

ENERGY STAR Consumer Products Lighting Project

Market Progress Evaluation Report #4

PREPARED BY

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Market Progress Evaluation Report 4

Northwest Energy Efficiency Alliance
Portland, OR

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E.1 Executive Summary

E.1.1 Program History and Theory

NEEA's launched its first residential lighting market initiatives in 1997 to accelerate the awareness and use of high-efficiency compact fluorescent lamps (CFLs) and fluorescent light fixtures among residential customers. The program was designed to address market barriers including high first cost; lack of product availability; lack of consumer awareness; incompatibility of CFLs with existing fixtures, dimmers, timers and photocells; performance problems; unattractiveness of energy-efficient lighting products; and consumer fear of fluorescent technologies. The programs provided financial incentives to manufacturers to increase product availability and reduce product price. Other program components included retailer education and marketing, promotions, mass advertising, and branding.

Program-qualifying products expanded during the late 1990s. As a result, the project strategy evolved from targeting manufacturers to retailers in 2000. The project provided retailers with salesperson training as well as advertising and marketing support to encourage ENERGY STAR product promotion and marketplace acceptance. Local utility activities were leveraged and regional and national initiatives were launched to encourage the improvement of ENERGY STAR product quality.

In 2004, the project focused on improving the quality and consumer acceptance of CFLs in response to market data suggesting consumer issues with product performance. The project provided cooperative marketing opportunities and field services to retailers to promote ENERGY STAR products to consumers, and coordinated offerings of financial incentives for qualifying products. The project also coordinated with national efforts such as ENERGY STAR's Change a Light, Change the World campaign and the lighting quality research conducted by the Program for Evaluation and Analysis of Residential Lighting (PEARL). Finally, the project supported the advancement of new lighting technologies (e.g., dimmable, reflector CFLs) and supported efforts to encourage proper disposal of burned-out CFLs.

In 2005, the project coordinated a regional manufacturer buydown to reduce the market price of CFLs in the region and establish promotional distribution channels to move high-quality, low-priced products into the market. The promotion provided broad geographic sales coverage (including rural markets) through distribution channels including grocery, drug, supermarket, hardware, do-it-yourself chains, and wholesale clubs. The project coordinated similar promotions in 2006 and 2007 with a specific focus on consumers who had had limited access to high-quality, low-priced CFLs as well as those who had never purchased CFLs. The promotions emphasized non-traditional CFL distribution channels (such as drug and grocery stores) and rural areas, and excluded large do-it-yourself chains and wholesale clubs from the promotion.

E.1.2 Project Goals and Market Progress

The project's goals and evidence of progress towards these goals are described below.

- ***Increase consumer awareness of CFLs as measured by the rate of consumer awareness and purchase.*** Consumer awareness of CFLs and the CFL purchase rate increased substantially over the lifetime of the project. As of 2007, nearly all consumers in the Northwest were aware of CFLs as of 2007 and two-thirds had purchased them.

- **Increase product availability** as measured by the number of retail stores in the region that stock CFLs and the number of manufacturers that produce program-qualifying products. The number of retail stores stocking CFLs swelled from 30 before the project's launch to over 2,000 by 2007. The number of manufacturers producing qualifying product expanded such that all major lighting manufacturers produce ENERGY STAR CFLs and many new companies have entered the market that exclusively produce energy-efficient lighting.
- **Reduce product price** as measured by the average CFL price in both large and small markets. The average retail price per CFL dropped dramatically during the lifetime of the project – from approximately \$20 to less than \$5 in both large and small markets.
- **Increase product market penetration** through increased sales as measured by the number of CFLs sold in the region annually. The project intended to reach sales of 9 million by 2010, and achieved this goal ahead of schedule in 2007. In 2007, Northwest retailers sold more than 18 million ENERGY STAR CFLs.
- **Encourage improvement of ENERGY STAR product quality** as measured by consumer satisfaction with CFLs, CFL purchaser intentions to buy CFLs again and changes to the ENERGY STAR specification for CFLs. Consumer satisfaction with CFLs rebounded in 2004 after a slight drop and was sustained even as the CFL purchaser base expanded beyond early adopters to the general population. A large majority of CFL purchasers are repeat purchasers and intend to replace burned out CFLs with new CFLs. Additionally, there have been several key updates to the ENERGY STAR qualifying criteria for CFLs during the project's lifetime that have incorporated tighter standards with respect to various product quality attributes and independent quality assurance procedures.

E.1.3 NEEA's Influence on Market Changes

Based on feedback from market actors, program staff, and industry observers, NEEA's interventions impacted the market in three major ways:

- **Supplier conditions:** The promotions first targeted big-box stores, which could buy and sell CFLs in large volumes. Low promotional prices increased consumer demand, which in turn created supplier competition and led to lower prices. Once prices became relatively low, more retail stores could stock them – including discount, drug, grocery, rural, and independent stores. NEEA educated retailers and supported their promotional efforts, helping them succeed in selling CFLs.
- **Consumer purchases:** The promotions' effects on prices allowed the purchaser base to expand beyond 50 percent of the population by attracting new purchasers with relatively low prices at an expanded range of retail outlets.
- **Product quality:** NEEA was a leader in supporting the evolving ENERGY STAR specifications and addressing early CFL design flaws. NEEA was an early and influential member of PEARL and helped lay the groundwork for the eventual inclusion of third-party product testing into the 2008 ENERGY STAR qualifying criteria. NEEA's leadership in advancing product quality helped increase consumer acceptance and made strides toward overcoming CFLs' negative reputation. These market outcomes were crucial to creating opportunities for CFLs to become one of the major responses to address global warming – through media saturation, Wal-Mart's sustainability initiatives, and lighting efficacy legislation.

E.1.4 Conclusions and Recommendations

NEEA met its residential lighting project goals by the end of 2007 after a decade of market interventions. These interventions were instrumental in creating the right supplier conditions and product quality standards to expand consumer acceptance dramatically over the last few years. By 2006, increased positive media attention, Wal-Mart's sustainability initiatives, and lighting efficacy legislation helped propel CFLs into mainstream status.

The expected short- and long-term Northwest lighting market outcomes have occurred, and according to the program theory, the expected impacts should be realized within the next few years. Is the market transformed? Based on past evidence, the program theory logic suggests that answer is an unequivocal yes. However, if we look forward and predict what market outcomes will occur in absence of continued interventions, the answer is probably "not yet" – because of uncertainty surrounding the sustainability of widespread CFL availability and low prices.

The recent and dramatic market developments have taken place as a result of the expansion of retail channels selling CFLs and the CFL purchaser base beyond early adopters, as well as hospitable external conditions. These market outcomes resulted from promotions that allowed non-traditional retail outlets to sell CFLs at attractive prices. The dramatic market gains were also made possible by a confluence of concern regarding global warming and positive publicity from energy-efficiency program sponsors and the general media suggesting that CFLs are an easy and cost-effective step toward addressing to the climate change problem.

There could be some backsliding in market progress if grocery, drug and discount stores do not offer attractive prices and aggressively promote CFLs in absence of CFL promotions. Many representatives of CFL manufacturers, retailers, and utilities in the Northwest assert that CFLs will disappear from many of these channels or that the chains will stock only one or two CFL models at prohibitively high prices if CFL promotions do not continue. An additional threat to sustaining the recent substantial gains in CFL purchases is the increasing media attention on the hazards associated with mercury in CFLs.

