with market actors in the Northwest.

2.1.2 Characterization of Lighting Products and System Types

HMG established categories for the various lighting product types, such as commoditized products (basic fixtures, lamps, and controls), premium products (advanced controls and technologies), and systems products (whole-building management systems that include lighting capabilities). This characterization also identified key segments of interest, such as the impact of the T12 phase-out. The categories identified above informed the interviews with key market actors, as well as the final lighting retrofit market model.

2.1.3 Market Segmentation Strategy

HMG also identified key parameters for further analysis of the lighting market (such as product and system types, building type, building vintage, ownership type, coastal vs. inland, and urban

vs. rural), and the categories within each of those parameters. Findings from the literature review also informed the segmentation approach to allow for compatibility with available data.

2.2 Literature Review

As part of the commercial retrofit lighting market characterization, HMG conducted a limited literature review. HMG used the results of this literature review, in conjunction with the results of the other project activities, to shape the characterization of the commercial retrofit lighting market in the Northwest region.

HMG focused its efforts on several key sources believed to be most informative to a characterization of the retrofit lighting market in the Northwest region. The following section outlines these key sources.

2.2.1 Key Sources

HMG reviewed the following key sources for this literature review:

- **Energy Trust of Oregon Lighting Market Assessment Study**: In 2009 HMG conducted a Lighting Market Assessment Study for the Energy Trust of Oregon. The study provided a snapshot of Oregon's then-current state of the commercial and industrial lighting markets. The literature review incorporates the relevant conclusions and recommendations from that study that NEEA can apply to future efforts.
  - Energy Trust of Oregon, 2009. "Oregon Lighting Market Assessment." Prepared by Heschong Mahone Group, Inc. for the Energy Trust of Oregon. Published December 2009.

- **U.S. Department of Energy (DOE) Lighting Market Characterization Report**: Published in January 2012, U.S. DOE's 2010 Lighting Market Characterization Report provides summary estimates of the installed stock, energy use, and lumen production of all lamps operating in the U.S. The objective of the report was to collect and present the fundamental energy consumption information to plan an effective lighting research and development program. The report addresses three main questions:
  - How many of each type of lighting technology are in buildings in the U.S. in 2010, and in which building types are they?
  - How much energy do light sources consume in the U.S. in 2010?
  - How has the U.S. lighting market characteristics changed over the past decade?

  This report provides results at both national and sector-specific levels. The report groups light sources into six broad categories: incandescent, halogen, compact fluorescent, linear fluorescent, high intensity discharge, and solid state/other.
  - United States Department of Energy (DOE), 2012. "2010 U.S. Lighting Market Characterization." Prepared by Navigant Consulting, Inc. for Solid-State Lighting Program, Building Technologies Program, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy. Published January 2012.
  - http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/2010-lmc-final-jan-2012.pdf

- **Rosenberg ACEEE Paper:** This paper, presented at the 2012 Summer Study on Energy Efficiency in Buildings of the American Council for an Energy Efficient Economy (ACEEE), developed recommendations for changes in some of the most common features found in public benefit programs that promote efficient commercial lighting, based on a review of recent technical and market assessment research.
  - Rosenberg, Mitchell, DNV KEMA Energy & Sustainability, 2012. "Moving Targets and Moving Markets in Commercial Lighting." Paper presented at the 2012 ACEEE Summer Study on Energy Efficiency in Buildings, Asilomar Conference Center, Pacific Grove, CA, August 12-17, 2012.
  - http://www.aceee.org/files/proceedings/2012/data/papers/0193-000084.pdf

- **Pike Research Report:** Published in late 2011, the Pike Research report describes the key factors influencing the market for energy efficient lighting around the world: trends in energy codes, rebate and subsidy programs, sustainability/green certifications, raw material supply issues, and global geopolitical influences, to name a few. The report describes the influence of industry structure, key applications, and the technology issues involved in the decision to specify various lighting technologies.
  - Emmerich, David and Eric Bloom (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." Published Quarter 4, 2011. Pike Research, LLC.
  - http://www.pikeresearch.com/research/energy-efficient-lighting-for-commercial-markets

- **California Codes and Standards Enhancement Initiative (CASE) – Lighting Alterations and Modifications in Place:** This report, prepared by HMG in late 2011, included a literature review of various research sources on the lighting retrofit market in California. Although the studies reviewed in this literature review were specific to the California market, HMG expects that some of the findings will be generally applicable to the Northwest region.
  - Multiple sources, cited in the text below

2.3 Market Actor Interviews

2.3.1 Sample for Key Market Actor Interviews

Rather than following product flows in a top-down manner (starting from the manufacturer), HMG planned to take a bottom-up approach, starting with building owners, to understand how and where products flow in the lighting retrofit market. HMG based this strategy on the assumption that most market actors would be more willing to share information about their purchasing decisions and suppliers than about their sales.

The target interview sample is broken down as follows:

1. **Building Owners** (target of 10-15 interviews)
   HMG coordinated with NEEA and the utilities to identify potential building owner respondents who had recently completed a lighting retrofit project.

2. **Trade Allies** (target of 15-30 interviews)
   As much as possible, HMG asked respondents about their experiences with different building types, in order to identify unique practices associated with particular building types.

   HMG drew the interview sample from the Northwest Trade Ally Network list.

3. **Distributors** (target of 5-10 interviews)
   Although contact information for distributors is readily available, HMG coordinated with NEEA to identify and confirm distributor businesses of specific interest in the Northwest region. HMG drew the interview sample from the Northwest Trade Ally Network list.

4. **Manufacturers' Sales Representatives** (target of 5-10 interviews)
   Once again, HMG coordinated with NEEA to identify and confirm sales representatives of specific interest in the Northwest region. HMG drew the interview sample from the Northwest Trade Ally Network list, as well as from industry knowledge of major manufacturer groups and sales representatives.

5. **Manufacturers** (target of 5-10 interviews)
   HMG developed the manufacturer interview sample based on industry knowledge of the major market actors in the retrofit lighting space. The sample also represents a broad range of product offerings, including fixture types, control systems, and whole-building energy management systems.

Appendix F reproduces the interview guides HMG developed for the market actor interviews.

2.4 Commercial Lighting Retrofit Market Model

Following the literature review and the market actor interviews, HMG modified the conceptual framework to more accurately represent the lighting retrofit market, based on the findings of the interviews, and as much as possible, categorized those results based on the market segmentation strategy established in the conceptual framework.

3. CONCEPTUAL FRAMEWORK

The sections below outline the basis for characterizing the lighting retrofit market in the Northwest. These parameters will serve as hypotheses, which the key market actor interviews will test.

This conceptual framework consists of the following elements:

- Map of Lighting Actors and Flows
- Lighting Product and System Types
- Market Segmentation Strategy

3.1 Map of Lighting Actors and Flows

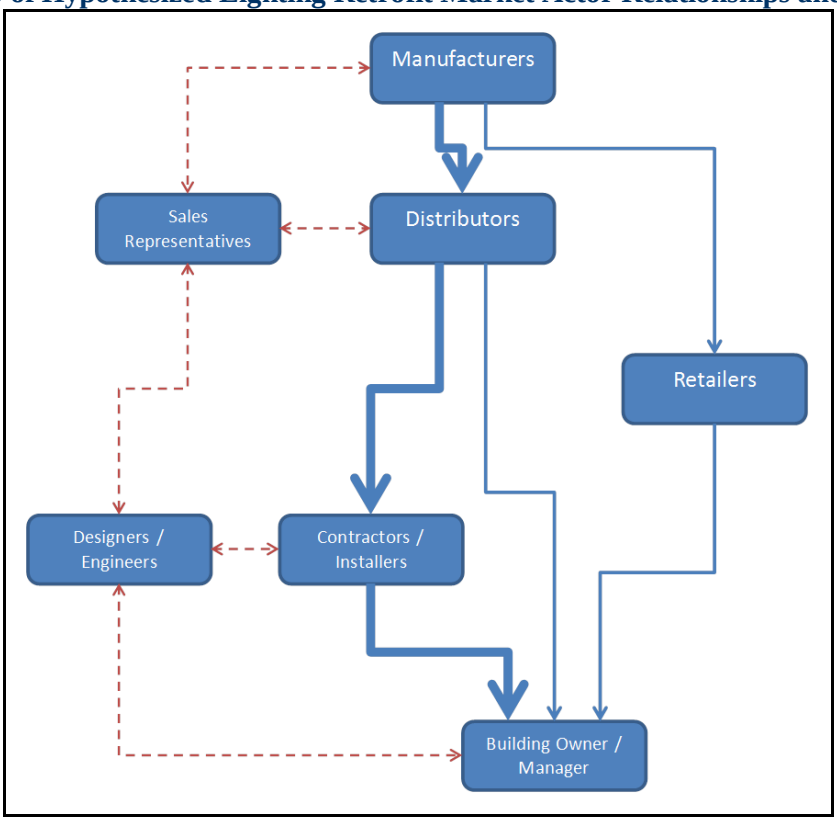
Figure 2 represents HMG's hypothesized map of the commercial lighting retrofit market in the Northwest. The map indicates relationships and product flows among various market actors. Solid blue arrows on the map indicate product flows, while dashed red arrows represent relationships that only exchange information. It is important to note that product flows are also an information source for the parties involved. Thicknesses of the arrows represent preliminary estimates of relative product volume and the relative influence of each relationship on the market.

For example, HMG expected that the majority of commercial lighting retrofit products flow through distributors to the installing contractors, and then to the building owners. HMG also expected that the relationship between the building owner and the contractor is more influential in the lighting retrofit market than the relationship between a lighting designer and a building owner.

Although NEEA and the utilities also play a role in the commercial lighting retrofit market, this study takes the position that NEEA and the utilities can interact with and influence the market at any point. One of the goals of this study is to identify the key relationships in the retrofit lighting market, and leverage points that NEEA and utilities should be focusing their efforts on. As such, this diagram of lighting retrofit market relationships does not include NEEA and the utilities.

HMG tested the assumptions outlined in this map through interviews with key market actors, and refined the details of the map based on those interviews. HMG also expected to find variations in the results for the different market segments outlined in the sections below. For example, designers or engineers may have more influence in certain building types, or retailers (i.e., hardware stores, etc.) may have more influence in certain ownership types.

Figure 2. Map of Hypothesized Lighting Retrofit Market Actor Relationships and Product Flows



Note: Solid blue arrows indicate product flows, dashed red arrows indicate information flows. Thicknesses of the arrows represent relative product volume and the relative influence of the relationship.

3.2 Lighting Products and System Types

HMG grouped lighting products and systems into the following categories for the purpose of analyzing the results of this study:

- Commoditized products
  This category represents standard, "off-the-shelf" products, such as:
  - Standard fluorescent lamps
  - Linear fluorescent fixtures or fixture retrofit kits
  - Wall- or ceiling-mounted occupancy sensors
  - Linear fluorescent ballasts, including those with high ballast factors, or low ballast factors

- Premium products
  This category represents more advanced technologies, and/or products that require some degree of commissioning or programming, such as:
  - Fluorescent dimming ballasts
  - Light-emitting diode (LED) fixtures
  - Photocells and automatic daylight controls
  - Programmable, multi-scene, and/or multi-level controls

- Systems products
  This category represents advanced and/or whole-building control products, often requiring a high level of coordination and commissioning, such as:
  - Networked lighting control systems (DALI, etc.)
  - Whole-building energy management systems that include lighting controls

These categories represent HMG's initial hypotheses of the lighting retrofit market. Where necessary, HMG adjusted these categories to more accurately represent the results of the study.

3.3 Market Segmentation Strategy

Where possible, HMG broke the results of the market actor interviews down based on the following parameters:

- Product or system type – differences in lighting retrofit practices and/or product flows for the various product categories outlined in the previous section
- State or regional differences within the Northwest – differences in typical practices and/or product flows for states in NEEA territory – Washington, Oregon, Idaho and Montana. Where possible, the findings also attempt to distinguish between urban and rural areas, and coastal and inland areas
- Building type – differences in typical practices and/or product flows for various building types, such as retail, office, healthcare, warehouse, industrial
- Building vintage – differences in lighting retrofit practices and/or product flows depending on the age of the building and/or the lighting system
- Ownership type – differences in typical practices and/or product flows depending on ownership type, such as large commercial property managers, large owner-occupied or corporate clients, and small businesses

4. LITERATURE REVIEW FINDINGS

This section presents the findings and conclusions of the Literature Review HMG conducted. Appendix A discusses the Literature Review results in detail.

- **T12s continue to represent a savings opportunity** – Although federal legislation has effectively banned the sale of new T12 lamps, they remain installed in significant quantities in the commercial and industrial sectors. The Energy Trust study estimated that seventeen percent of commercial and industrial lighting in Oregon in 2009 consisted of T12 lamps. Similarly, the DOE study found that T12s comprised over thirty percent of the installed lighting watts in the U.S. commercial sector. In addition, some manufacturers have developed so-called "compliant T12" lamps that comply with the federal regulations, which may further dissuade retrofits. If possible, programs should continue to support T12 retrofits, especially among customers that earlier programs may have missed, such as small businesses.

- **Turnover in commercial lease space as an energy efficiency opportunity** – Owners and tenants typically renovate commercial office space every ten years, and retail every fifteen years. These renovations represent prime opportunities for energy efficiency. However, building owners may not be motivated to retrofit inefficient lighting equipment, especially if the tenants are paying the utility bills. These scenarios could represent an opportunity for targeting as-yet unrealized energy savings. Utilities could work directly with large retail or office property owners to encourage energy efficient lighting retrofits at tenant turnover, or they could develop programs directly targeting these opportunities.

- **Energy use and savings potential can vary greatly by building type** – Inefficient lighting technologies appear to be more heavily concentrated in certain building types, such as lodging, food service, and public assembly. Similarly, building types such as grocery, healthcare, and food service have much higher energy use intensities than others. Efficiency efforts should target these building types with the most to gain from energy efficient retrofits.

- **Controls are largely absent from the current building stock** – Lighting controls have the potential to provide substantial energy savings (twenty-four to thirty-eight percent depending on the application), but according to the DOE study, they are in use on only thirty percent of all commercial lighting nationwide. Energy efficiency efforts should encourage the use of lighting controls wherever possible.

- **The retrofit market has already captured many savings opportunities** – The DOE study reported that the commercial lighting sector made significant gains in efficacy in the period between 2001 and 2010. This may indicate that the market has already captured most of the "easy" lighting retrofit opportunities. Further efficiency efforts may require more investment to achieve the same levels of savings.

- **LEDs have very long life spans** – As indicated by Pike Research's prediction that the lighting market will shrink moving forward (Pike Research 2011, 4), the long life spans of LED lighting products will significantly affect lighting retrofits. At the same time, the DOE expects LED performance to continue to improve over the next ten years. Installing current LED products may lock in that energy use for the next twenty-five years or more. Energy efficiency programs should carefully assess the LED market to ensure that they incentivize only the best and highest-performing products.

HMG further developed these findings into more specific recommendations in the Conclusions section (Section 12).

5. ONE FACILITY MANAGER'S PERSPECTIVE

Unfortunately, due to time constraints and low response rates, HMG was able to complete only one building owner or manager interview. As Table 1 shows, despite over two hundred contacts with building owners and facility managers in the Northwest region, only one agreed to an interview.

Table 1. Building Owner and Facility Manager Interview Sample

	n
Target Sample	10-15
Contacts	202
Completed Interviews	1

The interviewer spoke with a national facility manager for a retail chain. This section summarizes the key results from this building owner interview.

As a facility manager for a large number of buildings throughout the country, this respondent has direct relationships with several key lighting product manufacturers, as well as with utilities throughout the country. As an employee of an energy- and environmentally-conscious company, this respondent reported having energy savings goals, and has dedicated staff to track utility incentive opportunities.

This facility manager reported that lighting in the retail stores is typically updated every nine years, but also reported that the stores realize little energy savings at this point because their lighting is already efficient. When his company does test new technologies, it typically starts in markets where electricity costs are highest.

Although this one interview cannot be representative of building owners and facility managers in general, it does provide some important insights. While large national chains like the one in this interview may present opportunities for significant energy savings across multiple buildings with replicable solutions, HMG expects that they are also more likely to have dedicated resources tracking utility incentives and looking for those energy savings opportunities. Furthermore, companies such as the one described above may have already taken steps to increase their energy efficiency, and may be able to achieve only incremental improvements.

In contrast, HMG expects that smaller businesses without the resources to follow utility developments and program offerings may not be aware of the savings potential of energy efficient retrofits, or may not even realize that those programs are available. In addition, incentives and programs beneficial for large corporations, like the one in this example, may not have the same benefits for small businesses that lack the same economies of scale.

As a result, regional efficiency efforts may need to more actively tailor incentive programs to specific sectors of the market to capture previously-unrealized energy savings.

6. TRADE ALLY INTERVIEW RESULTS

As part of the Market Characterization project, HMG interviewed a sample of lighting contractors and installers (trade allies) on their views and experiences in the lighting retrofit market. Table 2 outlines the interview sample.

Table 2. Trade Ally Interview Sample

	n
Target Sample	15-30
Contacts	235
Completed Interviews	11

HMG contacted 235 trade allies from the Northwest Trade Ally Network maintained by Evergreen Consulting. Unfortunately, due to the time constraints of the trade allies, HMG conducted only eleven interviews. In addition, one of these respondents ran out of time before completing the interview, so some questions have only ten responses.

Although the final sample is lower than the target, the results are still useful for the market characterization process.

The following sections provide a summary of findings and conclusions from these interviews. Appendix B includes a detailed discussion of the trade ally interview findings.

6.1 Summary of Findings

Of the eleven survey respondents, only two reported that all of their work consisted of energy efficient lighting retrofits. The other respondents reported that energy efficient retrofits make up twenty percent or less of their work. This relatively low average level of experience with lighting retrofits may limit the applicability of the findings of this survey.

Eight of the eleven respondents reported that they get lighting products from distributors, and five reported that their suppliers vary depending on the price of lighting products. Three other respondents noted that they use different suppliers for fixtures and controls. Two respondents also noted that their suppliers may vary depending on specific building types or project needs.

Seven of the eleven respondents reported having regular interactions with manufacturers' sales representatives. Contrary to the original hypothesis that retrofit contractors do not regularly deal with sales reps, the two respondents who do exclusively lighting retrofits reported interacting with sales reps. Six of the eleven respondents also reported receiving design assistance from sales reps, distributors or both.

Respondents cited three building types most favorable to retrofits, one for each of the following:

- Manufacturing
- Large commercial
- Retail

In contrast, respondents cited six building types not favorable to retrofits:

- Small business (two respondents)
- Offices (one)
- Small grocery (one)
- Retail (one)
- Auto parts stores (one)
- Restaurants (one)

Of note, one respondent listed retail as unfavorable, while another listed it as favorable to retrofits. Similarly, although distributors cited small commercial as a favorable building type, one trade ally described small business as unfavorable. These results may indicate building types that require more effort or better incentives to encourage energy efficient retrofits.

Seven respondents expect the phase-out of T12s and 700-series T8s to increase their sales. Respondents most frequently cited the T12 phase-out and utility incentives (three respondents each) as having the most impact over the past five years. Respondents expect LEDs and the T12 phase-out (three respondents each) to have the greatest impact over the next five years. Seven respondents also reported that they expect LEDs to substantially change the lighting retrofit market over the next five years.

All ten respondents claimed awareness of utility incentive programs; nine of those ten had projects that had participated in those programs; and six of ten reported that at least ninety-five percent of their retrofit projects participate in utility programs. Trade ally respondents most frequently mentioned the inconsistencies between programs (two respondents), and the upfront cost to customers (two respondents) as program challenges. Respondents cited high first costs (four respondents) and a lack of understanding of measures and strategies (four respondents) as the most common challenges to utility incentive programs for their customers.

6.2 Conclusions

The small survey sample and the general lack of experience with lighting retrofits may limit the applicability of these findings. However, some of these findings may provide useful insights into the lighting retrofit market in the Northwest region. Contrary to the original hypothesis, lighting retrofit installers do have interactions with sales representatives. Sales reps provide product information and, in some cases, design assistance. Sales reps may be useful partners in providing information and assistance with utility lighting programs.

The building types respondents identified as being most favorable for lighting retrofits tend to be large building types with relatively simple retrofit solutions, while those deemed less favorable tended to be smaller spaces that require more involved retrofit solutions. These results suggest that incentive structures favor large and simple retrofit opportunities while neglecting smaller or more difficult space types.

7. DISTRIBUTOR INTERVIEW RESULTS

As part of the Market Characterization project, HMG interviewed a sample of electrical product distributors on their views and experience in the lighting retrofit market. Table 3 outlines the interview sample.

Table 3. Distributor Interview Sample

	n
Target Sample	5-10
Completed Interviews	5

The following sections provide a summary of findings and conclusions from these interviews. Appendix C includes a detailed discussion of the distributor interview findings.