There are still market barriers and opportunities that could be addressed through market interventions to ensure that the full potential for CFL energy saving impacts is realized. Solid state lighting has advanced appreciably in the past few years, but household applications will be niche-only for the foreseeable future. To achieve the intended market impact of 50 percent residential socket saturation with CFLs, market actors and industry observers agree that several remaining CFL market barriers need to be reduced. To that end, we recommend that NEEA play a continued role in addressing these market barriers to ensure that the long-term project impacts occur. Below we list remaining barriers in the CFL market and our specific recommendations to address them.

Inadequate consumer education regarding proper CFL applications and the role of specialty bulbs.

Continue to support ENERGY STAR's efforts to educate consumers regarding proper CFL choices for specific applications; retailers and manufacturer efforts to educate consumers on proper CFL applications; and local utilities efforts to directly educate consumers on these issues.

Lack of widespread and sustained availability and low prices. Continue strategic, targeted market interventions that address availability in non-traditional retail channels, leveraging local utility and

supplier resources, relationships with suppliers, and the national ENERGY STAR program to support the development of the specialty CFL market.

Inconsistent quality. Continue to support CFL quality assurance initiatives and utility promotions in the region (and ensure that these promotions include high-quality products); and continue to support relationships with regional suppliers to encourage supply and sales of high-quality products.

Lack of accurate information about the potential hazards of CFLs' mercury content and disposal infrastructure. Continue to provide input toward developing consistent messages for consumers about the mercury issue; support local utilities and suppliers to educate consumers on mercury issues; and work with various stakeholders at the regional and national levels to support disposal infrastructure development.

1. Introduction

This report is the fourth and final market progress evaluation report (MPER) for NEEA's Consumer Products Lighting project.

1.1 Project Description

NEEA is a regional organization that seeks to make affordable, energy-efficient products and services available in the marketplace. To that end, it supports projects targeted at the residential, commercial, industrial, and agricultural sectors in the Pacific Northwest (Idaho, Montana, Oregon and Washington). It is funded by leading Northwest electric utilities as well as Energy Trust of Oregon and the Bonneville Power Administration, which pays on behalf of its electric utility customers. NEEA works to create energy efficiency in the marketplace by creating leverage with local utilities; encouraging new technologies; and providing local utilities with marketing and training resources to help their customers become more energy-efficient.

NEEA's Board of Directors approved two residential lighting programs in June 1997: ENERGY STAR[®] Fixtures and LightWise Bulbs. The program objectives were to accelerate the awareness and use of high-efficiency compact fluorescent lamps (CFLs) and fluorescent light fixtures among residential customers. These projects were intended to introduce energy-efficient lighting products to the marketplace by developing relationships with product manufacturers. The programs included manufacturer financial incentives to increase product availability and reduce product price. Other program components included retailer education and marketing, promotions, mass advertising, and branding.

In the late 1990s NEEA also worked to develop and disseminate information about energy-efficient lighting to lighting market actors (such as architects, designers and engineers) through its ongoing support of the Lighting Design Lab in Seattle. NEEA encouraged the Lab to extend its outreach beyond the Puget Sound area and to establish formal committees that would provide input to the Lab on local market conditions and professional needs related to lighting design and efficiency. These focused, strategic efforts helped to maximize the Lab's influence on the promotion of energy efficiency lighting.

In 2000, ENERGY STAR Fixtures and LightWise Bulbs were combined into the ENERGY STAR Residential Lighting project and the focus was narrowed to ENERGY STAR-rated products. The intervention strategy evolved from targeting manufacturers to retailers. The project provided retailers with salesperson training as well as advertising and marketing support to encourage ENERGY STAR product promotion and marketplace acceptance. Local utility activities were leveraged and regional and national initiatives were launched to encourage the improvement of ENERGY STAR product quality. In response to the West Coast energy crisis of 2001, the project infrastructure was expanded to support an ENERGY STAR coupon campaign sponsored by the Bonneville Power Administration. Eighty-seven utilities in the region participated and more than 8 million coupons were distributed to Northwest customers.

Starting in 2004, all residential project activities were rolled up into the Residential Sector Initiative, which included the ENERGY STAR Consumer Products project (targeting consumer lighting and appliance markets) and the ENERGY STAR Homes Northwest project (targeting the new construction market). This umbrella approach to targeting residential products and homes streamlined NEEA's messaging to partnering utilities and upstream market actors and improved the functional efficiency of project implementation. The Consumer Products project reflected the culmination of over 5 years of

market interventions and market intelligence. As energy-efficient consumer products have moved through the various stages of the adoption process, the project evolved accordingly to ensure its strategies were cost-effective.

The lighting portion of the Consumer Products project focused on improving the quality and consumer acceptance of compact fluorescent lamps. The project provided cooperative marketing opportunities and field services to retailers to promote ENERGY STAR products to consumers, and coordinated the availability of financial incentives for qualifying products. The project was also coordinated with national efforts, such as ENERGY STAR's Change a Light, Change the World campaign and the lighting quality research conducted by the Program for Evaluation and Analysis of Residential Lighting (PEARL). Finally, the project supported the advancement of new lighting technologies (e.g., dimmable, reflector CFLs) and supported efforts to encourage the proper disposal of burned-out CFLs.

In 2005, the project launched the Savings with a Twist (SWAT) CFL promotion which provided manufacturers with an upstream incentive to reduce the market price of CFLs in the region. Specifically, the NEEA worked with manufacturers and retailers to establish promotional distribution channels to move high-quality, low-priced products into the market. The promotion provided broad geographic sales coverage (including rural markets) through distribution channels including grocery, drug, supermarket, hardware, and do-it-yourself chains as well as wholesale clubs. Fifteen retail chains participated, representing nearly 900 individual store locations, and just under 900,000 promotional CFLs¹ were sold between August and December 2005. The promotion was exclusively for CFLs of 18 or more watts, since the market for lower wattage CFLs had already progressed such that prices were low and availability was fairly widespread. The focus on higher wattage CFLs was also an attempt to address issues of brightness, since the lower wattage CFLs were not bright enough for all household applications.

In 2006, NEEA ran the SWAT promotion with a new focus on consumers who had had limited access to high-quality, low-priced CFLs as well as those who had never purchased CFLs. Accordingly, the promotion emphasized "non-traditional distribution channels" (such as drug and grocery stores) and rural areas, and excluded large do-it-yourself chains and wholesale clubs from the promotion. More than 1,200 individual store locations carried SWAT CFLs during the 2006 promotion, resulting in sales of over 1.15 million promotional CFLs² between September and December 2006. This promotional strategy likely contributed to the increase in lighting retailers selling CFLs from 1,516 before the promotion to 2,550 after.

In 2007, NEEA again ran a CFL promotion intended to reduce the market price of CFLs in the region. The Fall Change a Light (FCAL)³ promotion was similar to 2006's SWAT promotion with a continued focus on twister-style CFLs, non-traditional distribution channels, and rural markets. The promotion also

¹ Retail pricing for CFLs through the 2005 promotion was \$0.99 to \$1.49 for single-pack CFLs and \$4.79 for four-packs.

² Most promotional CFLs were sold for less than \$1.00 per bulb. The promotion encouraged sales of single packaged CFLs versus multi-packs in order to address the increasing CFL storage rate among recent CFL purchasers.

³ Bonneville Power Administration (BPA) ran a campaign in the spring called Spring Change a Light. Both the fall and spring campaigns were intended to leverage the national ENERGY STAR Change a Light campaign. The BPA campaign focused on specialty CFLs (although twister-style CFLs were also promoted) sold through do-it-yourself stores, mass merchants, and membership retail outlets. Approximately 2 million CFLs were sold through the 2007 promotion.

attempted to promote CFL products that were already in the stores versus special shipments of CFLs that would be available only during the promotion. Likewise, the promotion encouraged retailers to sustain the stock of CFLs after the promotion period. NEEA also changed its field services support function such that the project would support and encourage manufacturer representatives and private contractors that were already serving a similar function in the marketplace. These innovations were consistent with NEEA’s market transformation orientation.

A total of nearly 1.8 million CFLs were sold through the FCAL promotion between September and December 2007.⁴ Most promotional CFLs were sold for less than \$1.00 per bulb and sales of single packaged CFLs were encouraged versus multi-packs. CFLs less than 18 watts were added in the 2007 promotion to expand retailer involvement and provide consumers with more options.

1.2 Project Goals and Market Progress Indicators

The overall ENERGY STAR Consumer Lighting Project objective was to achieve greater efficiency in lighting products and to transform the residential lighting market to one in which high-efficiency lighting products are regularly used in residential applications. Table 1-1 below shows the project’s specific goals (along with the indicators of market progress toward those goals) that were measured during the lifetime of the project. The last section of the report will summarize the project’s cumulative impacts on the region’s lighting market.

**Table 1-1
General Project Goals and Market Progress Indicators**

Goal	Market Progress Indicator
Increase product market penetration through increased sales	CFL purchase and sales in the region
Reduce product price	Average CFL price in the region
Increase product availability	The number of retail stores in the region that stock CFLs and the number of manufacturers that produce program-qualifying CFLs
Increase consumer awareness of CFLs	Rate of CFL awareness and purchase
Encourage improvement of ENERGY STAR product quality	Consumer CFL satisfaction; Intentions of CFL purchasers to keep buying and using CFLs; ENERGY STAR specifications

1.3 Program Theory and Logic Model

NEEA sponsored baseline market research⁵ in 1997 prior to developing its lighting programs. This research consisted of market and consumer research to help NEEA design future program strategies. It identified market barriers to the adoption of energy-efficient lighting products. The research identified the following market barriers:

- High first cost;
- Lack of product availability;

⁴ Approximately 450,000 additional FCAL CFLs were sold during the first quarter of 2008.

⁵ Regional Economic Research, 2000.

- Lack of consumer awareness of the technology and its costs and benefits;
- Incompatibility of CFLs with existing fixtures, dimmers, timers and photocells;
- Performance problems;
- Unattractiveness of energy-efficient lighting products; and
- Consumer fear of fluorescent technology.

NEEA introduced programs in 1998 that were intended to accelerate the awareness and use of high-efficiency CFLs and fluorescent light fixtures among residential customers. The programs used a combination of lighting manufacturer incentives, retailer education and marketing, promotions, mass advertising, and branding to address market barriers preventing increased adoption of energy-efficient lighting products.

By 2000, the market conditions had changed such that CFL availability had improved somewhat, but some barriers for consumers and retailers remained (such as high incremental cost and lack of widespread availability).⁶ Nationally, manufacturers were using the ENERGY STAR brand to designate high-quality energy-efficient lighting products. Accordingly, NEEA adapted its strategies to the changing market context. The project's objectives in 2000 were to encourage consumers to purchase new generation ENERGY STAR CFLs, torchieres, and hard-wired fixtures; encourage the development of and enhance market conditions for residential ENERGY STAR lighting fixtures; encourage local utility support for retail program efforts; and protect and improve ENERGY STAR product quality. NEEA collaborated with national lighting initiatives and eliminated manufacturer incentives while expanding the promotion's focus on retailers.

Many remaining market barriers were reduced between 2000 and 2004. However, first cost was still a barrier for most consumers.⁷ NEEA shifted its focus once again by adding manufacturer incentives to reduce the first cost for consumers. NEEA also focused its interventions where they were needed most – in the eastern areas of the region and in non-traditional retail outlets such as drug, grocery, and small hardware stores, where the CFL purchase rate lagged behind that of the western region and big-box stores. These strategies were successful in increasing CFL sales through non-traditional retailers and increasing the CFL purchase rate in smaller market areas.⁸

The process by which the energy-efficiency community monitored CFL product quality also evolved over time. Lighting manufacturers eventually agreed to support third-party CFL quality testing efforts as part of the ENERGY STAR CFL criteria that will go into effect in late 2008.⁹ This development reflected the cumulative efforts of NEEA and similar organizations across the nation that had implemented and funded quality assurance initiatives through PEARL since 2000.

There were several key external developments that also impacted the lighting market during this timeframe. These include increased attention to the problem of global warming, Wal-Mart's sustainability

⁶ Pacific Consulting Services and Shel Feldman Management Consultants 1999; Dethman & Associates, 1999.

⁷ EcoNorthwest, 2002 and 2004.

⁸ KEMA 2005, 2006, and 2007.

⁹ ENERGY STAR, 2008.

initiatives, regulation of CFL light efficacy by Australia, the European Union, and the United States, and other developments (see Section 3.6 for more detail).

Figure 1-1 presents a timeline showing the evolution of NEEA’s market interventions along with the market context. Also shown are the external conditions that influenced the lighting market and NEEA’s resultant project strategies.