7.1 Summary of Findings

All five distributors surveyed reported specific marketing efforts and product lines geared toward the commercial lighting retrofit market. Several respondents mentioned specific products or building types more favorable to commercial lighting retrofits with no clear favorite. They mentioned the following building types:

- Small commercial (two respondents)
- Warehouse (one)
- Food processing (one)

Respondents mentioned the following product types:

- High efficiency fixtures, generally (two respondents)
- T5 and T8 high bay fixtures (two)
- Controls (two)
- T5 2x4 troffers with controls (one)
- LED can lights (one)

Respondents also mentioned the following specific brands:

- GE lamp and ballast combinations (two respondents)
- Cooper fixtures (one)
- Hubbell fixtures (one)
- Lithonia fixtures (one)

Most (four of five) also reported providing design services for their customers.

Respondents reported that second-generation T8s (three respondents) and utility incentives (two respondents) had the biggest impacts on their retrofit business in the past five years; they expect LEDs (four respondents) and utility incentives (one respondent) to have the biggest impacts in the coming five years. Four of the five respondents also expect that the phase-out of T12s and 700-series T8s will lead to increased sales for alternative products, but three respondents reported that customers are still buying these less-efficient products.

Four respondents reported increased sales or added product lines due to the growth in LEDs, and all five respondents reported increased sales or added product lines due to the growth in controls. However, only one respondent reported an increase in sales due to the growth of ceramic metal halide.

Two distributors reported a lack of education and product recognition with new high-efficiency products as a challenge for both installers and customers. However, two respondents noted no challenges for installers or customers.

All five respondents claimed familiarity with utility incentive programs, and all five reported that at least half of their retrofit work involved utility incentives. Respondents identified the following challenges with utility incentive programs:

- Variations across utilities (two respondents)
- Complexity of programs (one)
- Product costs (one)
- Low incentives (one)

Three of the five respondents also reported experience working with utilities to provide incentives directly to manufacturers and suppliers to lower product costs. Two of these three considered these efforts to be very effective, while the third noted it is effective only if the product volume for end-users increases.

7.2 Conclusions

Although this group of respondents yielded no consensus, distributors are aware that certain building types and product types are best-suited to commercial lighting retrofits. Building types identified by these distributor respondents may indicate areas where utility programs have already most effectively directed incentives, and therefore do not need additional support.

Almost all respondents (four of five) expect LED products to have the biggest impact on their retrofit business over the next five years. The fast growth of LEDs renders this a key area for NEEA and utility support, to ensure that utilities incentivize only high-quality and high-efficiency products in retrofit applications.

Responses also indicated that most distributors are familiar with upstream incentive programs, in which utilities work directly with manufacturers and suppliers to reduce the cost of efficient products. This may be another opportunity to encourage energy efficient lighting in the Northwest region.

8. MANUFACTURER SALES REPRESENTATIVE INTERVIEW RESULTS

As part of the Market Characterization project, HMG interviewed a sample of lighting product manufacturers' sales representatives ("sales reps") on their views and experience in the lighting retrofit market. Table 4 outlines the interview sample.

Table 4. Sales Representative Interview Sample

	n
Target Sample	5-10
Completed Interviews	5

The following sections provide a summary of findings and conclusions from these interviews. Appendix D includes a detailed discussion of the manufacturer sales representative interview findings.

8.1 Summary of Findings

Contrary to the original hypothesis, sales reps are actively involved in the commercial lighting retrofit market. All respondents reported specific efforts geared toward the retrofit market, and all reported approaching the retrofit market differently than they do the new construction market.

Respondents mentioned warehouse and industrial building types (two respondents each) as most favorable to lighting retrofits; they also noted that cities (three respondents) tend to be better for the retrofit market than rural areas.

Most respondents (three) mentioned utility incentives as the most important factor in their retrofit businesses over the past five years. Almost all (four) expect LEDs to have the greatest impact over the next five years. Respondents largely concurred that growth in LEDs and controls has led to increased sales (four and five respondents respectively); conversely, none perceived an impact from the growth in ceramic metal halide.

Respondents reported lack of education as a challenge to lighting retrofits for both installers (three respondents) and customers (two respondents).

With regard to Northwest-specific conditions that affect the lighting retrofit market, three respondents noted the region's relatively low electricity rates, which can make selling efficiency retrofits difficult. However, two respondents each also mentioned that utilities in the region have aggressive incentive rates, and the population is generally environmentally conscious.

All five sales reps have participated in utility incentive programs, and of the four who provided estimates, three respondents reported that approximately all of their lighting retrofit projects go through utility programs. Respondents identified the following challenges with utility programs:

- Limited number of eligible products (four respondents)
- Difficulty of product submittals (two)
- Difficulty of submitting products to the DLC (two)
- Payback calculations (one)
- Restrictive cost effectiveness requirements (one)

In additional open-ended comments, three respondents reiterated the challenge of utility program measures and product lists that are too restrictive.

8.2 Conclusions

Contrary to the original hypothesis of this study, these survey results make clear that manufacturer sales representatives are actively involved in the commercial lighting retrofit market, but limited measure options and approved product lists in utility incentive programs pose challenges for them.

Savings-based incentive programs (rather than measure-specific rebates) could provide greater opportunity for sales reps. While sales reps tend to find approved fixture lists and performance standards excessively restrictive, those performance standards will be essential to the success of savings-based incentive programs.

Utility programs and regional organizations such as NEEA should also utilize the skills and knowledge of sales reps to help educate trade allies on new technologies and lighting strategies.

9. MANUFACTURER INTERVIEW RESULTS

As part of the Market Characterization project, HMG interviewed a sample of lighting product manufacturers on their views and experience in the lighting retrofit market. Table 5 outlines the interview sample.

Table 5. Manufacturer Interview Sample

	n
Target Sample	5-10
Completed Interviews	4

Unfortunately, due the manufacturers' time constraints, HMG successfully conducted only four interviews, one short of the target sample. The respondents included two lighting controls manufacturers; one building energy management system control manufacturer; and one who works for a large conglomeration of luminaire, lighting control and daylighting product brands.

Although the number of completed interviews was less than the target sample size and the sample consisted mostly of controls manufacturers, HMG expects the results of these interviews to provide a relatively accurate view of the lighting retrofit market. Most manufacturers are very aware of trends in the lighting market, especially considering the need for interoperability of different system types such as luminaires and lighting controls.

The following sections provide a summary of findings and conclusions from these interviews. Appendix D includes a detailed discussion of the manufacturer interview findings.

9.1 Summary of Findings

As expected, all four respondents stated that their companies develop products specifically for the retrofit market; all likewise reported that they approach the retrofit market differently than they approach the new construction market. Three respondents reported having dedicated marketing efforts or staff for the retrofit lighting market, one reported using different distribution channels for retrofit products, and one noted that the retrofit market is more cost-sensitive than new construction.

Respondents most commonly reported controls (three responses), and LED fixtures (two responses) as their most successful energy efficient products. However, this may reflect respondents' specific product offerings rather than the broader retrofit market.

Respondents considered a wide variety of building types or market conditions beneficial for the retrofit market; offices and industrial building types received multiple mentions (two responses each).

Three of the four respondents claimed their companies have developed products or marketing efforts for specific regional or local markets. Two developed products in response to California codes or programs; the third reported developing marketing efforts specific to local markets, most frequently related to utility programs.

All four respondents reported that both LED and high-efficiency linear fluorescent products yielded the largest impacts on their retrofit businesses over the past five years. Three respondents each expected utility incentive programs and controls to have the biggest impacts over the next five years.

All respondents reported that the growth in both LEDs and controls have either increased sales or required changes in product lines. However, they also all felt no impact on their businesses from the growth in ceramic metal halide. Three reported a lack of education and product awareness as a challenge for both contractors and customers.

The utility structure in the Northwest, with NEEA and other outside organizations promoting energy efficiency, sets the region apart from the rest of the country for three respondents.

All four respondents reported participation in utility programs, and three of the four reported that at least sixty percent of their retrofit business goes through a utility program. Respondents cited the complexity of programs, including cumbersome reporting requirements, as a common challenge for utility programs (two respondents). Two respondents reported working with utilities on upstream incentive programs to reduce the cost of products. One found this very effective; the other was unsure.

9.2 Conclusions

As expected, manufacturers are actively participating in the commercial retrofit lighting market. In contrast to respondents in the other groups, manufacturers expected utility incentives to have the most significant impact on their retrofit business over the next five years.

Although some manufacturers stated willingness to develop products in response to specific market requirements, they tend to focus these efforts on large markets where code and program requirements affect large numbers of customers. The fragmented nature of utilities and program requirements in the Northwest may prevent manufacturers from making specific efforts in the region.

Similarly, respondents noted the complexity of programs and varying program requirements across the region as challenges for lighting retrofits. Respondents suggested that uniform program requirements across larger areas would be beneficial. They further suggested that the prescriptive or product-specific nature of many programs may hinder certain technologies, and that incentives should be more performance-oriented instead.

10. MARKET ACTOR GROUP COMPARISON

The interviews for the various market actor groups (manufacturers, sales representatives, distributors, and trade allies) included questions identical across multiple groups. This section summarizes the comparison of these results among the four interview groups.

10.1 Sales and Marketing

Interviewers asked manufacturers, sales representatives, and distributors about differences in how they address the retrofit market versus the new construction market. In all three groups, all respondents reported addressing the two markets differently. Table 6 summarizes the responses of the manufacturers, sales representatives and distributors. Manufacturers and distributors more commonly claimed dedicated staff or marketing efforts (three and four respondents, respectively), while sales representatives focused on direct project or client interactions (two respondents) and on the differences in project structures (two respondents noted the prominence of design/build project delivery structure in the retrofit market).

Table 6. Differences between Retrofit and New Construction Markets

Question: Are there differences between the ways that your company addresses the commercial retrofit market, compared to commercial new construction? (if yes, describe)

	Manufacturers (n=4)	Sales Representatives (n=5)	Distributors (n=5)
Dedicated marketing efforts or staff for retrofit market	3	1	4
Retrofit market involves more direct project or client interaction	--	2	--
Retrofit market involves more design/build project structure	--	2	--
Retrofit market involves different distribution channels	1	--	1
The retrofit market is more cost-sensitive than new construction	1	--	--
Retrofit market involves more focus on program or incentive eligibility	--	1	--

Note: One manufacturer and one sales representative respondent provided more than one answer.

10.2 Products and Services

Manufacturers, sales representatives and distributors identified their most successful energy efficient product lines for commercial lighting retrofits. As Table 7 shows, the responses varied

among the market actor groups. Manufacturers most frequently referenced controls (three respondents) (note that three of the four manufacturer respondents were controls manufacturers); sales representatives mentioned LED fixtures most often (four respondents); and distributors mentioned high-efficiency fluorescent fixtures generally (five responses) as well as specific fixture or component manufacturers (five responses) most often. The distinction between the manufacturers and the other two groups is likely due to the limited number of products associated with a single manufacturer, as opposed to the wider ranges of products available to sales representatives and distributors.

Table 7. Most Successful Energy Efficient Retrofit Products

Question: What do you consider to be your three most successful energy efficient product lines for commercial retrofit situations? (list in order of success)

	Manufacturers (n=4)	Sales Representatives (n=5)	Distributors (n=5)
Controls	3	2	3
LED fixtures	2	4	1
High efficiency fluorescent fixtures	1	3	5
LED lamp retrofits	--	1	--
HID ballast retrofits	--	1	--
GE lamp and ballast combinations	--	--	2
Cooper fixtures	--	--	1
Hubbell fixtures	--	--	1
Lithonia fixtures	--	--	1

Note: Respondents from each group provided fewer than three responses.

All four groups provided feedback on their perceptions of market conditions more favorable to energy efficient lighting retrofits, such as building type, client types, or regional variations. Table 8 summarizes the responses from all four groups. Manufacturers and sales representatives most frequently mentioned specific building types (eight and seven responses, respectively), although little agreement occurred either within or across the groups as to building types most favorable to lighting retrofits. At least one respondent in each market actor group mentioned the industrial and manufacturing sector as more likely to pursue retrofits, and at least one respondent in three of the four groups mentioned retail, warehouse, and general commercial building types. Similarly, at least one respondent from three of the four market actor groups mentioned both cities/urban areas and favorable utility territories as factors that can encourage lighting retrofits.

Table 8. Favorable Market Conditions

Question: Are there certain building types or clients that are more likely to pursue energy efficient lighting retrofits? (Certain building types? Certain contractor types? Regional variations?)

	Manufacturers (n=4)	Sales Representatives (n=5)	Distributors (n=5)	Trade Allies (n=11)
Building Types				
Industrial / Manufacturing	2	1	1	1
Office	2	--	--	--
Warehouse	1	2	1	--
General Commercial	--	1	2	1
Retail	1	1	--	1
Labs	1	--	--	--
Auto Dealership	1	--	--	--
Multi-family	--	1	--	--
Parking / Site lighting	--	1	--	--
Regional / Geographic				
Cities / Urban areas	1	3	--	1
Favorable utility territories	1	2	2	--
Western Washington	--	--	--	1
Contractor Types				
Lighting maintenance contractors	1	--	--	--
None / N/A	--	--	2	6

Note: Some manufacturers, sales representatives and distributors provided more than one answer.

10.3 Market Trends

The interviewers asked all market actor groups to identify retrofit opportunities with significant impacts on their businesses over the past five years. Table 9 shows the responses from all four groups. Although manufacturers most often cited LED and second-generation T8 (four responses each), other groups more commonly cited utility incentive programs (three sales reps, two distributors, five trade allies) as well as second-generation T8 (one sales rep, three distributors, five trade allies).

Table 9. Market Forces in the Past Five Years

Question: What retrofit opportunities have had a significant impact on your commercial retrofit business over the past five years?

	Manufacturers (n=4)	Sales Representatives (n=5)	Distributors (n=5)	Trade Allies (n=11)
Second generation T8 / T12 phase-out	4	1	3	5
Utility incentive programs	1	3	2	5
LED	4	1	--	--
Controls	1	--	--	3
None	--	--	--	2

Note: Respondents in all groups provided more than one answer.

The interviewers also asked all four market actor groups to specify the retrofit opportunities they expect to have significant impacts on their businesses in the next five years; Table 10 shows these responses. Respondents in all four groups most commonly mentioned LED (two manufacturers, four sales representatives, four distributors, and three trade allies).

Table 10. Market Forces in the Next Five Years

Question: What retrofit opportunities do you expect to have a significant impact on your commercial retrofit business over the next five years?

	Manufacturers (n=4)	Sales Representatives (n=5)	Distributors (n=5)	Trade Allies (n=11)
LED	2	4	4	3
Utility incentive programs	3	--	1	2
Controls	3	--	--	--
Code changes that affect retrofit lighting	1	1	--	--
T12 phase-out	--	--	--	3
Economy	--	--	--	1
None	--	--	--	3

Note: Respondents in all groups provided more than one answer.

Manufacturers, sales representatives, and distributors stated their expectations of the impact of new federal standards that effectively ban T12 and 700-series T8 linear fluorescent lamps. As Table 11 shows, most in each group expected no change as a result of these new federal standards (three manufacturers, three sales representatives, and four distributors). However, a majority of distributors (three of five) reported that customers are still purchasing T12s and 700-series T8 products.

Table 11. Impact of T12 and 700-series T8 Phase-out

Question: How do you expect the phase-out of T12s and 700-series T8s to affect your retrofit product distribution?

	Manufacturers (n=4)	Sales Representatives (n=5)	Distributors (n=5)
No change	3	3	4
Increase sales	1	2	1

Table 12, Table 13, and Table 14 show responses across all four groups about the impacts of specific product trends. All manufacturers and sales representatives expect the growth in LED products to affect their businesses in some way; most distributors (four respondents), and half of trade allies (five respondents) expect impacts. Similarly, all manufacturers, sales representatives

and distributors expect the growth in controls to impact their businesses; most trade allies expect no change based on growth in controls (five respondents). In contrast, all manufacturers and sales reps expect no impact from ceramic metal halide on their businesses; most distributors (four of five) and trade allies (eight of ten) likewise expect no such impact.

Table 12. LED Impacts

Question: How is the growth of LEDs affecting your retrofit product line?

	Manufacturers (n=4)	Sales Representatives (n=5)	Distributors (n=5)	Trade Allies (n=10)
Increase sales	2	4	2	4
Change product line / offer more products	4	1	2	1
No change	0	0	1	5

Note: Two manufacturers provided multiple responses.

Table 13. Lighting Controls Impacts

Question: How is the growth of controls affecting your retrofit product line?

	Manufacturers (n=4)	Sales Representatives (n=5)	Distributors (n=5)	Trade Allies (n=10)
Increase sales	4	5	4	3
Change product line / offer more products	0	0	1	0
No change	0	0	0	7

Table 14. Ceramic Metal Halide Impacts

Question: How is the growth of ceramic metal halide affecting your retrofit product line?

	Manufacturers (n=4)	Sales Representatives (n=5)	Distributors (n=5)	Trade Allies (n=10)
Increase sales	0	0	1	2
Change product line / offer more products	0	0	0	0
No change	4	5	4	8

Manufacturers, sales representatives, and distributors noted challenges for installers and contractors as well as for customers in energy efficiency retrofits. As Table 15 shows, respondents in all three groups cited a lack of education or product recognition as the most common challenge for installers and contractors.

Table 15. Challenges for Installers and Contractors

Question: Are you aware of any challenges with installing contractors adapting to these new technologies mentioned in the previous questions (LEDs, controls, CMH)? (if yes, specify)

	Manufacturers (n=4)	Sales Representatives (n=5)	Distributors (n=5)
Yes – Lack of education / product recognition	3	3	2
Yes – Commissioning / installation issues	1	0	1
Yes – Price point	1	0	0
No	0	2	2

Note: One manufacturer provided more than one response.

Similarly, Table 16 shows that respondents in all three groups cited a lack of education or product recognition as the most common challenge for customers (three manufacturers, two sales representatives, and two distributors).

Table 16. Challenges for Customers

Question: Are you aware of any challenges with customers adapting to these new technologies mentioned in the previous questions (LEDs, controls, CMH)? (if yes, specify)

	Manufacturers (n=4)	Sales Representatives (n=5)	Distributors (n=5)
Yes – Lack of education / product recognition	3	2	2
Yes – Price point	0	1	1
Yes – Lack of end-user control with high-end controls	1	0	0
Yes – LED dimming problems	0	1	0
No	0	1	2
Not sure	1	1	0

Note: One manufacturer and one sales representative provided more than one response.

10.4 Utility Programs

Finally, all four market actor groups addressed challenges with utility retrofit programs. As Table 17 shows, responses varied widely across the four groups. Respondents from the manufacturer (two), distributor (one), and trade ally (one) groups mentioned the complexity of programs. Similarly, respondents from the distributor (two) and trade ally (two) groups mentioned the challenge of variations among the different utilities and programs.

Table 17. Challenges with Utility Programs

Question: What are the most difficult challenges or barriers of utility commercial retrofit programs for you?

	Manufacturers (n=4)	Sales Representatives (n=5)	Distributors (n=5)	Trade Allies (n=10)
Complexity of programs	2	--	1	1
Variation across utilities	--	--	2	2
Limited number of eligible products	--	4	--	--
Incentive rates are too low or rebate structures are ineffective	2	--	1	--
Delays or difficulties in product approvals	1	2	--	--
Difficulty of Design Lights Consortium (DLC) certification	--	2	--	--
Challenges with payback, ROI or cost effectiveness calculations	--	2	--	--
Product cost	--	--	1	2
Unresponsive utilities	--	--	--	1
Product performance requirements	--	--	--	1
Product disposal	--	--	--	1
None	--	--	--	1

Note: Respondents in the manufacturer, sales representative, and distributor groups provided more than one response.

10.5 Summary of Findings

Comparing responses across the market actor groups reveals relative consistency in viewpoints at all levels of the market.

All respondents in the manufacturer, sales representative, and distributor groups reported addressing the retrofit market differently than new construction. Manufacturers (three responses) and distributors (four responses) commonly cited dedicated staff or marketing efforts for the retrofit market, and sales representatives reported that they are more directly involved with retrofit projects (two responses).

Respondents' most successful energy efficient products constituted one key distinction among the different market actor groups. Manufacturers mentioned controls most often (three respondents), while sales reps mentioned LED fixtures (four respondents), and distributors mentioned high-efficiency fluorescent fixtures (five respondents). These distinctions most likely reflect differences in roles for each of these three groups. Manufacturers typically focus on relatively few products compared to sales representatives or distributors. Similarly, sales representatives tend to more eagerly promote new technologies (LED fixtures in this case), whereas distributors tend to focus on more well-known products (high-efficiency fluorescent fixtures in this case).

Little consensus emerged on which building types or project conditions are most advantageous for lighting retrofits. However, at least one respondent in each of the four groups mentioned the industrial and manufacturing sector. One manufacturer, two sales representatives, and one distributor mentioned the retail sector. One sales representative, two distributors, and one trade ally mentioned general commercial buildings. One manufacturer, one sales representative, and one trade ally mentioned retail. In addition to building types, one manufacturer, three sales representatives, and one trade ally cited cities and urban areas as more beneficial for lighting retrofits. One manufacturer, two sales representatives, and two distributors also mentioned the advantage of favorable utility territories for the lighting retrofit market.

The four market actor groups largely agreed on the impacts of specific products. Most manufacturers (six responses), sales representatives (five responses), and distributors (four responses), and half the trade allies (five responses) expect the growth in LED products to affect their businesses in some way. Similarly, all manufacturers, sales representatives, and distributors expect the growth in controls to affect their businesses. In contrast, across all four groups, most or all expect ceramic metal halide to have no impact on their businesses (four manufacturers, five sales representatives, four distributors, and eight trade allies). This may suggest that developments in LED products have eclipsed ceramic metal halide in most applications.

Manufacturers, sales representatives, and distributors also agreed that a lack of education and product recognition constitutes the biggest challenge facing both installers (cited by three manufacturers, three sales representatives, and two distributors), and customers (cited by three manufacturers, two sales representatives, and two distributors).

Market actors mentioned a broad range of challenges for utility programs with little commonality among the market actor groups. At least one respondent in three groups (two manufacturers, one distributor, and one trade ally) mentioned the complexity of programs as a challenge; two distributors and two trade allies mentioned variations in programs across utilities as a challenge. Other commonly-cited challenges included difficulties in getting products approved (cited by one manufacturer, and two sales representatives), and high product costs (cited by one distributor, and two trade allies). Sales representatives most frequently cited the limited number of eligible products (four respondents). Although the perceived challenges vary, these most common responses all relate to the complexity of program requirements (with the exception of product cost).

10.5.1 Conclusions

Although the four market actor groups tended to agree on most issues, they disagreed slightly on the most successful products for energy efficient retrofits. While the various roles of the market actors may drive the differences (sales representatives often promote new technologies, while distributors tend to favor more traditional products), such differences may also signal a lack of product awareness in the retrofit lighting market. Most notably, only the manufacturers mentioned lighting controls as a market force likely to have significant impact in the next five years, despite the fact that greater use of lighting controls will be essential to achieving deeper energy savings in lighting retrofits in the coming years.

Similarly, given that manufacturers, sales representatives, and distributors all cited a lack of education and product recognition as the most significant barrier to energy efficient lighting retrofits for both contractors and customers (see results in Section 10.3), overcoming this educational barrier will be essential to the success of future energy efficient lighting retrofit efforts.

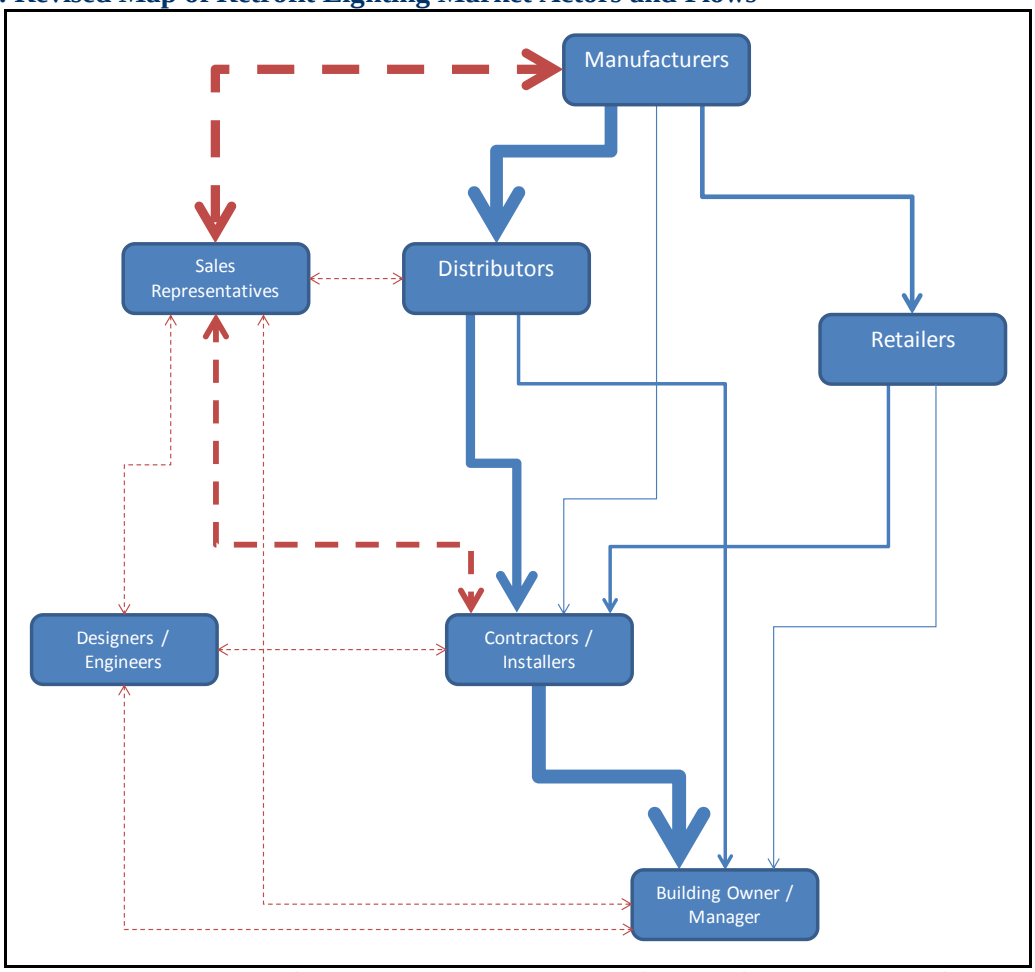
11. COMMERCIAL LIGHTING RETROFIT MARKET MODEL

As described in Section 3, HMG created a hypothetical map of market actors and product and information flows in the commercial lighting retrofit market. That initial map served as a testable hypothesis for this market characterization. HMG initially expected that the most prominent product flow path went from manufacturers through distributors to the contractors who provide services to the building owners. In this hypothesis, retailers, sales representatives, and designers play more minor roles in the lighting retrofit market.

11.1 Revised Retrofit Lighting Market Actor Map

Not surprisingly, the results of the analysis revealed a much more complicated set of interactions than that shown in the hypothesis presented above. Figure 3 presents a revised map of retrofit lighting market actors and flows based on the results of the literature review and market actor interviews. Once again, blue arrows indicate product flows, while dashed red arrows indicate information-only relationships. The thicknesses of the arrows represent relative product volume, in the case of the blue arrows, and the relative influence of each relationship in the market.

Figure 3. Revised Map of Retrofit Lighting Market Actors and Flows



Note: Solid blue arrows indicate product flows; dashed red arrows indicate information flows. Thicknesses of the arrows represent relative product volume and the relative influence of the relationship.

As originally expected, the primary product flow in the lighting retrofit market is through distributors, to contractors, and on to building owners. In some cases, contractors and building owners acquire products from retailers, and some building owners or managers have direct relationships with lighting distributors. Rarely, contractors or installers get products directly from manufacturers.

Contrary to the original hypothesis, the analysis found that manufacturers' sales representatives are regularly involved in the retrofit lighting market. Sales representatives have regular interactions with retrofit contractors and installers, and are occasionally involved directly with the building owner or facility manager. However, similar to the original hypothesis, the results of the analysis suggest that designers are only rarely involved in lighting retrofit projects.

As noted above, the diagram does not illustrate the influence of NEEA and utilities in the market since they have the ability to influence the market at all points. One of the goals of this relationship map is to identify potentially underutilized relationships for NEEA and the utilities, such as the relationship between manufacturer sales representatives and contractors.

11.2 Market Segmentation Distinctions

Part of HMG's initial plan was to identify any product flow or relationship differences based on specific market factors. Those market factors, as established in Section 3.3, are as follows:

- Product or system type
- State or regional differences within the Northwest
- Building type
- Building vintage
- Ownership type

The results of the analysis yielded no differences in product flows or relationships based on building type or vintage. In addition, the lack of building owner or manager interview results precludes any distinctions based on ownership type. However, the results of the literature review and market actor interviews did reveal some distinctions based on product types, and regional differences, as described below.

11.2.1 Lighting Product and System Type Distinctions

As part of the conceptual framework established in Section 3, HMG defined a set of three unique product and system types, as follows:

- Commoditized products
- Premium products
- Systems products

The results of the literature review and market actor interviews revealed no major differences in how these products move through the market. However, the interview results did indicate that

product awareness varies among the market actor groups. As described in Section 10.3, only the manufacturers (three respondents) mentioned lighting controls as a market force likely to have significant impact in the next five years. Despite this apparent lack of awareness among sales representatives, distributors, and trade allies, lighting controls will be essential to achieving energy savings in utility retrofit programs going forward. These findings may indicate that utilities need to do more to encourage the use of lighting controls in retrofit projects.

11.2.2 Regional Distinctions

Similarly, although respondents did not mention distinctions among specific locations within the Northwest region, respondents cited cities and urban areas, as well as favorable utility territories, as regional factors that encourage energy efficient lighting retrofits [1]. Although both of these factors may seem obvious, they may also provide useful guidance for future planning. While cities are naturally a more fertile market for lighting retrofits, these findings may indicate that utility programs are missing out on savings opportunities in rural or less populated areas.

11.3 Conclusions

As described above, the revised map of retrofit lighting market actors and flows reveals a more complicated set of interactions than originally anticipated in the conceptual framework hypothesis. Although the analysis confirmed that retrofit lighting products typically flow through distributors, and then to contractors who install them in the building, the results of the study also indicate that sales representatives are much more involved in the retrofit lighting market than initially thought.

Although the results indicate no distinct market flows for specific product types, responses did indicate a potential lack of awareness of the effectiveness of lighting controls in retrofits among trade allies, distributors, and sales representatives. This may present an opportunity for NEEA and the utilities to encourage manufacturers to provide trainings on the benefits and energy savings potential of lighting controls, as a tool to promote additional awareness in the region.

[1] As noted in Section 10.2, one manufacturer, three sale representatives, and one trade ally mentioned cities and urban areas; one manufacturer, two sales representatives, and two distributors mentioned favorable utility territories.

12. CONCLUSIONS AND RECOMMENDATIONS

The following sections summarize the conclusions from the various study activities described above, and provide recommendations based on the findings of this study.

12.1 Literature Review Conclusions

Based on the results of the literature review presented above, HMG developed the key findings outlined below.

- **T12s continue to represent a savings opportunity** – Although federal legislation has effectively banned the sale of new T12 lamps, they remain installed in significant quantities in the commercial and industrial sector. The Energy Trust study estimated that seventeen percent of commercial and industrial lighting in Oregon in 2009 consisted of T12 lamps. Similarly, the DOE study found that T12s comprised over thirty percent of the installed lighting watts in the U.S. commercial sector. In addition, some manufacturers have developed so-called "compliant T12" lamps that comply with the federal regulations, which may further dissuade retrofits. If possible, programs should continue to support T12 retrofits, especially among customers that earlier programs may have missed, such as small businesses.

- **Turnover in commercial lease space as an energy efficiency opportunity** – Owners and tenants typically renovated commercial office space every ten years, and retail every fifteen years. These renovations represent prime opportunities for energy efficiency. However, building owners may not be motivated to retrofit inefficient lighting equipment, especially if the tenants are paying the utility bills. These scenarios could represent an opportunity for targeting as-yet unrealized energy savings. NEEA and the utilities could work directly with large retail or office property owners to encourage energy efficient lighting retrofits at tenant turnover, or they could develop programs directly targeting these opportunities.

- **Energy use and savings potential can vary greatly by building type** – Inefficient lighting technologies appear to be more heavily concentrated in certain building types. Similarly, some building types have much higher energy use intensities than others. Efficiency efforts should target building types with the most to gain from energy efficient retrofits.

- **Controls are largely absent from the current building stock** – Lighting controls have the potential to provide substantial energy savings (twenty-four to thirty-eight percent depending on the application), but according to the DOE study, they are in use on only thirty percent of all commercial lighting nationwide. Energy efficiency efforts should encourage the use of lighting controls wherever possible.

- **The retrofit market has already captured many savings opportunities** – The DOE study reported that the commercial lighting sector made significant gains in efficacy in the period between 2001 and 2010. This may indicate that the market has already

captured most of the "easy" lighting retrofit opportunities. Further efficiency efforts may require more investment to achieve the same levels of savings.

- **LEDs have very long life spans** – As indicated by Pike Research's prediction that the lighting market will shrink moving forward, the long life spans of LED lighting products will significantly affect lighting retrofits. At the same time, the DOE expects LED performance to continue to improve over the next ten years. Installing current LED products may lock in that energy use for the next twenty-five years or more. Energy efficiency programs should carefully assess the LED market to ensure that they incentivize only the best and highest-performing products.

12.2 Facility Manager Interview Conclusions

Unfortunately, due to time constraints and low response rates, HMG was able to complete only one building owner or manager interview – a corporate-level facility manager for a national retail chain. Although this one facility manager interview is not representative of building owners and facility managers in general, it does provide some important insights. While large national chains like this respondent may present opportunities for significant energy savings across multiple buildings with replicable solutions, they are also more likely to have dedicated resources tracking utility incentives and seeking out those energy savings opportunities. The facility manager HMG interviewed reported having direct relationships with manufacturers and distributors, as well as with dedicated staff members who track utility programs and incentives. Furthermore, large companies and national chains may have often already taken steps to increase their energy efficiency, and may be able to achieve only incremental improvements. For example, this respondent reported that new lighting efficiency improvements at his company resulted in only minor savings because its baseline technology is already efficient.

In contrast, HMG expects that smaller businesses without the resources to follow utility developments and program offerings may not realize the savings potential of energy efficient retrofits, or may not even realize that those programs are available. In addition, incentives and programs beneficial for large corporations, like the one in this example, may not have the same benefits for small businesses that lack the same economies of scale. Results from other interview groups in this study also suggest that small businesses with more complex retrofit needs are less likely to pursue energy efficient retrofits.

As a result, NEEA and the utilities may need to more actively tailor program efforts to specific sectors of the market to capture previously-unrealized energy savings.

12.3 Trade Ally Interview Conclusions

The small sample of trade allies surveyed and their general lack of experience with lighting retrofits may limit the applicability of these findings. However, some of these findings may provide useful insight into the lighting retrofit market in the Northwest region.

Contrary to the original hypothesis, lighting retrofit installers do have interactions with sales representatives. Seven of the eleven respondents report having regular interactions with

manufacturers' sales representatives. Sales reps provide product information and, in some cases, design assistance. Six of the eleven respondents also reported receiving design assistance from sales reps, distributors or both. Sales reps may be useful partners in providing information and assistance with utility lighting programs.

The building types respondents identified as being most favorable for lighting retrofits tend to be large building types with relatively simple retrofit solutions, while those deemed less favorable tended to be smaller spaces that require more involved retrofit solutions. Three respondents mentioned building types most favorable to retrofits, one for each of the following building types:

- Manufacturing
- Large commercial
- Retail

By contrast, respondents mentioned five building types that were not favorable to retrofits:

- Small business (two respondents)
- Retail (two)
- Offices (one)
- Small grocery (one)
- Restaurants (one)

These results may suggest that incentive structures favor these large and simple retrofit opportunities, while neglecting smaller or more difficult space types.

All ten respondents (one respondent was unable to complete the full survey) indicated awareness of utility incentive programs; nine of those ten had projects that had participated in those programs; and six of ten reported that at least ninety-five percent of their retrofit projects participate in utility programs. Trade ally respondents most frequently cited the inconsistencies among programs (two respondents), and the upfront cost to customers (two respondents) as program challenges. Respondents cited high first costs (four respondents) and a lack of understanding of measures and strategies (four respondents) as the most common challenges to utility incentive programs for their customers.

12.4 Distributor Interview Conclusions

Although this group of respondents yielded no consensus, distributors are aware that certain building types and product types are best-suited to commercial lighting retrofits. Specific building types mentioned are as follows:

- Small commercial (two respondents)
- Warehouse (one)
- Food processing (one)

However, building types identified by the respondents in this survey may indicate areas where utility programs have most effectively directed incentives, and which therefore do not need additional support.

Most distributor respondents (four of five) expected LED products to have the biggest impact on their retrofit businesses over the next five years (due to the growth of LED in the lighting industry, HMG expects that the fifth respondent has already seen a significant impact on their business from the LED products). The fast growth of LEDs renders this a key area for NEEA and utilities to ensure that utility programs are incentivizing only high-quality and high-efficiency products in retrofit applications.

Responses also indicate that most distributors are familiar with upstream incentive programs, in which utilities work directly with manufacturers and suppliers to reduce the cost of efficient products. Three of the five respondents reported experience working with utilities to provide incentives directly to manufacturers and suppliers to lower product costs. Two of these three respondents considered these efforts very effective, while the third noted it is effective only if the product volume for end-users increases. This may be another opportunity to encourage energy efficient lighting in the Northwest region.

12.5 Sales Representative Interview Conclusions

Contrary to the original hypothesis of this study, these survey results make clear that manufacturer sales representatives are actively involved in the commercial lighting retrofit market, but limited measure options and approved product lists in utility incentive programs pose challenges for them. As with the manufacturer group, all sales representative respondents reported specific efforts geared toward the retrofit market, and all reported approaching the retrofit market differently than the new construction market.

Four sales rep respondents noted that the limited number of eligible products is a major challenge to utility programs for sales representatives. Savings-based incentive programs (rather than measure-specific rebates) could provide greater opportunity for sales reps. Two respondents also mentioned the difficulty of product submittals as a barrier, and two others cited the difficulty of submitting products to the DesignLights Consortium (DLC). While sales reps tend to find approved fixture lists and performance standards excessively restrictive, those performance standards will be essential to the success of savings-based incentive programs.

NEEA and the utility programs should also utilize the skills and knowledge of sales reps to help educate trade allies on new technologies and lighting strategies.

12.6 Manufacturer Interview Conclusions

As expected, manufacturers are actively participating in the commercial retrofit lighting market. All four manufacturers surveyed reported developing products specifically for the retrofit market, and all reported that they approach the retrofit market differently than the new construction market. In contrast to the other groups, most manufacturers (three of four) expected utility incentives to have impacts on their retrofit business over the next five years.

Although some manufacturers (three of four) stated willingness to develop products in response to specific market requirements, they tended to focus these efforts on large markets where code and program requirements affect large numbers of customers. The fragmented nature of utilities and program requirements in the Northwest may prevent manufacturers from making specific efforts in the region.

Similarly, respondents cited the complexity of programs, including cumbersome reporting requirements, as the most common challenge for utility programs (two respondents). One respondent suggested that uniform program requirements across larger areas would be beneficial. Another also suggested that the prescriptive or product-specific nature of many programs may hinder certain technologies, and that incentives should be more performance-oriented instead.

12.7 Market Actor Group Comparison Findings

Although the four market actor groups tended to agree on most issues, they disagreed slightly on the most successful for energy efficient retrofits. Manufacturers mentioned controls most often (three respondents), while sales reps mentioned LED fixtures (four respondents), and distributors mentioned high efficiency fluorescent fixtures (five respondents). While the various roles of the market actors may drive the differences (sales representatives often promote new technologies, while distributors tend to favor more traditional products), such differences may also signal a lack of product awareness in the retrofit lighting market. Most notably, only the manufacturers mentioned lighting controls as a market force likely to have significant impact in the next five years, despite the fact that greater use of lighting controls will be essential to achieving deeper energy savings in lighting retrofits in the coming years.

Similarly, given that manufacturers, sales representatives, and distributors all cited a lack of education and product recognition as the most significant barrier to energy efficient lighting retrofits for both installers[2].

12.8 Commercial Lighting Retrofit Market Model Conclusions

As described in Section 11.1, the revised map of retrofit lighting market actors and flows reveals a more complicated set of interactions than initially anticipated in the conceptual framework hypothesis. Although the analysis confirmed that retrofit lighting products typically flow through distributors, and then to contractors who install them in the building, the results of the study also indicate that sales representatives are much more involved in the retrofit lighting market than initially thought. These sales representatives could be useful partners to help utilities inform the market about program and incentive offerings.

[2] Cited by three manufacturers, three sales representatives, and two distributors), and customers (cited by three manufacturers, two sales representatives, and two distributors), overcoming this educational barrier will be essential to the success of future energy efficient lighting retrofit efforts

Although the results do not indicate any distinct market flows for specific product types, responses did indicate a potential lack of awareness of the effectiveness of lighting controls in retrofits among trade allies, distributors, and sales representatives. This may present an opportunity for NEEA and the utilities to encourage manufacturers to provide trainings on the benefits and energy savings potential of lighting controls, as a tool to promote additional awareness in the region. Similarly, interview responses indicate that rural areas and certain utility territories with less favorable program offerings may be missing out on energy savings from lighting retrofits.