Figure 1-1
Evolution of NEEA’s Lighting Market Interventions

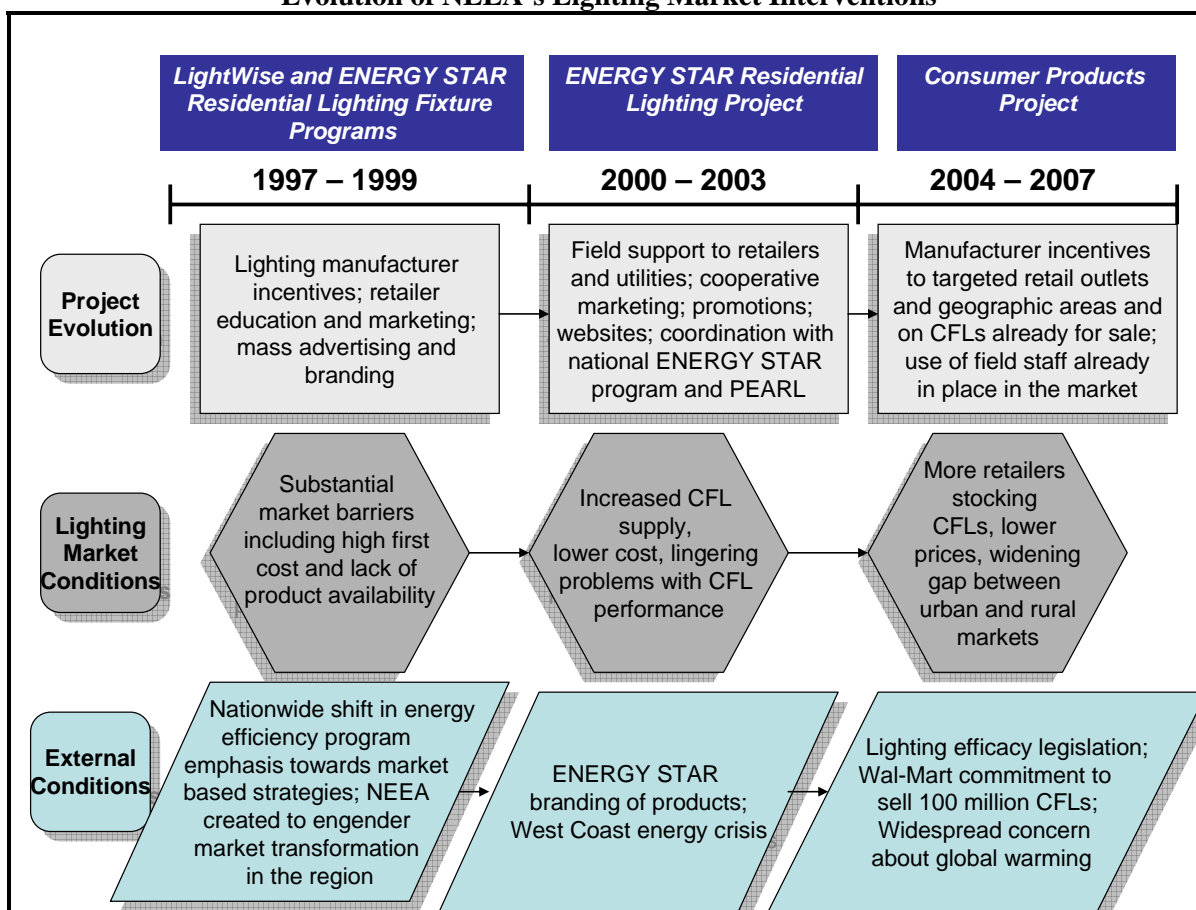


Figure 1-2 presents a generic logic model prepared by NEEA’s residential lighting program manager that illustrates the theory behind NEEA’s market interventions.¹⁰ Each column of the model is defined as follows:

- **Situation:** the context and need that gives rise to an initiative (both barriers and opportunities are described).
- **Inputs:** the resources, contributions, and investments made in response to the situation.
- **Activities:** how inputs are used to address the problems identified in the first column in order to lead to the outcomes listed in the following columns.

¹⁰ Section 7 of this report provides an updated logic model including linkages between the mode’s elements.

-
- **Outputs (or activity indicators):** the desired results that are expected to follow from the activities listed in the prior column.
 - **Outcomes — Short and Longer Term:** the results and benefits that are expected in 1 to 3 and 4 to 6 years, respectively, as a result of the project activities.
 - **Impact:** if the short- and long-term outcomes are achieved, changes that are expected in 7 to 10 years as a result of the project activities.

**Figure 1-2
NEEA Consumer Products Lighting Project Logic Model**

Situation	Inputs	Activities	Outputs	Outcomes—Short Term	Outcomes—Longer Term	Impact
<p><i>Barriers:</i> High price (compared to incandescents)</p> <p>Limited manufacturers</p> <p>Limited availability (not in all retail stores where consumer buy light bulbs)</p> <p>Lack of awareness of benefits (long life, lower price)</p> <p>Low satisfaction—light quality, color, application etc.</p> <p><i>Market Opportunities:</i> With limited manufacturers, have fewer points of leverage</p> <p>Huge potential for energy savings</p> <p>Frequent consumer purchase at relatively lower cost</p>	<p>Staff Program Lead (overall project planning, goal setting & project management, utility communications, national coordination)</p> <p>Contractor services - retail/mfr outreach & support - utility coordination - marketing & promotion</p> <p>Product (the thing being “sold”)</p> <p>Market Actors - Retailers - Manufacturers - Consumers - ENERGY STAR (DOE & EPA)</p> <p>Budget (for utility coordination, retail support and marketing, etc.)</p> <p>Utilities - coordinated retail promotion - consumer education</p>	<p>Leverage utility incentives with manufacturers and retailers</p> <p>Support consumer education</p> <p>Support in-store merchandising and sales staff training on benefits</p> <p>Influence national specifications for ENERGY STAR and quality assurance/product testing efforts</p> <p>Track retail CFL sales</p> <p>Leverage retail/manufacture promotional efforts and resources</p> <p>Focus on mass market via big-box retail, then smaller market channels</p>	<p>Field representatives to support retailer merchandising of ENERGY STAR CFLs, coordinate in-store activities</p> <p>Offer cooperative marketing support to retailers</p> <p>Program-designed point-of-purchase in-store collateral</p> <p>Regional CFL buy-down promotion (leverages utility incentives)</p> <p>Leverage ENERGY STAR Change a Light national campaign in marketplace (retailers/mfrs)</p> <p>As market matures, coordinate in-store support via manufacturer representatives (natural market actor)</p> <p>Support PEARL/third-party quality testing</p>	<p>Consumers demonstrate increased awareness of CFLs</p> <p>Price points decrease</p> <p>Purchase rate reflects increased demand by early adopters</p> <p>Large volume/big-box retailers begin to offer product</p> <p>More manufacturers enter the market with new product</p> <p>Consumers indicate intent to purchase again (repeat purchase)</p> <p>Significant measurable kWh savings</p>	<p>Consumer satisfaction continues to increase</p> <p>Market actors actively promoting ENERGY STAR CFLs as evidenced by their marketing and positioning</p> <p>CFLs are widely available in multiple/traditional retail channels</p> <p>Purchase rate increase reflects mainstream acceptance</p> <p>CFL distribution and quality improves in other parts of the country</p> <p>Industry supports and DOE adopts third-party testing QA</p>	<p>Socket penetration grows steadily (to 50%?) without NEEA intervention</p> <p>Consumers indicate they can buy CFLs anywhere they shop for lighting</p> <p>Ave. price remains below \$2 per bulb</p> <p>All major lighting manufacturers regularly produce full line of CFLs (range of wattage, some specialty)</p> <p>CFLs gain mainstream “status”</p>

Source: NEEA, 2007b.

2. Evaluation Activities

The objectives of this final MPER are to:

- document the project's activities, goals and intended market outcomes over its lifetime;
- assess lighting market progress over the course of the project;
- present evidence that the project's market interventions lead to (or contributed to) various market outcomes; and
- draw conclusions about the project's ultimate effects on the lighting market.

During Phase 1 of the two-phase study, we reviewed prior market planning, research and evaluation documents to summarize the ENERGY STAR Consumer Lighting Project's progress to date, document the program theory, and identify gaps in the existing literature. During Phase 2, we conducted research to address the gaps identified during Phase 1 to substantiate progress in the Northwest residential lighting market and establish NEEA's influence on the market.

Table 2-1 below shows the market research studies and evaluations conducted from 1997 through 2007 for NEEA's residential lighting market initiatives that we reviewed during Phase 1.