12.9 Recommendations

Based on the results summarized above, HMG developed the following recommendations for future energy efficient lighting retrofit efforts in the Northwest region:

- **Simplify programs whenever possible** – Interview respondents described a variety of complications with utility programs that present barriers to participation. As much as possible, programs should simplify. Specific examples include the following:

  - **Encourage performance, not prescriptive product change-outs** – Prescriptive product change-outs may limit energy savings, prevent best practices, and result in over-lighting. Instead, programs should incentivize strategies that deliver the best energy performance possible. Rather than providing a long list of product-specific incentive rates, utilities could provide a single savings-based incentive structure. Savings-based approaches are also less restrictive on design options, and can also encourage more appropriate retrofit solutions than product-specific incentives.
  - **Encourage regional coordination when possible –** Variations in program requirements among the many utilities in the Northwest region cause confusion and complication. Product performance requirements and submittals can be especially cumbersome if they vary among the different utilities. Although the different utilities in the region will have different program needs, any effort to coordinate on a regional level can ease this burden.

- **Where possible, continue to encourage early T12 replacements** – Despite new federal requirements, significant quantities of T12 lamps remain in the market; manufacturers have developed so-called "compliant T12" lamps that comply with the federal regulations; and distributors report that customers are still purchasing T12s. Considering these factors, T12 lamps in the market continue to present energy savings opportunities. Wherever possible, utilities should continue to encourage T12 replacements, especially in more rural market areas.

- **Provide more education and training for contractors/installers and customers** – Manufacturers, sales representatives, and distributors all cited a lack of education and product recognition as the most significant barrier to energy efficient lighting retrofits for both installers (cited by three manufacturers, three sales representatives, and two distributors), and customers (cited by three manufacturers, two sales representatives, and two distributors). NEEA and the utilities need to provide installers with more education

in order for them to be able to implement the strategies and technologies necessary to achieve deep energy savings through lighting retrofits. Similarly, customers need to be educated in order to understand the values and benefits of energy efficient retrofits.

- **Build relationships with manufacturer sales representatives** – Sales representatives are a generally untapped resource in the retrofit lighting market. Sales representatives are involved in lighting retrofit projects, and provide information to the contractors and installers performing the retrofits. NEEA should build relationships with manufacturer sales representatives, and utilize them to promote retrofit opportunities. Because of their existing connections and relationships in the retrofit market, sales representatives can serve as a resource for customers on utility programs, as well as on energy efficient products, technologies and strategies. Similarly, sales representatives can also serve as a resource to NEEA and the utilities on energy efficient products and technologies.

- **Take advantage of synergistic opportunities** – NEEA and the utilities should encourage energy efficient retrofits at synergistic intervals. For example, owners and tenants typically renovate commercial office space every ten years and retail space every fifteen years. Utilities should capitalize on these opportunities, or on similar intervals such as tenant turnover, to encourage energy efficient retrofits. NEEA and the utilities could reach out to large retail and office space owners to encourage energy efficient retrofits at tenant turnover, or develop programs specifically targeted at these opportunities.

- **Focus efforts on as-yet untapped savings opportunities** – Trade allies have already acted on many of the most basic lighting retrofit opportunities. Trade allies already focus on opportunities in cities and urban areas; generous utility territories; and large building types with simple retrofit solutions. NEEA and the utilities may need to encourage future program efforts in more difficult and previously-unrealized savings opportunities, such as rural areas and small businesses.

- **Encourage the use of lighting controls** – As mentioned several times throughout the report, interview results indicate a general lack of awareness of the energy savings potential of lighting controls in the retrofit market. Lighting controls will be essential to achieving energy savings in lighting retrofits in the coming years. NEEA and the utilities need to continue to provide education on the application, installation, commissioning and use of lighting controls in energy efficient retrofits. Furthermore, NEEA and the utilities need to continue to encourage the use of lighting controls through incentives. Energy performance-based incentives, or tiered incentives that increase along with energy savings, may encourage the use of more lighting controls.

- **Continue to be cautious with LED** – Although LED represents the most efficacious light source for commercial lighting retrofits, quality and performance varies widely among specific LED products. Furthermore, LED products have a long lifetime and a high first cost, and LED performance continues to improve. Encouraging underperforming LED products today may lock in subpar energy performance and light

quality for up to thirty to fifty years. In addition, light quality is a critical factor in terms of end-user acceptance. To ensure end-user acceptance, NEEA and the utilities should only incentivize LED products with the best performance. Although it may frustrate manufacturers, sales representatives, and distributors, utilities should continue to use product performance standards or third-party certifications such as the DesignLights Consortium (DLC) to qualify LED products.

- **Consider "upstream" incentive efforts** – NEEA should consider developing "upstream" incentive relationships with distributors, manufacturer sales representatives, and manufacturers to provide lower cost energy efficient products to consumers. Three of the five distributors interviewed in this study reported experience working with utilities to provide incentives directly to manufacturers and suppliers to lower product costs. Two of these three considered these efforts to be very effective, while the third noted it is effective only if the product volume for end-users increases. Based on these findings NEEA should review the outcomes of upstream programs in other areas to provide guidance in the development of upstream efforts in the Northwest.

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14. APPENDIX A: LITERATURE REVIEW

The following sections outline the findings of the Literature Review task.

14.1 Previous Market Assessments

14.1.1 Oregon Lighting Market Assessment, 2009

In 2009, the Heschong Mahone Group conducted the Oregon Lighting Market Assessment study on behalf of The Energy Trust of Oregon. The study provided a "snapshot" of the state of the Oregon commercial and industrial lighting market at that time. It also compared the state of the market to data from previous years, including previous market assessments conducted for the Northwest Energy Efficiency Alliance (NEEA). Although the results of this study were limited to the state of Oregon, this report represents the most current lighting market assessment specific to the Northwest region, and it references earlier region-wide studies.

The Oregon Lighting Market Assessment noted the relatively fast adoption of "High Performance" T8[3] fluorescent lamps (HPT8), estimating that they comprised about twenty-five percent of the market of new fluorescent lighting in commercial and industrial applications at that time (Energy Trust of Oregon 2009). The report also noted that federal regulations would make HPT8 the minimum efficiency standard for linear fluorescent lighting by 2012 (Energy Trust of Oregon 2009).

The Energy Trust study also estimated that T12s made up 17% of the existing commercial and industrial lighting market at that time, representing a major opportunity for energy savings (Energy Trust of Oregon 2009, 2). However, the report also cautioned that direct one-for-one replacements of T12 lamps with T8 or HPT8 lamps could result in overlit or underlit spaces (Energy Trust of Oregon 2009, 2).

In addition to fluorescent lamp improvements, the report noted that low-cost wireless lighting controls had the potential to open new retrofit opportunities and to provide more energy savings, but also warned that lighting controls require more knowledge and experience on the part of the installer in order to be implemented properly (Energy Trust of Oregon 2009, 1).

The Energy Trust report presented several conclusions, with specific recommendations associated with each conclusion. The report geared the recommendations toward improving lighting programs and energy savings opportunities going forward.

- Lamp types such as T12s and high-intensity discharge (HID) lamps are declining in the market, with newer lamp technologies filling those gaps, such as the increased use of ceramic metal halide (CMH) in retail applications (Energy Trust of Oregon 2009, 64).

[3] The Energy Trust New Buildings program defined a high-performance T8 as a 48-inch T8 lamp with a not-to-exceed nominal wattage of 32W and ballast system listed on the ACEEE qualifying product list.

- Recommendation: "Consider new incentives for Ceramic Metal Halide in Retail Retrofits" (Energy Trust of Oregon 2009, 65).

- Although federal regulations will prevent future sales of T12 linear fluorescents, seventeen percent of all lighting in existing buildings is T12 lamps, representing significant energy savings opportunities (Energy Trust of Oregon 2009, 65).
  - Recommendation: "Plan to Maximize Savings from Mandatory T12 Retrofits" including identifying potential retrofit sites, educating owners about the new federal regulations, and educating building owners and trade allies to prevent over-lighting from T12 to T8 retrofits (Energy Trust of Oregon 2009, 65).

- High-output T5 lamps (T5HO), which are slightly less efficacious than standard T5 or T8 lamps, may be overused, potentially limiting the performance benefit (Energy Trust of Oregon 2009, 67).
  - Recommendation: "Reconsider Incentive Structure for T5HO and Consider Promoting Other Lamp Types in Industrial Buildings and Warehouses" (Energy Trust of Oregon 2009, 67).
  - Recommendation: "Consider Retrofitting Industrial and Warehouse Applications with more efficient Metal Halide Lamps" (Energy Trust of Oregon 2009, 67).

- Statewide (Oregon) reductions in lighting energy use intensity appear to be partly due to Energy Trust programs and efforts, and not just to energy codes (Energy Trust of Oregon 2009, 68)

- "Use of Daylight Controls Has Become Much More Widespread" (Energy Trust of Oregon 2009, 68)
  - Recommendation: "Ensure Quality Design, Installation and Commissioning for Daylight Controls" (Energy Trust of Oregon 2009, 68).

Energy Trust of Oregon has implemented many of these recommendations since the publication of this report in 2009, although in some cases more opportunities exist for additional energy savings. While some of these recommendations are still relevant today, advances in lighting technology may have eclipsed some of these recommendations.

14.1.2 California CASE Report Lighting Retrofit Market Literature Review

HMG conducted this Lighting Retrofit Market Literature review in 2010 (published 2011) as part of the Nonresidential Lighting Codes and Standards Enhancement (CASE) report. The literature review drew extensively from a 2000 Nonresidential Remodeling and Renovation Study prepared by ADM and TecMRKT Work for the California Energy Commission (the "NRRR study") (CEC 2002). While the sources in this study are relatively outdated, the sections below outline relevant findings, such as classification of lighting retrofit project types; criteria for project-level decision-making; program incentives and program participation; funding models for retrofit projects; and typical project characteristics. Although this data is specific to the California retrofit lighting market, HMG expects that the results may be generally applicable to the Northwest region.

Types of Alteration Projects

Changes to lighting systems can come in many forms, from the most basic maintenance, such as replacing components, to comprehensive tenant improvements, replacing entire lighting systems, and new construction. Table 18, below, provides a summary of the types of projects, from the most simple (at the top) to the most extensive. It shows how the lighting market commonly categorizes these activities and how the NRRR study categorizes them (CEC 2002).

Table 18. Classification of Lighting Project Types

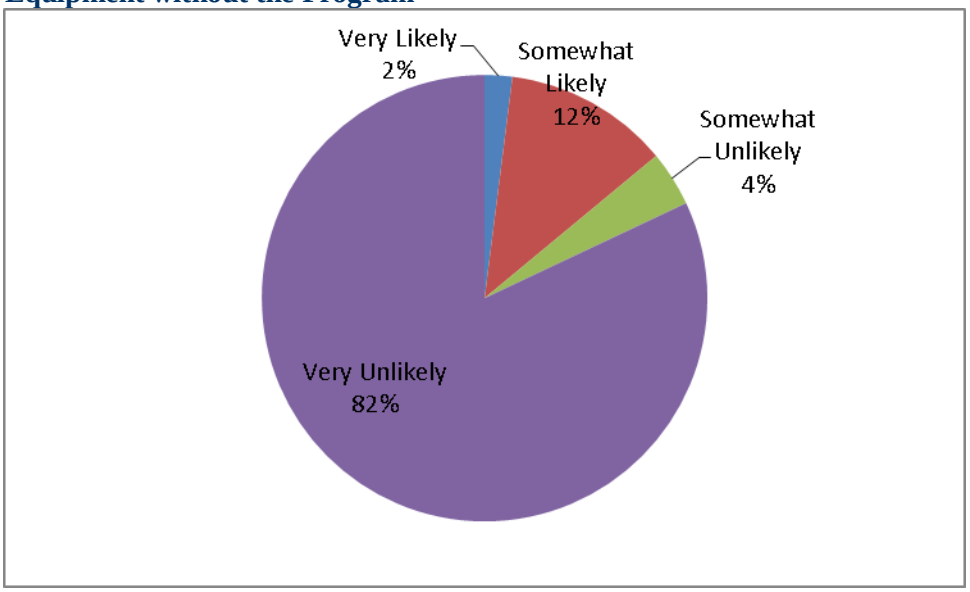
Activity	Common Description of Type of Construction	NRRR Study Classification
Maintenance –lamp replacement, cleaning and burnout replacement	Lighting maintenance	Emergency replacement / Planned maintenance
Replacement of ballast and lamp	Lighting upgrade	Retrofit
Luminaire replacement	Lighting upgrade	Retrofit
Luminaire relocation	Tenant improvement	Remodeling
Additional luminaires added (possibly in conjunction with luminaire removal)	Tenant improvement	Remodeling
Installing new lighting and wiring in a space that had <0.5 W/sf	Tenant improvement	Remodeling
Installing any lighting in an existing but previously unlit space	New construction	Renovation
Installing lighting during new construction	New construction	New construction

Note: Adapted from CEC 2002

Incentive Programs and Program Participation

An evaluation of one lighting retrofit program in California found that a majority of program participants would not have installed higher efficiency lighting without the program, as indicated in Figure 4, below. Only fourteen percent of participants were either somewhat or very likely to install higher efficiency lighting without the program (PG&E 2006). Although this study is not very current, HMG expects that customer motivations are similar today.

Figure 4. Likelihood that Program Participants Would Have Installed the Same Equipment without the Program



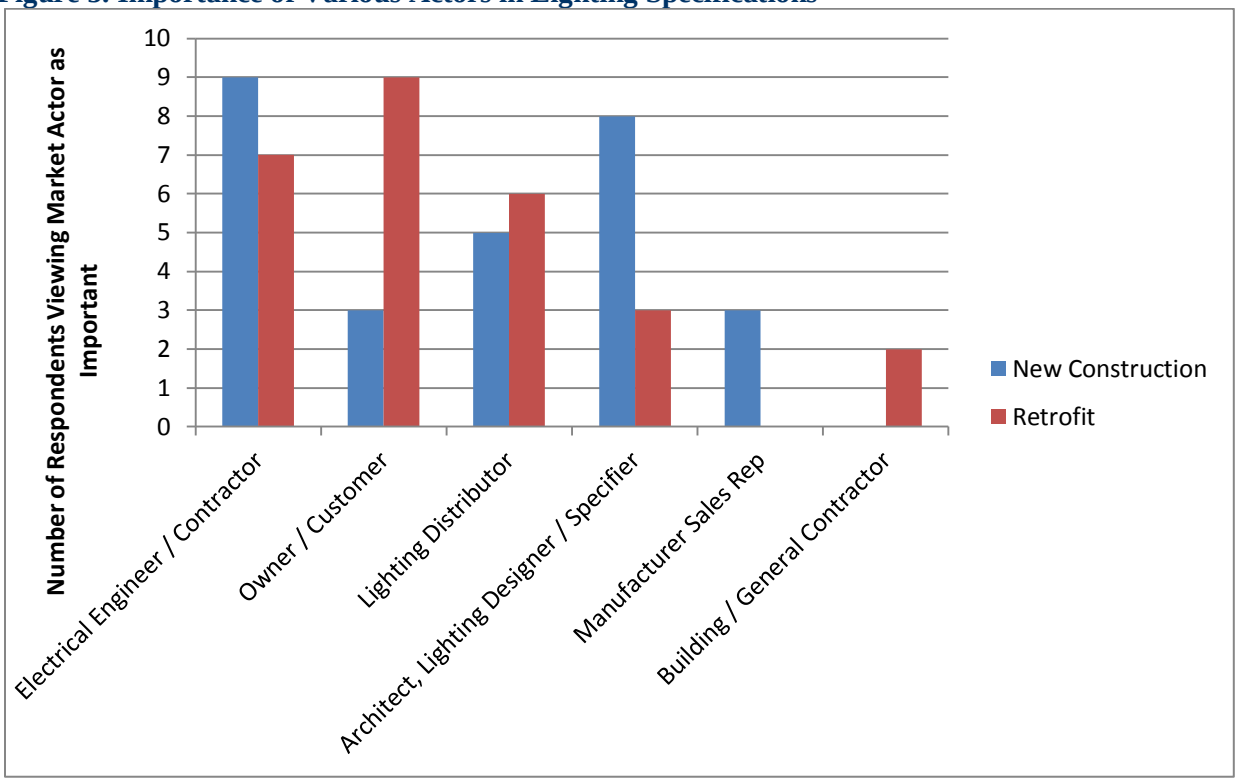
Note: Adapted from PG&E 2006

Decision Makers

According to the NRRR study, the opportunity to influence decision-makers to pursue energy efficient retrofits depends on how easy it is for decision-makers to act autonomously, and how much ongoing financial interest they have in the energy efficiency (or leasability) of their buildings.

A study that included an overview of commercial lighting retrofit programs in 2009 for PG&E found that owners/customers were significantly more important in the specification process for retrofit/remodeling projects than they were on new construction, and conversely that design professionals such as engineers and architects were more influential in new construction than in retrofits. Figure 5, below, describes the relative importance of various actors in lighting specification for new construction and for retrofit/remodeling projects (PG&E 2009).

Figure 5. Importance of Various Actors in Lighting Specifications

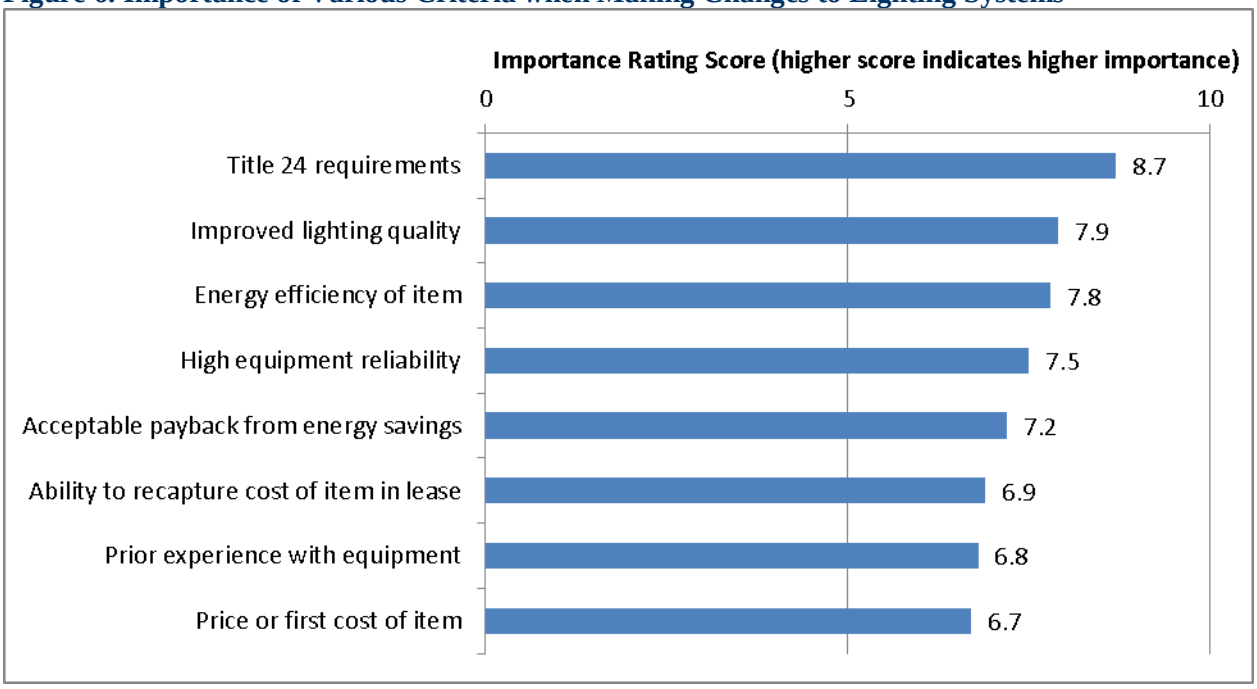


Note: n=19 for new construction and 23 for retrofit/remodeling. The total numbers of important market actors are greater than 19 or 23 because some respondents cited more than one important actor. (Source: PG&E 2009)

Criteria for Project-Level Decision Making

The NRRR study also surveyed decision-makers who had made substantial changes to lighting systems to determine the importance of a variety of selection criteria. Figure 6, below, indicates that energy code requirements constituted the primary factor in the decision-making process ("Title 24 requirements" in California), followed by "Improved lighting quality" and "Energy efficiency of item" (CEC 2002). Although energy code requirements may not be as prominent in lighting retrofits in the Northwest region, these findings indicate that lighting quality is just as important as energy efficiency in lighting retrofits.

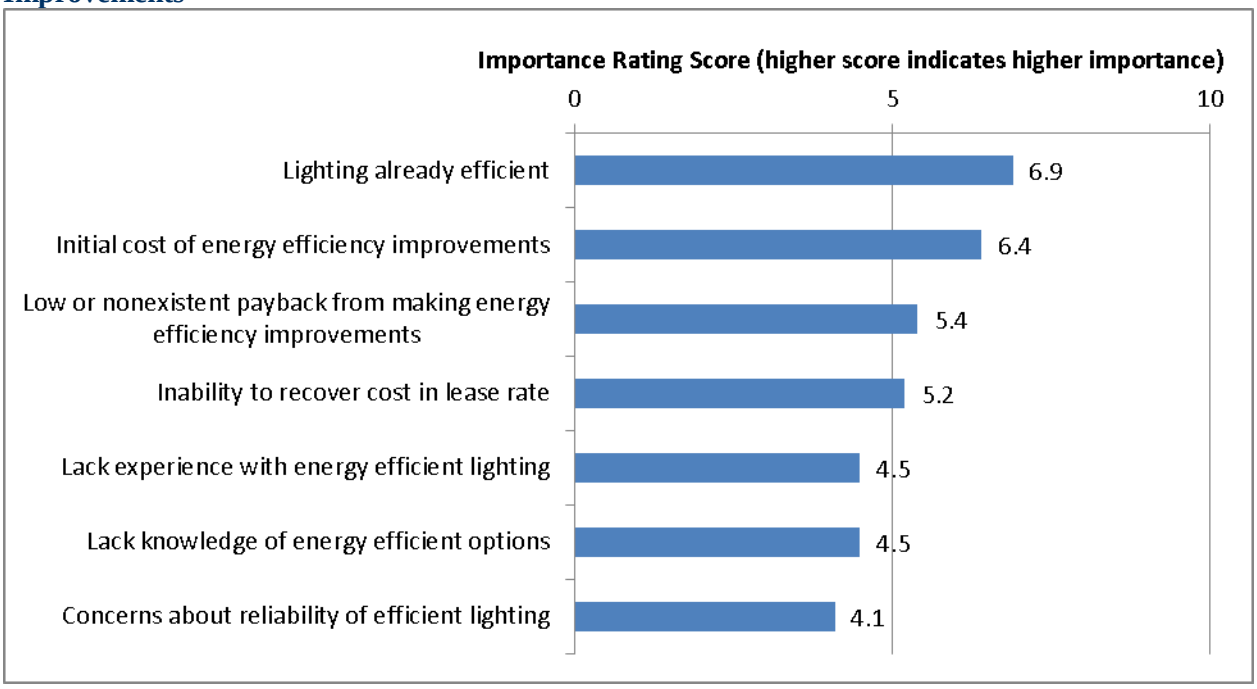
Figure 6. Importance of Various Criteria when Making Changes to Lighting Systems



Note: Adapted from CEC 2002

The NRRR study also looked at factors that influenced decision-makers who did not make substantial changes to lighting systems. As shown in Figure 7, the main reason for not making changes to lighting systems as part of a renovation was that the system was already efficient. The next three highest-ranked criteria all related to costs of efficiency improvements, suggesting that these decision-makers may not directly benefit from the energy savings of lighting improvements. This may also suggest that different decision-makers have different priorities in the renovation process (designers and engineers may be more concerned with code and light quality, while landlords and developers are most concerned with payback), and that the role of the decision-maker may impact whether or not substantial changes are made to lighting systems.

Figure 7. Average Importance Ratings for Reasons Preventing Lighting-Related Energy Efficiency Improvements



Note: Adapted from CEC 2002

Typical Project Characteristics

The NRRR study found that renovation and retrofit projects occur approximately once every ten years in office buildings (more frequently in leased space than in owned space), every fifteen years in retail space, and every eight years in schools and other institutional spaces (CEC 2002). If the remodel is fairly extensive, it is likely to change the lighting equipment, especially if the lighting is of an older and less-efficient type (CEC 2002). Occupants are also likely to change lighting if the building is undergoing a change in its use, for example, from a warehouse to office space (CEC 2002). Tenant turnover is highest in the small office, retail and restaurant sectors (CEC 2002).

14.2 Current Market Status

HMG primarily used the "2010 U.S. Lighting Market Characterization," published by the U.S. Department of Energy (DOE) in January of 2012, to understand the current status of the commercial lighting market. Although this study focused on broader markets than just the Northwest, HMG expects that many of the findings are applicable to the Northwest market.

14.2.1 Current Lighting Stock

According to the U.S. Lighting Market Characterization, although the residential sector has the vast majority of installed lamps, the much higher hours of use in the commercial sector results in higher overall energy use (DOE 2012a, 12). Table 19 illustrates these results.

Table 19. Summary of U.S. Lighting Market Characteristics in 2010

	Quantity of Lamps	Average Daily Operating Hours	Average Wattage per Lamp	Annual Electricity Use (TWh)
Residential	5,811,769,000	1.8	46	175
Commercial	2,069,306,000	11.2	42	349
Industrial	144,251,000	13.0	75	58
Outdoor	178,374,000	11.7	151	118
Total	8,203,700,000	4.7	48	700

Note: Adapted from DOE 2012a, 12[4]

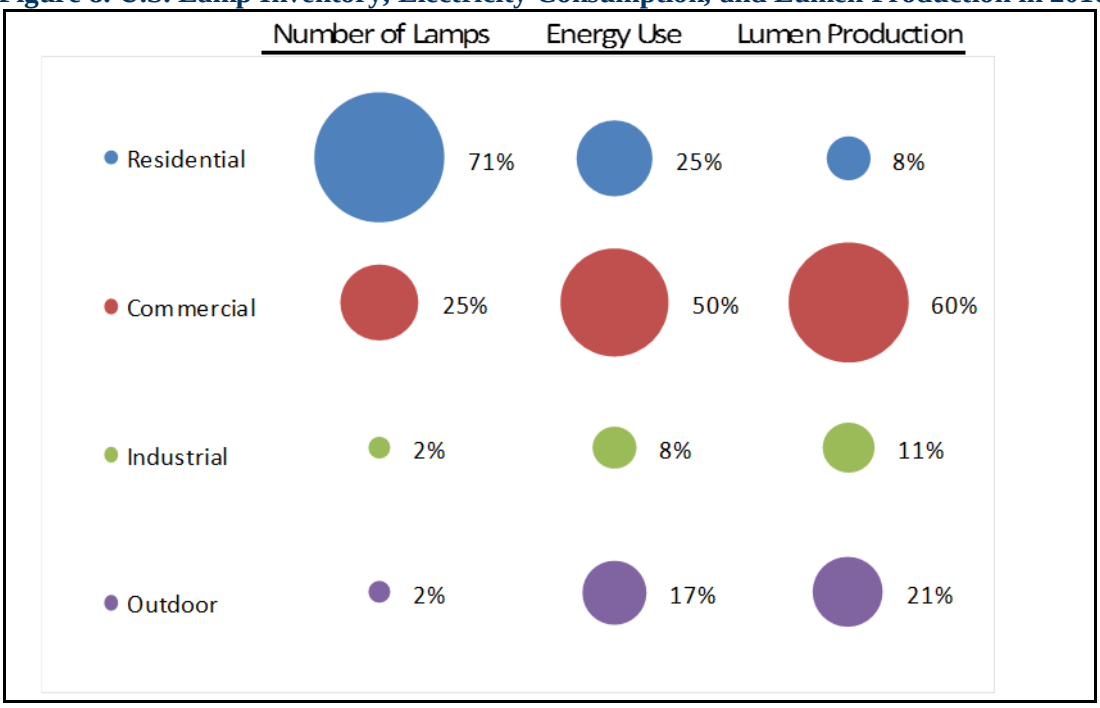
Despite the fact that the majority of lamps are in residential applications, commercial applications consume fifty percent of all lighting energy use in the U.S. and produce sixty percent of the total lumen output, as illustrated in Figure 8. (DOE 2012a, 77)

[4] The DOE report defines the commercial and industrial sectors and subsectors based on the principal activity conducted within the building. For the commercial building sector, the subsector classification is in accordance with that used by the Energy Information Administration (EIA) in its end-use consumption surveys and in the American Housing Survey (AHS). For the industrial subsectors, definitions are taken from the North American Industry Classification System (NAICS).

Commercial: Education; Food Service; Food Store; Health Care – Inpatient; Health Care – Outpatient; Lodging; Offices (Non-medical); Public Assembly; Public Order and Safety; Religious Worship; Retail Mall & Non-mall; Services; Warehouse & Storage; Other

Industrial: Food, Beverage & Tobacco Products; Textile Product Mills; Wood Products; Paper, Printing & Related Support; Petroleum & Coal Products; Plastics & Rubber Products; Nonmetallic Mineral Products; Primary Metals; Fabricated Metal Products; Machinery; Computer & Electronic Products; Electrical Equipment; Appliances & Components; Transportation Equipment; Furniture & Related Products; Miscellaneous

Figure 8. U.S. Lamp Inventory, Electricity Consumption, and Lumen Production in 2010



Note: DOE 2012a, 77

Although LED has experienced significant growth, it still represents a very small part of the market (<1% in buildings). "The technology will need continued research and marketing support to realize its high potential penetration and energy savings" (DOE 2012a, 13). Linear fluorescent still dominates commercial lighting (DOE 2012a, 13). Table 20, below, shows the distribution of lamp types in commercial buildings (LED is included in the "other" category). The table shows lighting distribution both as the percentage of total lighting wattage installed and as the percentage of total lamps installed.

Table 20. Distribution (%) of Lamp Types in Commercial Buildings in 2010

	Percent of Installed Wattage	Percent of Lamps
Incandescent	4.8%	3.7%
Halogen	3.8%	2.3%
Compact Fluorescent	4.9%	10.4%
Linear Fluorescent	71.8%	80.0%
High Intensity Discharge	14.2%	1.7%
Other	0.5%	1.9%

Note: Adapted from DOE 2012a

Although linear fluorescent lamps make up a large majority of both the installed lamps and the installed wattage, the kinds of linear fluorescent lamps currently installed in commercial buildings vary widely. As Table 21 shows, according to the DOE 2010 Lighting Market Characterization study, 31.1% of the installed wattage in commercial buildings is T12 lamps (DOE 2012a). Although the lighting retrofit industry has made concerted efforts since 2010 to replace many T12s with more efficient lighting technologies, these results suggest that T12s maintain a major presence in existing buildings.

Table 21. Distribution (%) of Linear Fluorescent Lamp Types in Commercial Buildings in 2010

	Percent of Installed Wattage	Percent of Lamps
T5	4.5%	5.2%
T8 less than 4ft	0.3%	0.7%
T8 4ft	31.8%	43.9%
T8 greater than 4ft	1.8%	1.3%
T12 less than 4ft	0.3%	0.4%
T12 4ft	20.4%	19.8%
T12 greater than 4ft	9.9%	5.3%
T8 U-shaped	1.6%	2.2%
T12 U-shaped	0.5%	0.5%
Miscellaneous	0.5%	0.6%
All Linear Fluorescent	71.8%	80.0%

Note: Adapted from DOE 2012a

However, lamp type distribution also varies by building type, as shown in Table 22.

Table 22. Lamp Distribution by Commercial Building Type in 2010

	Incandescent	Halogen	CFL	Linear Fluorescent	HID	Other
Education	1%	2%	10%	85%	1%	2%
Food Service	20%	1%	8%	67%	1%	3%
Food Store	1%	1%	3%	94%	1%	1%
Health Care – Inpatient	1%	1%	13%	84%	0%	1%
Health Care – Outpatient	1%	1%	9%	88%	0%	1%
Lodging	18%	2%	25%	53%	0%	2%
Offices (non-medical)	1%	1%	14%	82%	0%	1%
Public Assembly	8%	1%	21%	58%	3%	9%
Public Order and Safety	1%	1%	6%	89%	1%	2%
Religious Worship	4%	1%	8%	84%	1%	2%
Retail	5%	6%	6%	79%	3%	1%
Services	1%	1%	4%	90%	3%	1%
Warehouse and Storage	0%	2%	6%	86%	5%	1%
Other	2%	4%	9%	79%	2%	3%
Average	4%	2%	10%	80%	2%	2%

Note: Adapted from DOE 2012a, 57

Lighting electricity use also varies by building type; hospitals consume the largest amount of lighting energy per building, while grocery stores have the highest lighting energy use intensity, as Table 23 shows.

Table 23. Lighting Electricity Use by Commercial Buildings in 2010

	Average Lamps per 1,000 ft2	Installed Wattage (W/ft2)	Electricity Use per Building (kWh/yr)	Intensity (kWh/yr/ft2)	Intensity Rank
Education	17	0.6	65,100	2.5	13
Food Service	32	1.3	30,100	5.4	4
Food Store	40	1.8	40,800	7.3	1
Health Care – Inpatient	26	0.8	768,100	3.2	10
Health Care – Outpatient	37	1.3	55,900	5.4	5
Lodging	18	0.6	85,300	2.4	14
Offices (non-medical)	33	1.0	60,800	4.1	9
Public Assembly	24	1.0	58,900	4.1	8
Public Order and Safety	19	0.7	43,200	2.8	12
Religious Worship	27	1.1	45,100	4.4	6
Retail	34	1.5	107,800	6.3	2
Services	28	1.4	37,400	5.7	3
Warehouse and Storage	17	1.1	71,900	4.3	7
Other	18	0.8	70,500	3.2	11

Note: Adapted from DOE 2012a, 60

Controls

The DOE Market Characterization study estimates that seventy percent of lamps in the commercial sector do not use any kind of lighting controls (other than a manual switch). Table 24 shows the prevalence of different types of lighting controls in both the residential and commercial sectors.

Table 24. Prevalence of Lighting Controls by Sector

	None	Dimmer	Light Sensor	Motion Detector	Timer	EMS
Residential	86%	12%	1%	1%	0%	0%
Commercial	70%	3%	0%	5%	4%	18%

Note: Adapted from DOE 2012a, 72

The prevalence of lighting controls and the type of lighting control used varies depending on the lamp type controlled, as shown in Table 25. Energy Management Systems (EMS) are the most common control systems in all categories. Following EMS, motion detectors most frequently control linear fluorescent lamps, while dimmers most frequently control incandescent and halogen lamps.

Table 25. Prevalence of Lighting Controls in the Commercial Sector by Lamp Type

	None	Dimmer	Light Sensor	Motion Detector	Timer	EMS
Incandescent	76%	5%	0%	0%	2%	16%
Halogen	73%	3%	0%	5%	4%	18%
CFL	77%	0%	0%	3%	2%	18%
Linear Fluorescent	68%	3%	1%	7%	4%	17%
HID	71%	0%	2%	1%	6%	20%
Other	85%	0%	0%	0%	0%	15%

Note: Adapted from DOE 2012a, 74

The prevalence of lighting controls depends even more heavily on the building type. Controls are very common in offices, retail, and food stores, as shown in Table 26. The most common type of controls for these building types are EMS, which are useful for controlling large areas with multiple zones, or for spaces that have set schedules.

Table 26. Prevalence of Lighting Controls in the Commercial Sector by Building Type

	None	Dimmer	Light Sensor	Motion Detector	Timer	EMS
Education	83%	4%	0%	9%	2%	3%
Food Service	95%	2%	0%	0%	2%	1%
Food Store	60%	4%	1%	0%	4%	31%
Healthcare – Inpatient	92%	1%	0%	1%	1%	6%
Healthcare – Outpatient	78%	0%	0%	12%	8%	1%
Lodging	95%	1%	0%	0%	0%	4%
Offices (non-medical)	52%	4%	0%	14%	5%	24%
Public Assembly	77%	2%	0%	0%	1%	20%
Public Order and Safety	96%	0%	0%	0%	0%	4%
Religious Worship	95%	3%	0%	2%	0%	0%
Retail	50%	0%	1%	2%	7%	40%
Services	81%	19%	0%	1%	0%	0%
Warehouse and Storage	85%	0%	1%	3%	1%	9%
Other	88%	2%	1%	4%	4%	0%

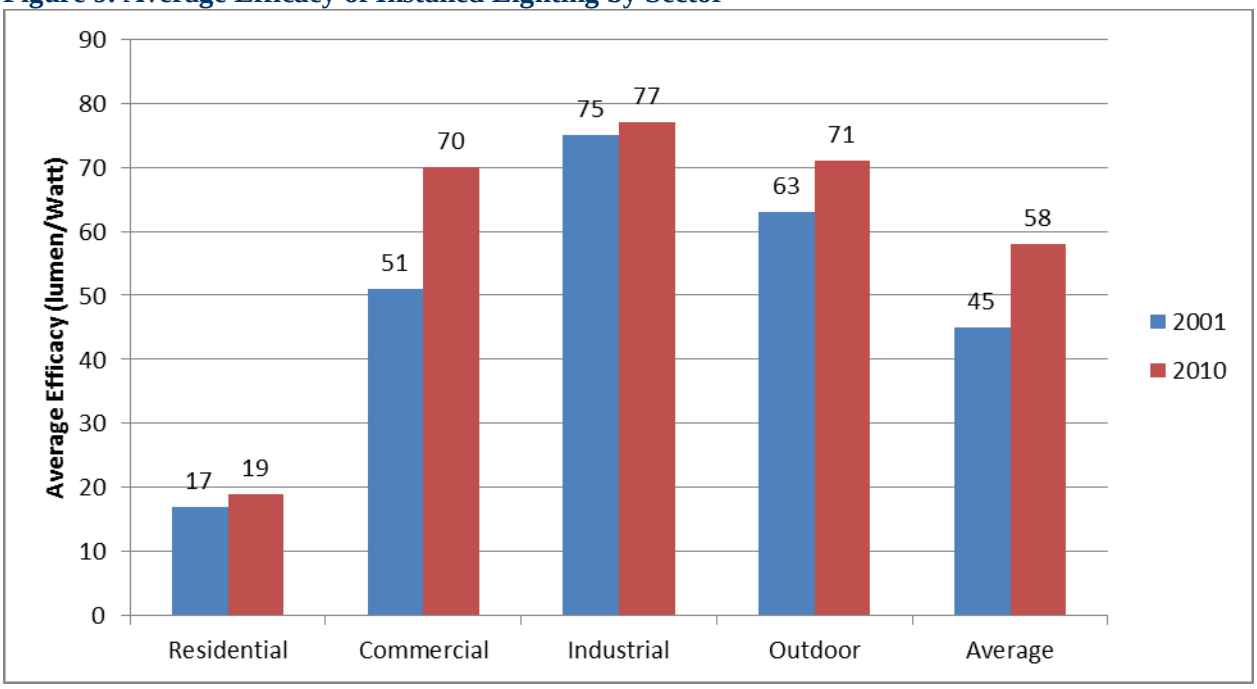
Note: Adapted from DOE 2012a, 74

14.2.2 Other Recent Market Trends

The push for higher-efficacy lighting technologies constituted the most significant trend in commercial lighting from 2001 to 2010. "Investment in more energy efficient technologies, federal and state-level lighting regulations, and public awareness campaigns have been effective in shifting the market towards more energy efficient lighting technologies. Across all sectors the lighting stock has become more efficient, with the average system efficacy of installed lighting increasing from 45 lumens per watt in 2001 to 58 lumens per watt in 2010." (DOE 2012a, 59-60) The commercial and industrial sectors largely experienced this shift due to the move from T12 to T8 and T5 fluorescent lamps.

Figure 9 illustrates the higher efficacy in the U.S. market for 2010 compared to 2001. The commercial sector saw the most significant increase.

Figure 9. Average Efficacy of Installed Lighting by Sector



Note: DOE 2012a, 60

14.3 Future Market Trends

For future market trends, HMG relied primarily on "Energy Efficient Lighting for Commercial Markets" published by Pike Research in the fourth quarter of 2011. Although this report looks very broadly at the global lighting market, many of the findings from this study are applicable to the Northwest region.

14.3.1 Global Market Trends

The Pike Research report estimated that the global market for commercial lighting would peak in 2012, and then gradually decline over the coming years due to the introduction of new technologies with longer lives and higher efficacy (Pike Research 2011, 4). It attributed the decline to the extended lamp lives of both fluorescents and LEDs as they become the primary lamp types over less-efficient and shorter-lived incandescent lamps (Pike Research 2011, 4).

14.3.2 LED

The DOE study found that in 2010, LEDs still comprised a very minor part of the installed lighting stock. By far the most common use for LEDs is in exit signs, as shown in Table 27. Again, while LEDs may have made significant gains in the lighting market since 2010, their current market share likely remains relatively small.

Table 27. LED Exit Signs and Lamps in Commercial and Industrial Sectors

	LED Exit Signs	LED Lamps	Total
Commercial	30,558,000	7,471,000	38,029,000
Industrial	580,000	12,000	592,000
Total	31,139,000	7,482,000	38,621,000

However, the Pike Research report estimates that eighty-five to ninety-five percent of all research and development resources in the lighting industry are dedicated to LED products (Pike Research 2011, 1). Due to rapid improvements in performance and costs, Pike Research predicts that LED products will displace more than fifty-two percent of conventional lighting products over the next ten years (Pike Research 2011, 1). However, it also noted that buildings retrofitted with high-efficiency fluorescent lighting technologies will have little incentive to replace that lighting with new LED products (Pike Research 2012, 2).

Similarly, an energy savings potential study for the U.S. Department of Energy estimated that LEDs will make up twenty-eight percent of the lumen hour sales in the U.S. commercial sector by 2020, and seventy percent by 2030 (DOE 2012b, 3).