**Table 2-1
Northwest Market Research Studies and Evaluations (1997-2007)**

Project Year	Project Name	Study	Author	Publish Date
2006	ENERGY STAR Consumer Products	Market Progress Evaluation Report (MPER) 3	KEMA, Inc.	July 24, 2007
2005	ENERGY STAR Consumer Products	MPER2	KEMA, Inc.	June 9, 2006
2004	ENERGY STAR Consumer Products	MPER1	KEMA, Inc.	October 21, 2005
2003	ENERGY STAR® Residential Lighting	MPER2	ECONorthwest	August 16, 2004
2002	ENERGY STAR® Residential Lighting	MPER1	ECONorthwest	June 20, 2002
N/A	N/A	Residential Energy-Efficient Lighting Consumer Research - Market Research Report	Regional Economic Research Inc.	April 2000
1999	Lighting Design Lab	MPER	Energy Market Innovations	September 2000
1998	LightWise	MPER2	Dethman & Associates	September 1999
1998	ENERGY STAR Residential Lighting Fixture Program	MPER3	Pacific Consulting Services and Shel Feldman Management Consultants	August 1999
1998	Lighting Design Lab	MPER	TecMRKT Works	April 1999
1997-1998	LightWise	MPER1	Gilmore Research Group (The)	January 1999
1997	ENERGY STAR Residential Lighting Fixture Program	Baseline Assessment and MPER1	Pacific Consulting Services and Shel Feldman Management Consultants	November 1998
1997	ENERGY STAR Residential Lighting Fixture Program	MPER	Pacific Consulting Services	August 1998
1997	Lighting Design Lab	Start-Up Process Evaluation Report	Research Into Action Inc.	April 1998

Table 2-2 below shows relevant evaluations and market research studies that the project consulted to help develop the program theory.

**Table 2-2
Other Relevant Market Research Studies and Evaluations**

Project Year	Project or Program Name	Study	Author	Publish Date
N/A	The Statewide Residential Lighting and Appliance Program	Phase I Baseline Assessment	Xenergy	November 1999
N/A	California Statewide Lighting Program	California Statewide Lighting Program Retail Market Overview Paper	Ecos Consulting and ICF Consulting	August 1999

Project Year	Project or Program Name	Study	Author	Publish Date
1997	SDG&E and PG&E Residential Refrigerator and Lighting Programs	Residential Market Effects Study	Hagler Bailey Consulting, Inc.	April 1998
1996	New England Electric System Residential Lighting Program	Residential Lighting Program Evaluation	Opinion Dynamics and RER	1996
N/A	N/A	Baseline Study of the Northeastern Residential Lighting Market	Opinion Dynamics Corp. and RER	1998
Unknown	Northern States Power Residential Lighting Program	Northern States Power Residential Lighting Program Market Assessment	RER	Unknown
N/A	N/A	A Look at Residential Energy Consumption in 1997	Energy Information Administration	November 1999
N/A	U.S. Energy-Efficient Technology Procurement Projects	U.S. Energy-Efficient Technology Procurement Projects: Evaluation and Lessons Learned	Pacific Northwest National Laboratory	February 1999
2000	The California Residential Lighting and Appliance Program	Draft Program Design – PY 2000 for the California Residential Lighting and Appliance Program	Richard Heath and Associates	November 1999
N/A	N/A	Halogen Torchieri Market Transformation: A Look at Progress to Date and Future Strategies	Ecos Consulting	September 1999
N/A	N/A	Lighting the Way to Energy Savings: How Can We Transform Residential Lighting Markets?	Natural Resources Defense Council	December 1999
N/A	Northwest Energy Efficiency Alliance Residential Lighting Fixture Program	Residential Lighting Market White Paper	Pacific Consulting Services	1999
N/A	Northwest Energy Efficiency Alliance LightWise Program	LightWise Program: Whitepaper for Decision-Makers	Dethman & Associates and the Gilmore Research Group	October 1999

Table 2-3 provides more detail for the major MPER4 data collection activities resulting from our investigation of gaps in the existing literature. The table provides information about the sample design, sample size, and data collection dates. Data collection instruments can be found in Appendix A.

**Table 2-3
Sampling Information for MPER4 Data Collection Activities**

MPER4 Data Collection Activity	Sample Frame Source	Sample Design Overview	Sample Size	Data Collection Dates
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Market Actor Interviews (in-depth telephone interviews)	List provided by Fluid Market Strategies	Complete up to 18 interviews. Attempt a census of representatives of the 7 CFL manufacturers that participated in FCAL 2007. Complete at least 8 interviews with retailer representatives. Complete 2 interviews with industry observers.	11 retailers 6 manufacturers 2 industry observers	March – April 2008
Program staff interviews	NEEA project contact list	Contact NEEA and implementation contractor program staff.	4 current/former program staff and contractors	April 2008
Utility Program Manager Interviews (in-depth telephone interviews)	NEEA's list of utility contacts	Attempt a census of program managers from the 15 funding utilities plus 15 medium-sized and 10 smaller utilities. Focus on utilities included in NEEA's "high priority" list from MPER3.	40 utility program managers	March - April 2008

Table 2-4 displays the data collection activities that supported each Consumer Products MPER from 2004 through 2008.

**Table 2-4
Consumer Products Evaluation Reports and Data Collection Activities (2004-2008)**

Data Collection Activity	Report and Publish Date			
	MPER1 (Nov 2005)	MPER2 (June 2006)	MPER3 (June 2007)	MPER4 (May 2008)
Project staff interviews	✓	✓	✓	✓
Consumer telephone survey	✓	✓	✓	
Lighting retailer shelf survey	✓	✓	✓	
Lighting retailer store manager surveys	✓		✓	
Market actor interviews		✓		✓
Utility program manager interviews	✓		✓	✓
Clothes washer mystery shopper survey	✓			

3. Market Characterization

This section presents characteristics of the regional and national lighting market. The purposes of reporting on these data are to measure the project’s performance and to provide additional context for evaluating the project. The section begins with a summary of the national ENERGY STAR program and key changes and additions to the program in 2007 and 2008. We then provide an update on the national market for ENERGY STAR CFLs. These subsections update the data presented in Consumer Products MPER3 (KEMA, 2007).

Following the national market update, we provide a brief summary of the two major region-wide CFL promotions that occurred in the Northwest during 2007 (the Spring and Fall Change a Light promotions) as well as a brief summary of major utility promotions in the region. After providing estimates of ENERGY STAR CFL sales and market share for the U.S. and Northwest, Section 3 closes with a summary of important external developments related to the CFL market.

3.1 National ENERGY STAR Program

The U.S. Environmental Protection Agency (EPA) introduced ENERGY STAR in 1992 as a voluntary labeling program designed to identify and promote energy-efficient products – specifically computers and computer monitors – to reduce greenhouse gas emissions. Over the next three years, EPA expanded the label to include additional office equipment as well as residential heating and cooling equipment and in 1996, partnered with the U.S. Department of Energy (DOE) for some product categories. The ENERGY STAR label is now on lighting, major household appliances, home electronics, new homes, and commercial and industrial buildings.¹¹

The ENERGY STAR label designates an energy-efficient product for all of the technologies to which it is applied. For lighting, however, it also designates a quality product, as the ENERGY STAR criteria for CFLs stipulate several requirements related to performance. DOE released an update to the criteria in February 2008 (“CFL Criteria Version 4.0”) that will become effective in December 2008.¹² The new criteria will cover both medium screw-based and-candelabra based CFLs and includes requirements not only for CFL performance but also for three other major components of compact fluorescent technology and production.

- **Performance.** Version 4.0 requires improvements in bulb performance over the prior specifications, particularly with regard to efficacy, color rendering, and start-up time.
- **Color temperature.** Each qualifying ENERGY STAR CFL will be designated as one of six correlated color temperatures (e.g., soft white) with the intent of improving consumer understanding of the CFL options available to them and improving consumers’ ability to select appropriate bulb for each application.
- **Safety.** The criteria impose the following limitations on mercury content for bulbs:
 - Bulbs under 25 watts may not exceed 5 milligrams of mercury per bulb; and
 - Bulbs between 25 and 40 watts may not exceed 6 milligrams of mercury per bulb.

¹¹ U.S. EPA, n.d.

¹² U.S. EPA, 2008a.

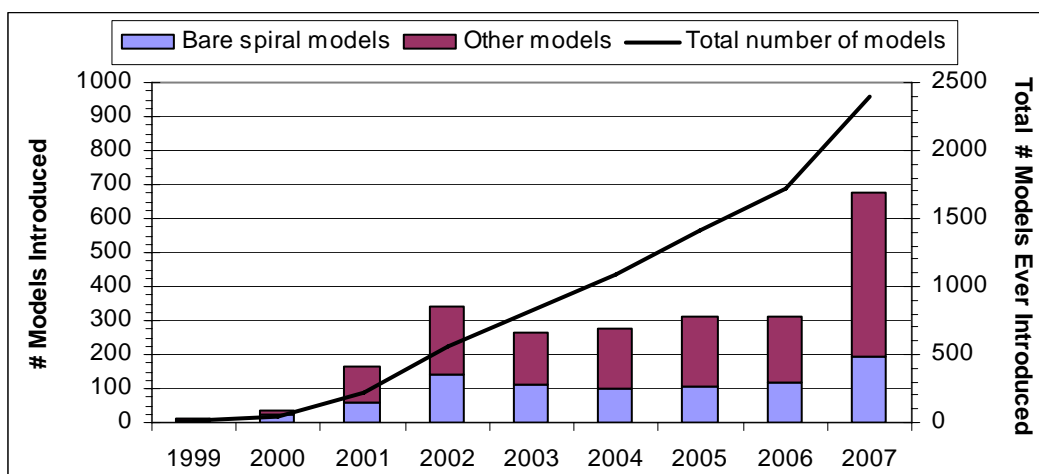
The criteria also impose mandatory language on bulb packaging that reminds purchasers to recycle their CFLs and refers them to the websites www.epa.gov/bulbrecycling or www.lamprecycle.org.

- **Testing.** Bulbs must go through a third-party testing program to qualify under the new criteria. The program includes specific high-heat testing requirements for reflector bulbs.¹³

3.2 Compact Fluorescent Product Update

The Northwest ENERGY STAR Consumer Products project promotes ENERGY STAR labeled CFLs. The ENERGY STAR website listed a total of 2,405 ENERGY STAR qualified CFL models produced during 2007 by 117 manufacturers around the world. Figure 3-1 illustrates the number of ENERGY STAR qualified CFL models on the U.S. market since 1999 by style.

Figure 3-1
Number of ENERGY STAR CFL Models by Style Category, 1999-2007



Source: U.S. EPA, 2008d.

Note: Models retired from company product lines are included in this figure but not in any other figures or tables in this section of the report.

- While bare spiral (also known as twister) bulbs are the most common models produced (representing approximately 28 percent of models produced in 2007), the number of models produced for other CFL styles has also increased significantly over time. In fact, the number of total CFL models more than doubled between 2006 and 2007.
- Bare spiral and mini-spiral (also known as twister and mini-twister) CFL models are the most common styles of ENERGY STAR qualified CFLs, representing nearly two-thirds of the total models produced in 2007. The number of bare mini-spiral CFL models produced in 2007 increased by 85 percent over the number produced in 2006 (from 476 to 882 models).
- ENERGY STAR CFL wattages range from 3 Watts to 52 Watts. Seventy-one percent of the qualified models produced in 2007 were between 13 and 23 Watts, while 15 Watt and 23 Watt

¹³ Karney, Richard H., 2008.

CFLs each represent 15 percent of the total models produced. Three-way CFLs represent 3 percent of the models produced in 2007.

- Osram Sylvania Inc., Technical Consumer Products, Inc. (TCP), and Globe Electric, Inc. produced the greatest number of CFL models in 2007.¹⁴

Appendix B provides additional detail on CFL and CF fixture manufacturing trends through 2007.

3.3 CFL Quality Assurance Initiatives

3.3.1 PEARL

In December 2000, the Natural Resources Defense Council organized a roundtable for energy-efficiency administrators interested in testing the performance of residential lighting products. Entitled the Program for the Evaluation and Analysis of Residential Lighting (PEARL), the group includes the Northwest Energy Efficiency Alliance, Bonneville Power Administration, Northeast Energy Efficiency Partnerships member utilities, the New York State Energy Research and Development Authority, Wisconsin utilities, the Sacramento Municipal Utilities District and the California statewide investor-owned utilities. These member organizations were concerned with the performance of certain ENERGY STAR lighting products being promoted by their programs and the lack of a self-policing mechanism within the lighting industry to ensure CFL reliability and compliance with ENERGY STAR specifications after the products become available to consumers in the marketplace.

The Lighting Research Center at Rensselaer Polytechnic Institute in New York tests products for PEARL against current ENERGY STAR specifications with the exception of product lifetime (which the Center tests only to 40 percent of rated lifetime). PEARL does not have the authority to disqualify or de-list products from ENERGY STAR, but does provide the test results to PEARL sponsors, who then pass them on to the EPA and DOE. Manufacturers whose products are tested also get copies of the results.

In seven test cycles conducted between 2000 and 2007, PEARL has tested 156 CFL models from 29 manufacturers and 52 hard-wired fixtures from 20 manufacturers for compliance. The tests include four parameters: efficacy, 1,000-hour lumen maintenance, lumen maintenance at 40 percent of rated lifetime, and rapid cycle stress tests.¹⁵ As of April 2008, PEARL was working on its eighth and final cycle of CFL testing.

NEEA took a leadership role in facilitating and promoting successive ENERGY STAR specifications changes to address problems with CFL product quality. NEEA was also pivotal in working to integrate third-party product testing (described below) into the 2008 ENERGY STAR qualifying criteria.

3.3.2 Third-Party Testing and Verification Program

The new ENERGY STAR Criteria 4.0 for CFLs take effect in 2008 and require manufacturer, distributor, and retailer partners of ENERGY STAR to participate in a Third-Party Testing and Verification Program which uses independent, third-party laboratories accredited by the National Voluntary Laboratory

¹⁴ U.S. EPA, 2008d.

¹⁵ PEARL, 2007.