Both the Pike Research study and the DOE study noted that LED prices will have to come down from their current levels to reach widespread market penetration. The DOE study notes that LED products will have to achieve "substantial improvements in price, efficacy, and operating life" in order to reach energy savings forecasts (DOE 2012b, 63). Similarly, the Pike Research study performed a cost comparison study that found that the initial costs of LED fixtures are too high to achieve the expected payback periods of two to three years for efficiency projects (Pike Research 2011, 16). However, the Pike Research study did not consider the influence of utility incentives in this cost comparison.

14.4 Lighting Efficiency Programs

The Pike Research report also touched briefly on rebate and incentive programs for energy efficient lighting programs. It noted that nearly a third of all rebate programs are concentrated in the five states of California, Washington, Oregon, Texas and Minnesota (Pike Research 2011, 10). The high concentration of program efforts in these states may have resulted in local lighting market characteristics notably different from those of the broader national market.

A study prepared by Mitchell Rosenberg of DNV KEMA for the 2012 ACEEE Summer Study on Energy Efficiency in Buildings provided the following recommendations for the future development of utility lighting programs:

- Programs will need to monitor LED product development on a continuous basis in order to stay current with the latest developments, and to ensure that programs are incenting the best products (Rosenberg 2012, 3-326).

- Continue to support T12 retrofits, especially among small businesses who may have been less motivated to participate in previous programs (Rosenberg 2012, 3-325).

- Stop providing incentives for high bay linear fluorescent retrofits. The costs have evolved to the point that unsubsidized paybacks are well within most businesses' investment horizon (Rosenberg 2012, 3-325).

- Focus technical assistance and program resources on the promotion of lighting controls. Savings from lighting controls can range from twenty-four to thirty-eight percent depending on the control strategy (Rosenberg 2012, 3-325 – 3-326).

15. APPENDIX B – TRADE ALLY SAMPLE CHARACTERISTICS AND INTERVIEW RESULTS

The following sections outline the sample characteristics and detailed results of the trade ally interviews.

15.1 Sample Characteristics

As Table 28 shows, the vast majority of respondents reported that commercial lighting retrofits make up a small part of their company's business. Only three respondents reported more than ten percent, and only one reported that one hundred percent of its company's business is retrofit lighting.

Table 28. Lighting Retrofits as a Percentage of Trade Ally Business

Question: Approximately what percentage of your company's business serves the commercial lighting retrofit market? (open ended) (n=11)	
Response	n
5% or less	7
10% or less	1
20%	1
60%	1
100%	1

Table 29 shows how much of respondents' business consisted of energy efficient lighting retrofits. Again, most respondents (six of eleven) report that energy efficient lighting retrofits make up five percent or less of their businesses. Only two reported that energy efficiency retrofits are one hundred percent of their business, and another two said twenty percent.

Table 29. Percentage of Trade Ally Business that is Energy Efficient Lighting Retrofits

Question: Approximately what percentage of your business is energy efficient lighting retrofits? (n=11)	
Response	n
5% or less	6
10%	1
20%	2
100%	2

Respondents' customer bases varied widely. Table 30 summarizes these results.

Table 30. Trade Ally Customer Base

Question: What is your customer base? (Certain building types? Client types?) (n=10)	
Response	n
All electrical	2
All commercial	2
Retail	2
Manufacturing / industrial	2
Offices	1
Schools	1

Notes: One respondent ran out of time before this question, so there are only ten responses.

Each respondent provided only one answer to this open-ended question.

As Table 31 shows, respondents cover service territories across all four Northwest states, more frequently from the less-populated states of Idaho and Montana.

Table 31. Trade Ally Service Territory

Question: What is your service territory? (n=11)	
Response	n
WA	2
OR	2
ID	4
MT	3

15.2 Survey Results

The following sections outline the results of the trade ally interviews.

15.2.1 Products and Services

As Table 32 shows, the majority (eight of eleven) of respondents typically get their lighting products from distributors, while two reported getting lighting equipment from retailers, and one said direct from the manufacturer.

Table 32. Lighting Equipment Suppliers

Question: Where do you typically get your lighting equipment? (n=11)	
Response	n
Retailers	2
Distributors	8
Direct from manufacturers	1
Other	0

With regard to variation in suppliers based on different factors, almost all (ten of eleven) said that their suppliers vary based on product types, as Table 33 shows. The most common reason for variation in suppliers was cost (five respondents). Three respondents also noted that they get fixtures and lamps from one supplier and controls equipment from a separate supplier.

Table 33. Variation in Suppliers by Product Type

Question: Do your suppliers vary depending on product type (components, fixtures, controls, etc.)? (n=11)	
Response	n
Yes – Price is the deciding factor	5
Yes – Fixtures and lamps from one supplier and controls from another	3
Yes – Accommodates different customer requests	1
Yes – Electricians decide where the products come from	1
No	1

Table 34 shows that most (eight of eleven) respondents did not vary suppliers depending on building type.

Table 34. Variation in Suppliers by Building Type

Question: Do your suppliers vary depending on building types or clients (office, retail, institutional, healthcare)? (n=11)	
Response	n
Yes – Specific needs for certain building types	1
Yes – Different products are needed for warehouses	1
Yes – Cost is still the driving factor	1
No	8

As Table 35 shows, the majority (seven) of respondents reported some kind of coordination with sales reps, with providing product information as the most commonly-mentioned (four respondents) activity.

Table 35. Coordination with Sales Representatives

Question: What, if any, coordination do you have with sales reps? (n=11)	
Response	n
Provide product information	4
Bring in projects / provide assistance on projects	2
Help commission systems	1
None	4

Contrary to the original hypothesis of this market characterization, the two respondents who reported that one hundred percent of their work was lighting retrofits also reported having regular coordination with sales reps.

As Table 36 shows, the majority (seven of eleven) did not mention any market actors who are actively marketing products for lighting retrofits. However, the other responses indicate that there some product types (for example, LED) or certain actors (such as distributors like North Coast Electric) may be better-suited to energy efficient lighting retrofits than others.

Table 36. Market Actors Actively Pursuing the Retrofit Market

Question: Are there certain manufacturers that you work with who are more actively marketing products to the energy efficient lighting retrofit market? (n=11)	
Response	n
Yes – North Coast Electric	1
Yes – GE and Acuity	1
Yes – Anyone marketing LEDs	1
Yes – All manufacturers	1
No	7

A slight majority (six of eleven) of respondents reported that they had received design assistance from manufacturers, sales reps or distributors. As Table 37 shows, design assistance comes from distributors, sales reps, or a combination of the two.

Table 37. Design Assistance

Question: Do you ever receive design assistance from manufacturers, sales representatives, distributors, or others? (n=11)	
Response	n
Yes – A combination of sales reps and distributors	3
Yes – Distributors	2
Yes – Sales Reps	1
No	5

The survey asked if certain market conditions were more favorable to lighting retrofits than others. The question was open-ended, but again, each respondent provided only one answer. Responses varied, as Table 38 shows. Although six of eleven did not identify any specific market conditions more likely to pursue energy efficient lighting retrofits, five respondents did identify specific conditions that are more favorable to lighting retrofits.

Table 38. Favorable Market Conditions

Question: Are there certain building types or clients that are more likely to pursue energy efficient lighting retrofits? (Certain building types? Certain contractor types? Regional variations?) (n=11)	
Response	n
Building Type – Manufacturing	1
Building Type – Large commercial	1
Building Type – Confident building owners/profitable businesses	1
Building Type – Retail	1
Region – Large cities	1
None	6

Note: Each respondent provided only one answer to this open-ended question.

Six respondents cited a variety of building types less likely to pursue energy efficient lighting retrofits, as Table 39 shows. The remaining five respondents offered no responses. Of note, one respondent listed retail as unfavorable, while another had listed it as favorable to retrofits in the previous question. Similarly, although distributors cited small commercial as a favorable building type, one trade ally described small business as unfavorable. These results may indicate building types that will require more effort or better incentives to encourage energy efficient retrofits.

Table 39. Unfavorable Market Conditions

Question: Are there certain building types or clients that are less likely to pursue energy efficient lighting retrofits? (Certain building types? Certain contractor types? Regional variations?) (n=11)	
Response	n
Building Type – Small business	2
Building Type – Offices	1
Building Type – Small grocery	1
Building Type – Retail	1
Building Type – Auto parts stores	1
Building Type – Restaurants	1
Other – Economic conditions	1
None	5

Note: Some respondents provided multiple answers.

A majority (seven of eleven) of respondents expect the phase-out of T12s and 700-series T8 lamps to result in increased sales, as Table 40 shows.

Table 40. Impact of T12 and 700-series T8 Phase-out

Question: How do you expect the phase-out of T12s and 700-series T8s to affect your commercial retrofit work? (n=11)	
Response	n
Increase sales	7
Change product line	1
No change	3

Note: Some respondents provided multiple answers.

15.2.2 Market Trends

When asked about market forces that have affected their businesses over the last five years, respondents most commonly mentioned the T12 phase-out and utility incentive programs (three respondents each). Two respondents reported that all options had significant impact, and one respondent cited controls. Table 41 summarizes these responses.

Table 41. Market Forces in the Past Five Years

Question: Which of the following conditions has had the most significant impact on your business over the past five years: availability of new lighting technologies, federal regulations such as the T12 sunset, utility incentive programs, increased technical sophistication of lighting products and systems, or code changes that effect lighting retrofits? (n=11)	
Response	n
T8s / phase-out of T12s	3
Utility incentive programs	3
Controls	1
All of the above	2
No major trends	2

Respondents most commonly mentioned LEDs and the T12 phase-out as future market trends (three respondents each), as Table 42 shows.

Table 42. Market Forces in the Next Five Years

Question: Which of the following conditions do you expect will have the most significant impact on your business over the next five years: availability of new lighting technologies, federal regulations such as the T12 sunset, utility incentive programs, increased technical sophistication of lighting products and systems, or code changes that effect lighting retrofits? (n=11)

Response	n
LEDs	3
T12 phase-out	3
Utility incentive programs	2
Economy	1
Unsure	3

Note: One respondent provided more than one answer

Respondents most commonly mentioned LED as a product they expect to substantially change the retrofit market over the next five years (seven respondents). Again, the survey allowed for open-ended responses, but each respondent provided only one answer. Table 43 summarizes these responses.

Table 43. Future Product Impacts

Question: Are there any new products that you expect will substantially change the retrofit market over the next five years? (n=10)

Response	n
LED	7
New fixtures	1
None	2

Note: Each respondent provided only one answer to this open-ended question.

The perceived impacts of certain product trends in the lighting market varied depending on the product type, as Table 44 shows. LED products have had the most impact on these respondents, with four reporting increased sales and one reporting a change in products offered. One respondent reported that the growth of LEDs has added the complication of needing to calculate project cost, energy savings, and payback for two different strategies (fluorescent versus LED). The most common response for both controls and ceramic metal halide was "no change" (seven and eight respondents respectively).

Table 44. Product Trend Impacts (n=10)

	Increase sales	Change product line / offer more products	No change	Other
How is the growth of LEDs affecting your retrofit product line?	4	1	4	1
How is the growth of controls affecting your retrofit product line?	3	0	7	0
How is the growth of ceramic metal halide affecting your retrofit product line?	2	0	8	0

15.2.3 Utility Incentive Programs

All ten respondents claimed awareness of utility incentive programs for energy efficient lighting retrofits, and nine of those ten reported having participated in utility programs, as Table 45 shows.

Table 45: Awareness of Utility Incentive Programs

Question: Are you aware of utility programs that provide incentives for energy efficient lighting retrofits? (If yes) Have you participated in any of these programs? (n=10)	
Response	n
Aware of programs	1
Participated in programs	9

As Table 46 shows, all nine respondents who had participated in utility incentive programs reported that at least half of their retrofit business is through energy efficiency programs. Six of those nine reported that projects in utility incentive programs constituted at least ninety-five percent of their retrofit business.

Table 46. Participation in Incentive Programs

Question: Of your commercial lighting retrofit business, approximately what percentage are energy efficient lighting projects that are run through utility incentive programs? (n=10)	
Response	n
100%	5
95%	1
50%	3
None	1

The most commonly mentioned challenges to utility programs for distributors referenced the differences among programs and the upfront cost of retrofits to the customer, as Table 47 shows.

Table 47. Challenges with Utility Programs

Question: What are the most difficult challenges or barriers of utility commercial retrofit programs for you? (n=10)	
Response	n
Differences between programs	2
Upfront cost to customers	2
Product performance requirements	1
Complexity of programs	1
Product disposal	1
Lack of response from the utility	1
None	1

Eight of the ten respondents reported facing barriers in installing energy efficient retrofits. Table 48 and Table 49 summarize the barriers identified. Four respondents cited higher first costs as the most significant barrier. Four respondents also identified a lack of understanding of certain measures or strategies: two as the most-significant barrier and two as the second-most significant barrier. Other barriers identified involved concerns over equipment failure or actual energy

savings. Respondents reported that all of the barriers mentioned are ongoing issues. All respondents who reported equipment reliability concerns or lack of understanding of measures had plans to overcome those barriers. Only two of the four who cited higher costs as a barrier had plans to overcome that barrier.

Table 48. Most Significant Barriers

Question: What is the most significant barrier that you have encountered? (n=8)	
Response	n
Higher first cost	4
Lack of understanding of some energy efficient measures or strategies	2
Concern that the system will not deliver energy savings as projected	1
Concern over system or equipment failure	1

Table 49. Second Most Significant Barrier

Question: What is the second most significant barrier that you have encountered? (n=3)	
Response	n
Lack of understanding of some energy efficient measures or strategies	2
Concern over system or equipment failure	1

16. APPENDIX C – DISTRIBUTOR SAMPLE CHARACTERISTICS AND INTERVIEW RESULTS

The following sections outline the sample characteristics and detailed results of the distributor interviews.

16.1 Sample Characteristics

HMG interviewed five distributors from the Northwest region. All five distributors reported distributing other electrical equipment in addition to lighting. However, these respondents reported a wide range in the percentages of their businesses that is lighting, as shown in Table 50.

Table 50. Lighting as a Percentage of Distributor Business

Question: Approximately what percentage of your business is in lighting? (open ended) (n=5)	
Response	n
15%	1
20%	1
30%	2
98%	1

Respondents also reported a wide range in the proportions of their businesses that consist of commercial lighting retrofits, as shown in Table 51.

Table 51. Percentage of Lighting Business Serving Commercial Lighting Retrofits

Question: Approximately what percentage of your lighting business serves the commercial lighting retrofit market? (open ended) (n=4, one respondent did not know)

Response	n
5%	1
40-50%	1
65%	1
90%	1

Respondents' service territories represented all four states in the Northwest region, as shown in Table 52.

Table 52. Distributor Service Territory

Question: What is your service territory? (n=5)

Response	n
Washington	2
Oregon	1
Idaho	1
Montana	1

Interviewees split their responses in terms of whom they supply, as shown in Table 53.

Table 53. Distributor Customer Base

Question: What is your customer base? (Designers? Specifiers? Installers?) (n=5)	
Response	n
Specifiers	2
Installers	3

16.2 Survey Results

The following sections outline the results of the distributor interviews.

16.2.1 Sales and Marketing Efforts

All five respondents reported having sales efforts and product lines specifically geared toward commercial retrofits, as Table 54 and Table 55 show.

Table 54. Sales Efforts Geared Towards Retrofits

Question: Do you have sales efforts specifically geared toward commercial retrofit markets? (if yes, describe) (n=5)	
Response	n
Yes – Have a dedicated person or team working on retrofits/doing energy audits	4
Yes – Work with utilities to get programs in place	1

Table 55. Product Lines Geared Toward Retrofits

Question: Do you have products specifically geared toward commercial retrofit markets? (if yes, describe) (n=5)	
Response	n
Yes – Lamp ballast combos	1
Yes – Retrofit kits	2
Yes – New technologies (i.e., LEDs, daylight controls, wireless controls)	2

In addition, all five respondents reported addressing the commercial retrofit market differently from how they address new construction. Table 56, below, summarizes these responses. Four respondents reported targeting marketing efforts directed specifically at the commercial retrofit market, while one respondent noted that the retrofit market uses different distribution channels, requiring distributors to seek out retrofit contractors more proactively.

Table 56. Differences between Retrofit and New Construction Markets

Question: Are there differences between the ways that your company addresses the commercial retrofit market, compared to commercial new construction? (if yes, describe) (n=5)	
Response	n
Targeted marketing efforts	4
Distribution channels	1

16.2.2 Products and Services

As Table 57 shows, respondents' perception of their most-successful energy efficient product lines for commercial retrofits varied widely, with some respondents referencing specific brands or products and others speaking more generally about product types.

Table 57. Most Successful Energy Efficient Retrofit Products

Question: What do you consider to be your three most successful energy efficient product lines for commercial retrofit situations? (list in order of success) (n=5)	
Response	n
High efficiency fixtures, generally	2
GE lamp and ballast combination	2
T5 and T8 high bay fixtures	2
Controls	2
T5 2x4 troffers with controls	1
LED can lights	1
Cooper fixtures	1
Hubbell fixtures	1
Lithonia fixtures	1

Note: Two respondents provided only two responses.

Respondents' perceptions of market conditions most favorable to lighting retrofits varied, as Table 58 shows. Two respondents noted the influence of utility programs and incentive rates, and one of these two identified Energy Trust of Oregon territory as most favorable for commercial lighting retrofits. Two respondents cited small commercial buildings as favorable for retrofits; one respondent mentioned warehouses; and one mentioned food processing facilities.

Table 58. Favorable Market Conditions

Question: Are there certain types of commercial retrofit customers or conditions that are more favorable to those energy efficient products you mentioned previously? (Certain building types? Certain contractor types? Regional variations?) (n=5)	
Response	n
Depends on referrals from clients	2
Depends on utility district, incentive rates	2
Small commercial	2
Warehouse	1
Food processing	1

Note: Three responses fit into more than one category.

All five respondents reported that all types of manufacturers are actively targeting the commercial retrofit market. One respondent each specifically mentioned Philips, Lithonia, Leviton, and GE.

Four of the five respondents reported that their companies provide design services. Two of these four reported providing these services more than half the time, and the other two reported providing these services less than half the time.

16.2.3 Market Trends

When asked about market forces that have affected their businesses over the last five years, three of five cited second-generation T8, while two of five reported that utility incentives have had the most impact. Table 59 summarizes these responses.

Table 59. Market Forces in the Past Five Years

Question: What market forces have had a significant impact on your commercial retrofit business over the past five years? (n=5)	
Response	n
Second generation T8	3
Utility incentive programs	2

Respondents most commonly cited LED as a significant market force on their commercial retrofit businesses over the next five years, as Table 60 shows.

Table 60. Market Forces in the Next Five Years

Question: What market forces do you expect to have a significant impact on your commercial retrofit business over the next five years? (n=5)	
Response	n
LED	4
Utility incentive programs	1

All five respondents named LED as a product they expect to substantially change the retrofit market over the next five years.

Although Table 61 shows that most (four of five) respondents reported that they expect the phase-out of T12s and 700-series T8s to result in increased sales, Table 62 shows that three of five respondents also reported that customers are still buying T12s and 700-series T8s, indicating that the new federal standards have not yet reached the entire market.

Table 61. Impact of T12 and 700-series T8 Phase-out

Question: How do you expect the phase-out of T12s and 700-series T8s to affect your retrofit product distribution? (n=5)	
Response	n
Increase sales	4
No change	1

Table 62. T12 and 700-series T8 Purchases

Question: Are any customers still purchasing T12s or 700-series T8s? (n=5)	
Response	n
Yes	3
No	2

Respondents reported varying levels of impact for product trends in the lighting market depending on the product type, as Table 63 shows. While they reported impacts from both LEDs and controls, they noted little impact of ceramic metal halide on their retrofit product lines, with two deeming it not the right approach for retrofit projects.

Table 63. Product Trend Impacts (n=5)

	Increase sales	Change product line / offer more products	Product is not the right approach	No change
How is the growth of LEDs affecting your retrofit product line?	2	2	0	1
How is the growth of controls affecting your retrofit product line?	4	1	0	0
How is the growth of ceramic metal halide affecting your retrofit product line?	1	0	2	2

Table 64 and Table 65 summarize respondents' feedback on challenges for installers and customers for these new energy efficient product types. While two respondents mentioned lack of education or product recognition for both installers and customers, two other respondents perceived no challenges for either group.

Table 64. Challenges for Installers and Contractors

Question: Are you aware of any challenges with installing contractors adapting to these new technologies mentioned in the previous questions (LEDs, controls, CMH)? (if yes, specify) (n=5)	
Response	n
Yes – Lack of education / product recognition	2
Yes – Installation problems	1
No	2

Table 65. Challenges for Customers

Question: Are you aware of any challenges with customers adapting to these new technologies mentioned in the previous questions (LEDs, controls, CMH)? (if yes, specify) (n=5)	
Response	n
Yes – Lack of education / product recognition	2
Yes – Price point	1
No	2

Only two of the five respondents mentioned Northwest-specific market conditions that impact their retrofit lighting businesses, as follows:

- The coastal areas exhibit higher energy awareness levels than does the rest of the U.S. (other than the East Coast)
- Low cost of energy in the Northwest increases the length of payback for retrofits

16.2.4 Utility Incentive Programs

All five respondents knew of utility incentive programs for energy efficient lighting retrofits, and all reported that at least half of their retrofit business consisted of projects run through utility efficiency programs, as Table 66 shows. Four of the five respondents reported that at least ninety-five percent of their retrofit business involves utility efficiency programs.

Table 66. Retrofit Business through Utility Incentive Programs

Question: Of your commercial retrofit business, approximately what percentage are energy efficient lighting projects that are run through utility efficiency programs? (n=5)	
Response	n
50%	1
95%	2
100%	2

Three of the five distributor respondents cited challenges of utility commercial retrofit programs related to complexity of, or variations in, programs, while the other two referenced costs and incentives, as Table 67 shows.

Table 67. Challenges with Utility Programs

Question: What are the most difficult challenges or barriers of utility commercial retrofit programs for you? (n=5)	
Response	n
Variations across utilities	2
Complexity of programs	1
Product cost	1
Low incentive rates	1

In addition to the utility incentive programs, three of the five respondents reported working directly with utilities (either in the Northwest or elsewhere) to provide incentives to suppliers or manufacturers to buy down the cost of certain products. Two of these three found these efforts to be very effective, while the other respondent would deem them effective only if the product volume for end-users increases.

17. APPENDIX D – MANUFACTURER SALES REPRESENTATIVE SAMPLE CHARACTERISTICS AND INTERVIEW RESULTS

The following sections outline the sample characteristics and detailed results of the manufacturer sales representative interviews.

17.1 Sample Characteristics

HMG interviewed five sales reps from the Northwest region. Respondents represented a range from five percent to one hundred percent in terms of the proportion of their businesses consisting of commercial lighting retrofits, as Table 68 shows.

Table 68. Percent of Business Serving Commercial Lighting Retrofits

Question: Approximately what percentage of your business serves the commercial retrofit market? (n=5)	
Response	n
5-10%	1
15%	1
20%	1
45%	1
100%	1

Sales rep respondents represented all four states in the Northwest region, as Table 69 shows. Unlike respondents from the other interview groups, who typically served an entire state, some sales reps served only specific portions of Oregon or Washington.

Table 69. Sales Representative Service Territory

Question: What is your service territory? (n=5)

Response	n
Western Washington	2
Eastern Washington	2
Southern Washington	1
All of Oregon	1
Western Oregon	1
Idaho	2
Montana	2

Note: Three respondents served multiple territories listed above.

Respondents also supported a range of customer types, as shown in Table 70.

Table 70. Sales Representative Customer Base

Question: What is your customer base? (Designers? Specifiers? Installers?) (n=5)

Response	n
Installers	2
Specifiers	1
Distributors	1
End users	1

17.2 Survey Results

The following sections outline the results of the sales representative interviews.

17.2.1 Sales and Marketing Efforts

All five respondents reported sales efforts and product lines specifically geared toward the commercial lighting retrofit market. All five respondents also reported approaching the retrofit market in a manner distinct from their approaches to the new construction market, as Table 71 shows.

Table 71. Differences between Retrofit and New Construction Markets

Question: Are there differences between the ways that your company addresses the commercial retrofit market, compared to commercial new construction? (if yes, describe) (n=5)	
Response	n
Yes – more direct interaction with owner / developer on retrofits	2
Yes – more design/build structure for retrofits	2
Yes – more involved in design / specification on retrofits	2
Yes – specific department / staff dedicated to retrofit work	1
Yes – more focus on incentive eligible products / meeting program requirements	1

Note: HMG grouped three respondents' answers into more than one category above.

17.2.2 Products and Services

As Table 72 shows, respondents most commonly mentioned LED fixtures (four respondents) as a most-successful energy efficient product line for commercial retrofits, followed by high-efficiency fluorescent fixtures (three respondents).

Table 72. Most Successful Energy Efficient Retrofit Products

Question: What do you consider to be your three most successful energy efficient product lines for commercial retrofit situations? (list in order of success) (n=5)

Response	n
LED fixtures	4
High-efficiency fluorescent fixtures	3
Controls	2
LED lamp retrofits	1
HID ballast retrofits	1

Note: Three respondents provided fewer than three responses.

When asked about market conditions more favorable to lighting retrofits, respondents' answers divided among specific building types and regional or geographic classifications, as Table 73 shows. Two respondents each mentioned warehouses and industrial building types. Three respondents cited cities or urban areas as more beneficial for retrofit work, and two noted that retrofit business is best in areas where utility program incentives are available.

Table 73. Favorable Market Conditions

Question: Are there certain types of commercial retrofit customers or conditions that are more favorable to those energy efficient products you mentioned previously? (Certain building types? Certain contractor types? Regional variations?) (n=5)	
Response	n
Building Types	
--Warehouse	2
--Industrial	2
--General commercial	1
--Retail	1
--Multi-family	1
--Parking / site lighting	1
Regional / Geographic Areas	
--Cities / urban areas	3
--"Where the incentives are"	2
--Western Washington	1

Note: All respondents provided multiple answers.

When asked about specific manufacturers more actively marketing to the lighting retrofit market, respondents mentioned only Acuity more than once (two respondents), as Table 74 shows. This wide variety and lack of primary manufacturers is likely due to sales reps typically representing a specific set of product lines.

Table 74. Manufacturers Actively Marketing for Lighting Retrofits

Question: Are there certain manufacturers that you represent who are more actively marketing products to the energy efficient lighting retrofit market? (n=5)	
Response	n
Specific Manufacturers	
--Acuity	2
--Hubbell	1
--Columbia	1
--Beacon	1
--Williams	1
--Cree	1
--Leviton	1
Product Types	
--LED lamps	1
--Building automation controls	1

Note: All respondents provided multiple answers.

All five respondents reported that their companies provide design services. Only one reported providing these services more than half the time; the other four reported providing these services less than half the time.

17.2.3 Market Trends

When asked about market forces that have affected their commercial lighting retrofit businesses over the last five years, three of five respondents mentioned utility incentive programs; one respondent each mentioned second-generation T8s and LEDs. Table 75 summarizes these responses.

Table 75. Market Forces in the Past Five Years

Question: What market forces have had a significant impact on your commercial retrofit business over the past five years? (n=5)	
Response	n
Utility incentive programs	3
Second-generation T8	1
LED	1

Respondents most commonly cited LED as a significant future market trend, as Table 76 shows.

Table 76. Market Forces in the Next Five Years

Question: What market forces do you expect to have a significant impact on your commercial retrofit business over the next five years? (n=5)	
Response	n
LED	4
Code changes that affect retrofit lighting	1

Asked specifically if there was any product that they expect to substantially change the retrofit market over the next five years, all five respondents cited LED.

With regard to expectations about the phase-out of T12s and 700-series T8s, three respondents reported that they expect no change; two expect that the phase-out will result in increased sales, as Table 77 shows.

Table 77. Impact of T12 and 700-series T8 Phase-out

Question: How do you expect the phase-out of T12s and 700-series T8s to affect your retrofit product distribution? (n=5)	
Response	n
No change	3
Increase sales	2

Respondents cited varying impacts of certain product trends in the lighting market depending on the product type, as Table 78 shows. Although respondents reported impacts from growth of both LEDs and controls, ceramic metal halide growth seems to have had little impact on sales rep business.

Table 78. Product Trend Impacts (n=5)

	Increase sales	Change product line / offer more products	No change
How is the growth of LEDs affecting your retrofit product line?	4	1	0
How is the growth of controls affecting your retrofit product line?	5	0	0
How is the growth of ceramic metal halide affecting your retrofit product line?	0	0	5

Table 79 and Table 80 summarize challenges for installers and customers with the new energy efficient product types discussed above. Three respondents cited a lack of education and product understanding as a challenge for contractors. Two respondents also reported lack of education as a challenge for customers. Product price point and LED dimming problems each received one mention as challenges for customers.

Table 79. Challenges for Installers and Contractors

Question: Are you aware of any challenges with installing contractors adapting to these new technologies mentioned in the previous questions (LEDs, controls, CMH)? (if yes, specify) (n=5)	
Response	n
Yes – Lack of education / product recognition	3
No	2

Table 80. Challenges for Customers

Question: Are you aware of any challenges with customers adapting to these new technologies mentioned in the previous questions (LEDs, controls, CMH)? (if yes, specify) (n=5)	
Response	n
Yes – Lack of education / product recognition	2
Yes – Price point	1
Yes – LED dimming problems	1
No	1
Not sure	1

Note: One respondent provided more than one response

Respondents reported a variety of Northwest-specific market conditions that impact their retrofit businesses, as summarized in Table 81.

Table 81. Northwest-Specific Conditions

Question: Are you aware of any Northwest specific market conditions that impact your ability to market your retrofit product(s)? (n=5)	
Response	n
Low electricity rates (makes efficiency a harder sell)	3
Aggressive utility rebates	2
Environmentally conscious population	2
Solar powered lighting does not work well in the Northwest region	1

Note: Three respondents provided more than one response.

17.2.4 Utility Incentive Programs

All five respondents reported past participation in utility incentive programs for energy efficient lighting retrofits. Three of the four respondents with valid responses reported that nearly all of their retrofit projects participate in utility programs; the fourth respondent estimated the proportion at around eighty-five percent, as Table 82 shows.

Table 82. Retrofit Business through Utility Incentive Programs

Question: Of your commercial retrofit business, approximately what percentage are energy efficient lighting projects that are run through utility efficiency programs? (n=5)	
Response	n
85%	1
Approximately 100%	3
Not sure	1

These sales reps' most commonly-mentioned challenges of utility commercial retrofit programs related to the limited number of eligible products and to the difficulty of getting new products added to approved product lists, as Table 83 shows.

Table 83. Challenges with Utility Programs

Question: What are the most difficult challenges or barriers of utility commercial retrofit programs for you? (n=5)	
Response	n
Limited number of eligible products	4
Difficulty of product submittals	2
Difficulty of Design Lights Consortium (DLC) certification	2
Payback / ROI calculations	1
Cost effectiveness requirements are too restrictive	1

Note: Three respondents provided more than one answer

17.2.5 Additional Comments

Among the four respondents providing additional open-ended comments, three suggested that utilities should add more products to approved product lists. Their additional comments are below:

- Utility programs should be more flexible and base incentives on kW or kWh savings, rather than on specific product measures.

- Utilities should consider manufacturer track records and not just product performance.
- Utilities are too concerned about owners spending too much money on new technologies. Owners should be free to choose the products they want.
- The general public is not aware of incentive programs. Utilities need to reach a broader audience.
- Utilities should make it easier to find approved products.

18. APPENDIX E – MANUFACTURER SAMPLE CHARACTERISTICS AND INTERVIEW RESULTS

The following sections outline the sample characteristics and detailed results of the manufacturer interviews.

18.1 Sample Characteristics

Table 84 shows the proportion of each respondent's company's business made up of commercial lighting retrofits, with responses ranging from ten percent to eighty percent.

Table 84. Lighting Retrofits as a Percentage of Manufacturers' Business

Question: Approximately what percentage of your company's business serves the commercial lighting retrofit market? (open ended) (n=4)

Response	n
10-15%	1
35%	1
40%	1
80%	1

The four manufacturers who completed interviews likely each have unique perspectives on the retrofit lighting market, as they each develop different types of products geared toward different applications or end-users.

18.2 Survey Results

The following sections outline the results of the manufacturer interviews.

18.2.1 Sales and Marketing Efforts

All four respondents offered product lines specifically geared toward the commercial lighting retrofit market. All four also reported approaching the retrofit market distinctly from their approaches to the new construction market, as Table 85 shows.

Table 85. Differences between Retrofit and New Construction Markets

Question: Are there differences between the ways that your company addresses the commercial retrofit market, compared to commercial new construction? (if yes, describe) (n=4)	
Response	n
Yes – targeted marketing efforts	2
Yes – different distribution channels	1
Yes – specific department / staff dedicated to retrofit work	1
Yes – more cost-sensitive market	1

Note: One respondent's answers fit into more than one category above.

18.2.2 Products

As Table 86 shows, respondents most commonly cited controls (three respondents) followed by high-efficiency fluorescent fixtures and LED fixtures (two respondents each) as their most successful energy efficient products for commercial retrofits.

Table 86. Most Successful Energy Efficient Retrofit Products

Question: What do you consider to be your three most successful energy efficient product lines for commercial retrofit situations? (list in order of success) (n=4)	
Response	n
Controls	3
LED fixtures	2
High-efficiency fluorescent fixtures	1

Note: Three respondents provided fewer than three responses.

While respondents most frequently identified specific building types as more favorable to lighting retrofits, two of four mentioned regional or geographic variations and one mentioned a contractor type, as Table 87 shows. Two respondents each mentioned office and industrial building types. One respondent cited cities or urban areas as more beneficial for retrofit work, and one noted that retrofit business is best where utilities encourage it through incentive programs. One respondent also pegged lighting maintenance contractors (contractors who have regular business with building owners maintaining existing lighting systems) as the most active contractor type in the retrofit field.

Table 87. Favorable Market Conditions

Question: Are there certain types of commercial retrofit customers or conditions that are more favorable to those energy efficient products you mentioned previously? (Certain building types? Certain contractor types? Regional variations?) (n=4)	
Response	n
Building Types	
--Office	2
--Industrial and manufacturing	2
--Labs	1
--Small retail	1
--Auto dealerships	1
--Warehouse	1
Regional / Geographic Areas	
--Cities / urban areas	1
--Favorable utility territories	1
Contractor Types	
--Lighting maintenance contractors	1

Note: All respondents provided multiple answers.

Three of the four respondents have developed products or marketing efforts specifically for certain local or regional markets. Two of these three have done so specifically to meet the requirements of California energy code or incentive programs. The third respondent's company develops specific marketing efforts and tracks incentive programs in various regions. These three manufacturers work with a variety of partners, chiefly distributors and installers (each with two responses), when developing products or marketing for specific markets, as Table 88 shows.

Table 88. Preferred Partners for Market-Specific Efforts

Question: When you have to tailor a product or marketing campaign to a specific regional or local market, who do you work with most closely? (n=3)	
Response	n
Distributors	2
Installers	2
Sales representatives	1

Note: Two respondents provided more than one answer

18.2.3 Market Trends

All four manufacturer respondents mentioned both LEDs and high-efficiency linear fluorescent fixtures as retrofit opportunities that have affected their commercial lighting retrofit businesses over the last five years. In addition, utility incentives and controls each merited one response. Table 89 summarizes these responses.

Table 89. Market Forces in the Past Five Years

Question: What retrofit opportunities have had a significant impact on your commercial retrofit business over the past five years? (n=4)	
Response	n
LED	4
High-efficiency linear fluorescent products	4
Utility incentive programs	1
Controls	1

Respondents most commonly expect utility incentives and controls (three responses each) to significantly impact their commercial retrofit business over the next five years, as Table 90 shows.

Table 90. Market Forces in the Next Five Years

Question: What retrofit opportunities do you expect to have a significant impact on your commercial retrofit business over the next five years? (n=4)	
Response	n
Utility incentive programs	3
Controls	3
LED	2
Code changes that affect retrofit lighting	1

Three respondents reported that they expect no changes in their retrofit product distribution due to the phase-out of T12s and 700-series T8s, while one expects the phase-out to result in increased sales, as Table 91 shows. These results may be more indicative of the specific products that each manufacturer sells than to the actual impact of these regulations.

Table 91. Impact of T12 and 700-series T8 Phase-out

Question: How do you expect the phase-out of T12s and 700-series T8s to affect your retrofit product distribution? (n=4)	
Response	n
No change	3
Increase sales	1

The impacts of certain product trends in the lighting market varied depending on the product type, as Table 92 shows. Although respondents reported impacts from both LEDs and controls, ceramic metal halide shows little impact on manufacturers' business. As noted above, three of the four respondents were controls manufacturers.

Table 92. Product Trend Impacts (n=4)

	Increase sales	Change product line / offer more products	No change
How is the growth of LEDs affecting your retrofit product line?	2	4	0
How is the growth of controls affecting your retrofit product line?	4	0	0
How is the growth of ceramic metal halide affecting your retrofit product line?	0	0	4

Note: Two respondents provided multiple responses to the LED question.

Three respondents considered a lack of education and product understanding to be a challenge for both contractors and end-users in adapting to the new technologies mentioned above. Product price point and commissioning and installation issues each received one mention as challenges for contractors. Table 93 and Table 94 summarize these responses.

Table 93. Challenges for Installers and Contractors

Question: Are you aware of any challenges with installing contractors adapting to these new technologies mentioned in the previous questions (LEDs, controls, CMH)? (if yes, specify) (n=4)	
Response	n
Yes – Lack of education / product recognition	3
Yes – Commissioning / installation issues	1
Yes – Price point	1

Note: One respondent provided more than one response

Table 94. Challenges for Customers

Question: Are you aware of any challenges with customers adapting to these new technologies mentioned in the previous questions (LEDs, controls, CMH)? (if yes, specify) (n=4)	
Response	n
Yes – Lack of education / product recognition	3
Yes – Lack of end-user control with high-end controls	1
Not sure	1

Note: One respondent provided more than one response

The one respondent citing Northwest-specific issues affecting their retrofit business noted difficulties caused by Oregon outdoor lighting codes and Washington and Seattle daylighting requirements. That respondent also pointed to low electricity rates as the biggest issue preventing energy efficient lighting retrofits in the Northwest region.

Table 95 shows respondents' open-ended feedback on differences between the lighting retrofit market in the Northwest and that in the rest of the country, with the Northwest's utility structure (with NEEA and outside organizations that encourage energy efficiency) earning mentions by three of the four respondents.

Table 95. Northwest Market Differences

Question: Do you know of any way that the lighting retrofit market is different in the Northwest than other parts of the country? If so, how? (n=4)	
Response	n
Utility structure – Alliance network and outside organizations promoting efficiency	3
More aggressive on energy savings	1
Lighting Design Lab and Design Lights Consortium (DLC) involvement in product approvals	1
Higher distributor involvement	1
Lower program complexity	1
High number of Energy Services Companies (ESCOs)	1

Note: All respondents provided more than one response

18.2.4 Utility Incentive Programs

All four respondents reported participation in utility incentive programs for energy efficient lighting retrofits. Three of the four reported that at least sixty percent of their commercial retrofit business was part of a utility incentive program, as Table 96 shows. (The respondent who answered ten to fifteen percent noted that the actual percentage was probably higher since contractors often handle program details without the manufacturer's knowledge.) These results reflect national patterns, which may include areas that offer no retrofit incentives.

Table 96. Retrofit Business through Utility Incentive Programs

Question: Of your commercial retrofit business, approximately what percentage are energy efficient lighting projects that are run through utility efficiency programs? (n=4)	
Response	n
10-15%	1
60%	2
80-85%	1

These four sales reps offered open-ended responses regarding challenges with utility programs; two mentioned the complexity of documentation required for programs, as Table 97 shows. Other

responses noted challenges with the way programs structure rebates: one felt that incentives need to be more application-based, and another noted that rebate structures do not effectively incentivize daylight controls.

Table 97. Challenges with Utility Programs

Question: What are the most difficult challenges or barriers of utility commercial retrofit programs for you? (n=4)	
Response	n
Complexity of programs – excessive documentation requirements	2
Rebate structure needs to be application and savings based rather than prescriptive	1
Delays in product approvals	1
Programs do not effectively incentivize daylight controls	1

Note: One respondent provided more than one answer

Two of the four respondents reported working with utilities on "upstream" incentive programs that buy down the cost of specific products. One of these two reported that these efforts were very effective, although difficult to coordinate. The other respondent was not sure how effective these incentives have been.

18.2.5 Additional Comments

All four respondents provided additional open-ended comments, as follows:

- A disconnect exists between end-user financial outlook and actual payback periods. Programs should tie incentives to the meter so that they go to the party that benefits, and can pass from one owner to the next if necessary.
- Incentives should ensure that efficiency measures like controls are working properly and that end-users have not disabled them after installation.
- Programs should streamline requirements across utilities to simplify participation.
- Utilities should educate end-users on the benefits of energy efficient retrofits.
- Utilities should make program requirements more specific.
- Utility programs should require minimum quality standards and require warranties to ensure longevity and reduce control overrides.

19. APPENDIX F – MARKET ACTOR GROUP INTERVIEW GUIDES

The following sections reproduce the market actor interview guides used in this study.