Accreditation Program. According to the ENERGY STAR criteria¹⁶, the goals of the Third Party Testing and Verification Program are to:

- Develop a CFL testing program that will aid DOE in maintaining quality control of its ENERGY STAR CFL Program;
- Develop a mechanism providing added assurance to ENERGY STAR PARTNERS that sponsor CFL Programs and to manufacturer competitors alike that qualified products do in fact meet the ENERGY STAR criteria;
- Provide a basis upon which the DOE can reasonably make decisions on disqualifying products not exhibiting the necessary qualifications to keep its ENERGY STAR qualification status; and
- Maintain the precepts of the ENERGY STAR Program, the highest of which is that the consumer receives superior products that perform as advertised.

The Program will conduct random off-the-shelf testing of ENERGY STAR CFLs and provide their testing results to the manufacturers. The Program will be managed using funds derived from a percentage of the testing fees. Tests and verification procedures differ based on whether the product is either a bare, covered, and outdoor reflector product or a reflector product for use indoors or in recessed downlights. For bare spirals, there are 11 separate tests – the 4 performed as part of PEARL testing plus base, correlated color temperature (CCT), color rendering index (CRI), run-up time, starting time, interim life test at 40 percent of rated lifetime, and power factor.

3.4 2007 Northwest CFL Promotions

This subsection provides an overview of the two regional CFL promotions that were sponsored in the Northwest during 2007. These included:

- The Spring Change a Light promotion (which was sponsored by Bonneville Power Administration and others);
- The Fall Change a Light promotion (which was sponsored by NEEA and replaced the 2005 and 2006 Savings with a Twist CFL promotions);
- Spring big box events; and
- Major utility promotions.

3.4.1 Fall 2007 Change a Light Promotion

The 2007 Fall Change a Light (FCAL) promotion was similar to 2006's SWAT promotion with a continued focus on twister-style CFLs, non-traditional distribution channels, and rural markets. The promotion also attempted to promote CFL products that were already in the stores versus special shipments of CFLs that would be available only during the promotion. Likewise the promotion encouraged retailers to sustain the stock of CFLs after the promotion period. NEEA also changed its field services support function such that the project would support and encourage manufacturer representatives and private contractors that were already serving a similar function in the marketplace. These innovations were consistent with NEEA's market transformation orientation. The promotion made CFLs available for

¹⁶ ENERGY STAR, 2008.

less than \$1.00 per bulb and encouraged sales of single-pack CFLs versus multi-packs. CFLs less than 18 watts were added in the 2007 promotion to expand retailer involvement and provide consumers with more options. The sales goal for the FCAL promotion was 2.5 million CFLs between September and December 2007.

The promotion achieved sales of nearly 1.8 million CFLs between the third and fourth quarters of 2007 (Table 3-1), and was extended into 2008 for a small number of retailers (including Wal-Mart and Fred Meyer) because of shipment delays and product availability issues as well as requests from the retailers. Grocery stores and mass merchandise chains (such as Wal-Mart, Fred Meyer, and Big Lots) each accounted for approximately one-third of the promotion's 2007 sales, followed by small hardware chains (13 percent), wholesale/club stores (Bi-Mart; 10 percent), drug stores (5 percent), and do-it-yourself stores (Jerry's; 2 percent). An additional 452,253 CFLs were sold through the promotion's extension into 2008 for a total of 2.2 million FCAL CFLs sold in 2007 and 2008.

**Table 3-1
NEEA Fall 2007 Change a Light (FCAL) CFL Sales, 2007 and 2008**

Store Type	2007 Quarter		Overall	
	Q3	Q4	2007 Sales*	% of Sales
Mass Merchandise	181,727	464,217	645,944	37%
Grocery	226,852	382,113	608,965	33%
Small Hardware	77,690	156,596	234,286	13%
Wholesale/Club	50,630	119,210	169,840	10%
Drug	16,522	76,634	93,156	5%
Do-it-Yourself	13,934	19,474	33,408	2%
Total 2007 FCAL Sales	567,355	1,218,244	1,785,599	100%
<i>Percent of 2007 FCAL Sales</i>	<i>32%</i>	<i>68%</i>	<i>100%</i>	
Total 2007 and 2008 FCAL Sales			2,237,852	

Source: Fluid Market Strategies, 2008b.

* Note that the FCAL promotion was active during Q3 and Q4 only.

3.4.2 Spring Change a Light Promotion

BPA also ran a Change a Light promotion in 2007 and into 2008. According to BPA documentation¹⁷, the promotion had three goals:

1. To offer utilities an easy-to-operate opportunity to achieve residential sector energy savings;
2. To introduce high-quality specialty CFLs with low promotional pricing through participating retailers in the region, who already have these products on their shelves; and
3. For market transformation of quality, high-end specialty bulbs.

The campaign was intended to leverage the national ENERGY STAR Change a Light campaign in DIY, mass merchandise, and membership retail outlets including Home Depot, Lowe's, Wal-Mart, Bi-Mart, and Costco. The promotion's primary focus was on specialty bulbs but a full range of styles were

¹⁷ Bonneville Power Administration, n.d.

included in the promotion (standard bare spiral bulbs, globes, high heat certified bulbs [for recessed can applications], 3-way bare spiral bulbs, and a-lamps) with incentive amounts ranging from \$1.25 to \$2.25 per bulb.¹⁸

The promotion included limited field services provided by PECEI field representatives in Washington, Oregon, and Idaho. PECEI was also responsible for the majority of retailer coordination. During the fall (September through December), the promotion included only specialty bulbs so as not to compete with NEEA's Fall Change a Light promotion. Sales through the promotion reached nearly 1.8 million CFLs during 2007, with the majority of bulbs sold during the first quarter of 2007 (53% of Spring 2007 Change a Light CFL sales; see Table 3-2).

Table 3-2
BPA Spring 2007 Change a Light CFL Sales

Store Type	2007 Quarter				Overall	
	Q1	Q2	Q3	Q4	2007 Sales	% of Sales
Wholesale/Club	708,030	253,938	113,666	354,283	1,429,917	81%
Do-it-Yourself	165,274	46,529	3,064	42,840	257,707	15%
Mass Merchandise	73,488	14,141	0	0	87,629	5%
Total 2007 Sales	946,792	314,608	116,730	397,123	1,775,253	100%
<i>Percent of Sales</i>	<i>53%</i>	<i>18%</i>	<i>7%</i>	<i>22%</i>	<i>100%</i>	

Source: Fluid Market Strategies, 2008b.

3.4.3 Spring Big Box Events

NEEA's implementation contractor, Fluid Market Strategies, implemented 25 in-store promotions in the Home Depot and Lowe's stores in Idaho and Montana during Spring, 2007. These events were intended to educate consumers regarding the benefits of ENERGY STAR CFLs and increase the quantity of CFLs sold during the time each event was held. Each event occurred during the course of one weekend, and local utilities were invited to provide staffing and marketing materials tailored to their customers. Table 3-3 below provides a summary of the events by state and retailer, showing the utilities that supported events in each state.

Table 3-3
2007 Big Box Events by State and Retailer

State	Number of Events		Total Events	Utility Supporters
	Home Depot	Lowe's		
Idaho	9	4	13	Idaho Power, Avista, Kootenai Electric, City of Idaho Falls
Montana	8	4	12	Northwestern Energy, Flathead Electric Cooperative, Lincoln Electric, Missoula Electric Cooperative
Overall	17	8	25	

Source: Fluid Market Strategies, 2007a.