19.1 Building Owner Interview Guide

Discussion questions:

- Where do you typically get your lighting equipment? (retailers, electrical contractors, distributors, direct from manufacturers, other – list)
  - Do your suppliers vary depending on product type (components, fixtures, controls, etc)? (Yes – describe, No, Not Sure)
  - Do you have an on-going maintenance relationship with a specific company? (Yes – describe, No, Not Sure)
- How often do you typically update your lighting system?
  - What typically motivates you to update your lighting system? (Scheduled updates, outdated technology, malfunctioning equipment, energy savings, other – describe)
- How familiar are you with utility programs that provide incentives for energy efficient lighting retrofits? (Very familiar, somewhat familiar, not familiar)
- Have you completed an energy efficient lighting retrofit in a building that you own or manage in the past five years? (Yes, No, Not sure)
  - (if yes, above) Did you receive a rebate or incentive for that project? (Yes, No, Not sure) – from whom?
  - (if yes, above) Who convinced you to install an energy efficient lighting retrofit? (installing contractor, utility representative, other – list)
  - (if yes, above) What motivated you to install an energy efficient lighting retrofit? (select all that apply: financial incentives, energy or cost savings, reduced maintenance costs, better light quality, company policy, concern for environment, other – specify)
- Are there any barriers you face or have faced in installing an energy efficient lighting retrofit? (select all that apply: higher first cost, do not understand some energy efficient measures or strategies, concern that the system will deliver energy savings as projected, concern that the system will not deliver enough light or quality of light as projected, concern over system or equipment failure, other – specify)
  - (For each barrier listed) Is this an on-going issue or barrier? (Yes, no, not sure)
  - (For each barrier listed) Do you have a plan to overcome this barrier (Yes – list, no, not sure)
- How do you typically find out about lighting retrofit incentive or rebate opportunities? (From utilities, from contractors, from manufacturers, from retailers, other – describe)
- Are there any specific market forces that impact your decisions on whether or not to pursue an energy efficient lighting retrofit? (new lighting technologies, increasing energy prices, new lighting equipment or energy regulations, economic forces, other – describe, not sure)
  - Are you aware that standard T12 fluorescent lamps are no longer being manufactured or distributed, because of a law requiring manufacturers to stop production of these products? (Yes, No, Not Sure)

- (If yes) How do you plan to respond to the phase-out of T12 lamps? (open ended, probe as necessary: replace T12s with T8 fixtures, not applicable – do not currently have T12 lamps, switch to other lighting strategies – specify, other – specify)
- Are you aware that 700-series T8 fluorescent lamps are no longer being manufactured or distributed, because of a law requiring manufacturers to stop production of these products? (Yes, No, Not Sure)
- (If yes) How do you plan to respond to the phase-out of 700-series T8 lamps? (open ended, probe as necessary: replace with other T8 lamps, not applicable – do not currently have 700-series T8 lamps, switch to other lighting strategies – specify, other – specify)

- What kinds of resources could your utility or a contractor provide to you to help you decide whether or not to pursue an energy efficient lighting retrofit? (energy savings calculations, utility bill savings calculations, payback estimates, other – describe)
- Is there anything else you would like to add regarding energy efficient lighting retrofits?

19.2 Specifiers (Contractors, Installers, etc)

Discussion questions:
(Intro) In this interview, we will be asking a series of questions about lighting for the commercial renovation, tenant improvement and energy retrofit market. For the purposes of this conversation, these activities will be grouped together under the phrase "commercial retrofit."

- Approximately what percentage of your company's business serves the commercial lighting retrofit market? (open ended, Not Sure)
- Where do you typically get your lighting equipment? (retailers, distributors, direct from manufacturers, other – list)
  - Do your suppliers vary depending on product type (components, fixtures, controls, etc)? (Yes – describe, No, Not Sure)
  - Do your suppliers vary depending on building types or clients (office, retail, institutional, healthcare)? (Yes – describe, No, Not sure)
- Approximately what percentage of your business is energy efficient lighting retrofits? (open ended, Not Sure)
- Do certain manufacturers, sales representatives, or distributors serve your commercial retrofit work better than others? (Yes – list, No, Not sure)
  - What, if any, coordination do you have with sales reps? (open ended)
- Are there certain manufacturers that you work with who are more actively marketing products to the energy efficient lighting retrofit market? (Fixture manufacturers, controls manufacturers, lamp manufactures, specific manufacturers – list)
  - What specific actions are these manufacturers taking to target the commercial retrofit market? (open ended)
- Do manufacturers or distributors provide any resources or information to help you with energy efficient lighting retrofits? (probe if necessary: technical support, design support, lighting calculation support, energy calculation support, applying for incentives, etc.) (Yes, No, Not sure)
  - What are these resources? (open ended)
  - Which manufacturers or distributors provide these resources? (open ended)

- Do you ever receive design assistance from manufacturers, sales representatives, distributors, or others? (Yes – manufacturers, Yes – sales reps, Yes – distributors, Yes – combination of two or more)

- Are there certain building types or clients that are more likely to pursue energy efficient lighting retrofits? (Certain building types, list; certain contractor types, list; regional variations, list; other, list)
- Are there certain building types or clients that are less likely to pursue energy efficient lighting retrofits? (Certain building types, list; certain contractor types, list; regional variations, list; other, list)
- How do you expect the phase-out of T12s and 700-series T8s to affect your commercial retrofit work? (select all that apply: require product line changes – specify change, increase sales, decrease sales, no change, other - specify, not sure)
- Which of the following conditions has had the most significant impact on your business over the past five years: availability of new lighting technologies, federal regulations such as the T12 sunset, utility incentive programs, increased technical sophistication of lighting products and systems, or code changes that effect lighting retrofits? Which of the following conditions do you expect will have the most significant impact on your business over the next five years: availability of new lighting technologies, federal regulations such as the T12 sunset, utility incentive programs, increased technical sophistication of lighting products and systems, or code changes that effect lighting retrofits. Are there any new products that you expect will substantially change the retrofit market over the next five years? (Yes – list, No, Not sure)
- How is the growth of LEDs affecting your retrofit product line? (select all that apply: require product line changes – specify change, increase sales, decrease sales, no change, other - specify, not sure)
- How is the growth of controls affecting your retrofit product line? (select all that apply: require product line changes – specify change, increase sales, decrease sales, no change, other - specify, not sure)
- How is the growth of ceramic metal halide affecting your retrofit product line? (select all that apply: require product line changes – specify change, increase sales, decrease sales, no change, other - specify, not sure)
- Are you aware of any challenges with customers adapting to these new technologies mentioned in the previous questions (LEDs, controls, CMH)? (Yes – specify which technologies, no, not sure)
- Are you aware of utility programs that provide incentives for energy efficient lighting retrofits? (If yes) Have you participated in any of these programs? (Not Aware, aware of programs, participated in programs)?
  - (If aware or participated) Of your commercial lighting retrofit business, approximately what percentage are energy efficient lighting projects that are run through utility efficiency programs? (open ended, Not Sure)?
  - (If aware or participated) What are the most difficult challenges or barriers of utility commercial retrofit programs for you? (variations in programs across utilities, complexity of programs, product performance requirements, contractor skill level, other – describe)
- Are there any barriers that you face or have faced in installing an energy efficient lighting retrofit? (Yes, No, Not sure)

- What is the most significant barrier that you have encountered? (higher first cost, do not understand some energy efficient measures or strategies, concern that the system will deliver energy savings as projected, concern that the system will not deliver enough light or quality of light as projected, concern over system or equipment failure, other – specify)
- Is this an ongoing issue or barrier?
- Do you have a plan to overcome this barrier?
- What is the second most significant barrier that you have encountered? (higher first cost, do not understand some energy efficient measures or strategies, concern that the system will deliver energy savings as projected, concern that the system will not deliver enough light or quality of light as projected, concern over system or equipment failure, other – specify)
- Is this an ongoing issue or barrier?
- Do you have a plan to overcome this barrier?
- Are there any additional barriers that you have encountered? (higher first cost, do not understand some energy efficient measures or strategies, concern that the system will deliver energy savings as projected, concern that the system will not deliver enough light or quality of light as projected, concern over system or equipment failure, other – specify)
- Is this an ongoing issue or barrier?
- Do you have a plan to overcome this barrier?

- Reference questions:
  - What is your service territory?
  - What is your customer base? (Certain building types? Client types?)
  - Who else should we talk to for Northwest-specific experience?
  - Is there anything else you would like to add regarding the lighting retrofit market?

19.3 Distributors

Discussion questions:
(Intro) In this interview, we will be asking a series of questions about lighting for the commercial renovation, tenant improvement and energy retrofit market. For the purposes of this conversation, these activities will be grouped together under the phrase "commercial retrofit."

- Are you a lighting distributor or do you also distribute other electrical equipment and products?
  - If a general electrical distributor, approximately what percentage of your business is in lighting? (open ended, Not Sure)
- Approximately what percentage of your lighting business serves the commercial lighting retrofit market? (open ended, Not Sure)
- Do you have sales efforts specifically geared toward commercial retrofit markets? (Yes – describe, No, Not Sure)
- Do you have products specifically geared toward commercial retrofit markets? (Yes – list, no, not sure)
- Are there differences between the ways that your company addresses the commercial retrofit market, compared to commercial new construction? (targeted marketing efforts, distribution channels, other - specify)

- What do you consider to be your three most successful energy efficient product lines for commercial retrofit situations? (list in order of success)
- Of your lighting business for the commercial retrofit market, approximately what percentage are those energy efficient products you mentioned in the previous question? (open ended, Not Sure)
- Are there certain types of commercial retrofit customers or conditions that are more favorable to those energy efficient products you mentioned previously? (Certain building types, list; certain contractor types, list; regional variations, list; other, list)
- Are there certain manufacturers that you represent who are more actively marketing products to the energy efficient lighting retrofit market? (Fixture manufacturers, controls manufacturers, lamp manufactures, specific manufacturers – list)
  - What specific actions are these manufacturers taking to target the commercial retrofit market? (open ended)
- What market forces have had a significant impact on your commercial retrofit business over the past five years? (Interviewer to list options, respondent to select all that apply: Second-generation T8, LED, CMH, controls, utility incentive programs, other – list)
- What market forces do you expect to have a significant impact on your commercial retrofit business over the next five years? (Interviewer to list options, respondent to select all that apply:T12 sunset, LED, CMH, controls, utility incentive programs, increasing technical sophistication of lighting products and systems, code changes that affect retrofit lighting, other – list)
  - Are there any new products that you expect will substantially change the retrofit market over the next five years? (Yes – list, No, Not sure)
- Does your company ever provide design services for your customers? (Yes, No, Not Sure)
  - Approximately how frequently does your company provide these services? (More than half the time, about half the time, less than half the time)
- How do you expect the phase-out of T12s and 700-series T8s to affect your retrofit product distribution? (select all that apply: require product line changes – specify change, increase sales, decrease sales, no change, other - specify, not sure)
  - Are any customers still purchasing T12s or 700-series T8s? (Yes, no, not sure)
- How is the growth of LEDs affecting your retrofit product line? (select all that apply: require product line changes – specify change, increase sales, decrease sales, no change, other - specify, not sure)
- How is the growth of controls affecting your retrofit product line? (select all that apply: require product line changes – specify change, increase sales, decrease sales, no change, other - specify, not sure)
- How is the growth of ceramic metal halide affecting your retrofit product line? (select all that apply: require product line changes – specify change, increase sales, decrease sales, no change, other - specify, not sure)
- Are you aware of any challenges with installing contractors adapting to these new technologies mentioned in the previous questions (LEDs, controls, CMH)? (Yes – specify which technologies, no, not sure)
- Are you aware of any challenges with customers adapting to these new technologies mentioned in the previous questions (LEDs, controls, CMH)? (Yes – specify which technologies, no, not sure)

- Are you aware of utility programs that provide incentives for energy efficient lighting retrofits? (If yes) Have you participated in any of these programs? (Not Aware, aware of programs, participated in programs)?
  - (If aware or participated) Of your commercial retrofit business, approximately what percentage are energy efficient lighting projects that are run through utility efficiency programs? (open ended, Not Sure)?
  - (If aware or participated) What are the most difficult challenges or barriers of utility commercial retrofit programs for you? (variations in programs across utilities, complexity of programs, product performance requirements, contractor skill level, other – describe)
- Is your company working with any utilities, either in the Northwest or in other parts of the country, on incentives that go to a supplier or manufacturer instead of the customer, in order to buy down the cost of certain products? (Yes, No, Not Sure)
  - If yes, in your experience, how effective are these types of programs? (Very effective, somewhat effective, neither effective or ineffective, somewhat ineffective, very ineffective, not sure)
- Are you aware of any Northwest specific market conditions that impact your ability to market your retrofit product(s)? (Yes – list, no, not sure)
  - Are these impacts positive or negative? What makes you say that? (open ended)
- Reference questions:
  - What is your service territory?
  - What is your customer base? (Designers? Specifiers? Installers?)
  - Who else should we talk to for Northwest-specific experience?
  - Is there anything else you would like to add regarding the lighting retrofit market?

19.4 Sales Representatives

Discussion questions:
(Intro) In this interview, we will be asking a series of questions about lighting for the commercial renovation, tenant improvement and energy retrofit market. For the purposes of this conversation, these activities will be grouped together under the phrase "commercial retrofit."

- Approximately what percentage of your business serves the commercial retrofit market? (open ended, Not Sure)
- Do you have sales efforts specifically geared toward commercial retrofit markets? (Yes – describe, No, Not Sure)
- Do you have products specifically geared toward commercial retrofit markets? (Yes – list, no, not sure)
- Are there differences between the ways that your company addresses the commercial retrofit market, compared to commercial new construction? (targeted marketing efforts, distribution channels, other - specify)
- What do you consider to be your three most successful energy efficient product lines for commercial retrofit situations? (list in order of success)
- Of your lighting business for the commercial retrofit market, approximately what percentage are those energy efficient products you mentioned in the previous question? (open ended, Not Sure)

- Are there certain types of commercial retrofit customers or conditions that are more favorable to those energy efficient products you mentioned previously? (Certain building types, list; certain contractor types, list; regional variations, list; other, list)
- Are there certain manufacturers that you represent who are more actively marketing products to the energy efficient lighting retrofit market? (Fixture manufacturers, controls manufacturers, lamp manufactures, specific manufacturers – list)
  - What specific actions are these manufacturers taking to target the commercial retrofit market? (open ended)
- What market forces have had a significant impact on your commercial retrofit business over the past five years? (Interviewer to list options, respondent to select all that apply: Second-generation T8, LED, CMH, controls, utility incentive programs, other – list)
- What market forces do you expect to have a significant impact on your commercial retrofit business over the next five years? (Interviewer to list options, respondent to select all that apply: T12 sunset, LED, CMH, controls, utility incentive programs, increasing technical sophistication of lighting products and systems, code changes that affect retrofit lighting, other – list)
  - Are there any new products that you expect will substantially change the retrofit market over the next five years? (Yes – list, No, Not sure)
- Does your company ever provide design services for your customers? (Yes, No, Not Sure)
  - Approximately how frequently does your company provide these services? (More than half the time, about half the time, less than half the time)
- How do you expect the phase-out of T12s and 700-series T8s to affect your retrofit product lines? (select all that apply: require product line changes – specify change, increase sales, decrease sales, no change, other - specify, not sure)
- How is the growth of LEDs affecting your retrofit product line? (select all that apply: require product line changes – specify change, increase sales, decrease sales, no change, other - specify, not sure)
- How is the growth of controls affecting your retrofit product line? (select all that apply: require product line changes – specify change, increase sales, decrease sales, no change, other - specify, not sure)
- How is the growth of ceramic metal halide affecting your retrofit product line? (select all that apply: require product line changes – specify change, increase sales, decrease sales, no change, other - specify, not sure)
- Are you aware of any challenges with installing contractors adapting to the technologies mentioned in the previous questions (LEDs, controls, CMH)? (Yes – specify which technologies, no, not sure)
- Are you aware of any challenges with customers adapting to the technologies mentioned in the previous questions (LEDs, controls, CMH)? (Yes – specify which technologies, no, not sure)
- Are you aware of utility programs that provide incentives for energy efficient lighting retrofits? (If yes) Have you participated in any of these programs? (Not Aware, aware of programs, participated in programs)?
  - (If aware or participated) Of your commercial retrofit business, approximately what percentage are energy efficient lighting projects that are run through utility efficiency programs? (open ended, Not Sure)?

    - (If aware or participated) What are the most difficult challenges or barriers of utility commercial retrofit programs for you? (variations in programs across utilities, complexity of programs, product performance requirements, contractor skill level, other – describe)
- Are you aware of any Northwest specific market conditions that impact your ability to market your retrofit product(s)? (Yes – list, no, not sure)
    - Are these impacts positive or negative? What makes you say that? (open ended)
- Reference questions:
    - What is your sales territory?
    - What is your customer base? (Designers? Specifiers? Installers?)
    - Who else should we talk to for Northwest-specific experience?
    - Is there anything else you would like to add regarding the lighting retrofit market?

19.5 Manufacturers

Discussion questions:
(Intro) In this interview, we will be asking a series of questions about lighting for the commercial renovation, tenant improvement and energy retrofit market. For the purposes of this conversation, these activities will be grouped together under the phrase "commercial retrofit."

- Approximately what percentage of your business serves the commercial retrofit market? (open ended, Not Sure)
- Do you have products specifically geared toward these markets? (Yes, No, Not Sure)
    - What types of products are these? (Open ended; results to be categorized later by HMG based on conceptual framework definitions: commoditized, premium, systems, or a combination)
    - Are there differences between the ways your company addresses the commercial retrofit market, compared to commercial new construction or residential? What are those differences? (targeted marketing efforts, distribution channels, other)
- What do you consider to be your three most successful energy efficient product lines for commercial retrofits situations? (–list in order of success)
- Of your lighting business for the commercial retrofit market, approximately what percentage are those energy efficient products you mentioned in the previous question? (open ended, Not Sure)
- Are there certain types of commercial retrofit customers or conditions that are more favorable to those energy efficient products you mentioned previously? (Certain building types, list; certain contractor types, list; regional variations, list; other, list)
- What market forces have had a significant impact on your commercial retrofit business over the past five years? (Interviewer to list options, respondent to select all that apply: Second-generation T8, LED, CMH, controls, utility incentive programs, other – list)
- What market forces do you expect to have a significant impact on your commercial retrofit business over the next five years? (Interviewer to list options, respondent to select all that apply:T12 sunset, LED, CMH, controls, utility incentive programs, increasing technical sophistication of lighting products and systems, code changes that affect retrofit lighting, other – list)

- How do you expect the phase-out of T12s and 700-series T8s to affect your retrofit product line or distribution? (select all that apply: require product line changes – specify change, increase sales, decrease sales, no change, other - specify, not sure)
- How is the growth of LEDs affecting your retrofit product line? (select all that apply: require product line changes – specify change, increase sales, decrease sales, no change, other - specify, not sure)
- How is the growth of controls affecting your retrofit product line? (select all that apply: require product line changes – specify change, increase sales, decrease sales, no change, other - specify, not sure)
- How is the growth of ceramic metal halide affecting your retrofit product line? (select all that apply: require product line changes – specify change, increase sales, decrease sales, no change, other - specify, not sure)
- Are you aware of any challenges with installing contractors adapting to these new technologies mentioned in the previous questions (LEDs, controls, CMH)? (Yes – specify which technologies, no, not sure)
- Are you aware of any challenges with customers adapting to these new technologies mentioned in the previous questions (LEDs, controls, CMH)? (Yes – specify which technologies, no, not sure)
- Are you aware of utility programs that provide incentives for energy efficient lighting retrofits? (If yes) Have you participated in any of these programs? (Not Aware, aware of programs but have not participated, participated in programs)?
  - (If aware or participated) Of your commercial retrofit business, approximately what percentage are energy efficient lighting projects that are run through utility efficiency programs? (open ended, Not Sure)?
  - (If aware or participated) What are the most difficult challenges or barriers of utility commercial retrofit programs for you? (variations in programs across utilities, complexity of programs, product performance requirements, contractor skill level, other – describe)
- Is your company working with any utilities, either in the Northwest or in other parts of the country, on incentives that go to a supplier or manufacturer instead of the customer, in order to buy down the cost of certain products? (Yes, No, Not Sure)
  - If yes, in your experience, how effective are these types of programs? (Very effective, somewhat effective, neither effective or ineffective, somewhat ineffective, very ineffective, not sure)
- Do you ever tailor products or marketing campaigns to specific regional or local markets? (Yes – list, No, Not Sure)
  - When you have to tailor a product or marketing campaign to a specific regional or local market, who do you work with most closely? (retailers, distributors, installers, designers, educators, researchers, gov. policy makers, IOU program managers, others - specify)
- Are you aware of any Northwest specific market conditions that impact your ability to market your retrofit product(s)? (Yes – list, no, not sure)
  - Are these impacts positive or negative? What makes you say that? (open ended)
- Do you know of any way that the lighting retrofit market is different in the Northwest than other parts of the country? If so, how? (more aggressive on energy savings, less aggressive on energy savings, utility structure – describe, other – describe)

- Who else should we talk to for Northwest-specific experience?
- Is there anything else you would like to add regarding the lighting retrofit market?