¹⁸ *Ibid.*

At each event, trained program staff operated an educational lighting booth at the entrance to the store or in store's the lighting aisle. The lighting booth was equipped with lighted product display demonstrations, educational materials, and a marketing suite of banners and giveaway items (such as ENERGY STAR stickers and pens). The lighting booth also included a display showing the energy consumed by an incandescent bulb versus an ENERGY STAR CFL to educate customers regarding potential energy and money savings achieved by switching to ENERGY STAR CFLs. Contractor staff report that the events made a positive impact on CFL sales within each participating store.

3.4.4 Utility Promotions

Several of the region's utilities sponsored CFL promotions during 2007, including Puget Sound Energy (PSE), Northwestern Energy (NWE), Snohomish County Public Utility District (SnoPUD), and others.^{19, 20} PSE's campaign included both bare spiral and specialty CFLs and ran in DIY, mass merchandise, grocery, and small hardware stores. The PSE promotion provided incentives for more than 1.6 million CFLs (Table 3-3). PSE also sponsored CFL giveaways. SnoPUD distributed more than 440,000 CFLs through retail sales and giveaways. NWE distributed more than 200,000 CFLs through direct installations, in-store events, tradeshow, and by mail.

Table 3-4
Select Northwest Utility CFL Promotions, 2007

Utility	2007 Quarter				Overall	
	Q1	Q2	Q3	Q4	2007 Total	% of 2007 Total
Puget Sound Energy	350,386	456,249	318,026	525,959	1,650,620	72%
Snohomish PUD	173,182	134,588	56,649	77,859	442,278	24%
Northwestern Energy	38,781	58,603	63,724	39,124	200,232	3%
Total	562,349	649,440	438,399	642,942	2,293,130	100%

Source: Fluid Market Strategies, 2008a.

3.5 CFL Sales and Market Share Assessment

Prior to 2006, the project's method for tracking ENERGY STAR CFL sales involved adding the CFLs sold with utility incentives to total retail sales for the region, thus assuming that all CFLs sold through utility promotions were distinct from retail sales. However, in actuality, more than 90 percent of the CFLs purchased with utility incentives were moving through retail channels, so this method resulted in double-counting of a great number of CFLs. In 2006, the project revised its tracking methodology to assume that the reported utility incentive sales are through retail channels only.²¹ This resulted in a more conservative

¹⁹ ENERGY STAR, 2007.

²⁰ Fluid Market Strategies collected data on the three utility promotions shown in Table 3-4, but other promotions were also active in the region during 2007.

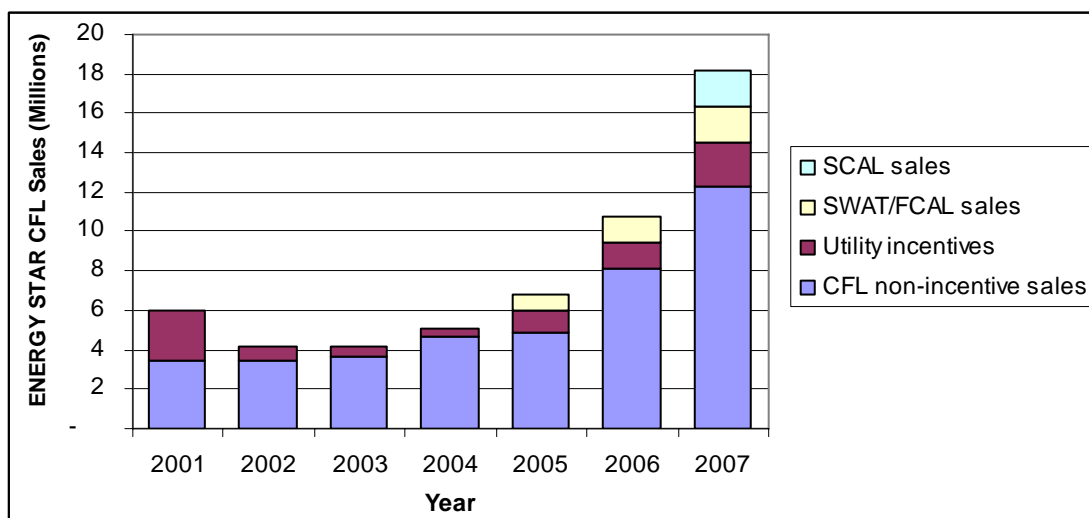
²¹ See MPER1 for a thorough discussion of the methods previously used to develop estimates of ENERGY STAR CFL estimates.

estimate, as there is limited information available regarding the quantity of CFLs sold through non-retail channels.²²

3.5.1 ENERGY STAR CFL Sales

Figure 3-2 shows ENERGY STAR CFL sales for the region based on NEEA estimates broken down by utility incentive versus non-incentive sales. SWAT sales and Fall 2007 Change a Light sales are also broken out starting in 2005. Data for 2007 also show sales through the Spring Change a Light promotion. Total ENERGY STAR CFL sales for 2007 were approximately 18.1 million, representing a 68 percent increase over total sales for 2006. ENERGY STAR CFL sales for 2007 in the Northwest exceed those of any prior year for which data are available – even excluding CFLs for which incentives were provided in 2007.

Figure 3-2
Estimated ENERGY STAR CFL Sales in the Northwest, 2001-2007*†



Sources: PEI, 2001–2006; Fluid Market Strategies, 2008a, 2008b, and 2007b.

* The 2007 Widget Report reports total CFL sales of 18,943,754 bulbs in the region, which includes 816,766 non-ENERGY STAR bulbs. Non-ENERGY STAR bulbs were excluded from the 2007 total shown above and from CFL sales totals for prior years.

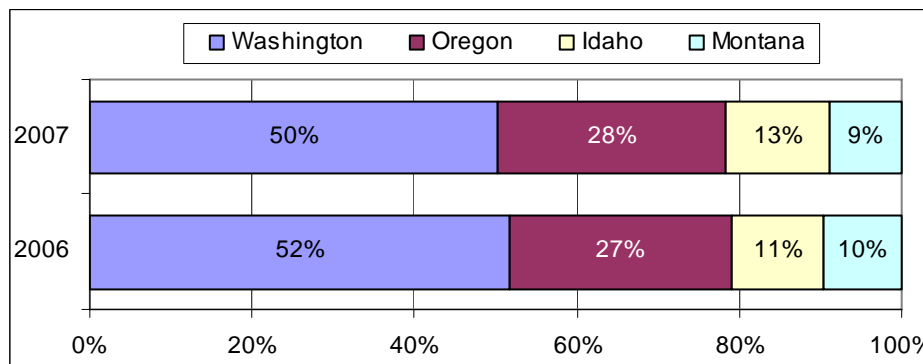
† 2006 sales include NEEA estimate of 1.5 million WAL-MART CFLs sold region-wide in 2006 (see KEMA, 2007 [MPER3] Appendix A for more detail).

Figure 3-3 shows the proportion of ENERGY STAR CFL sales by state in the Northwest for 2006 and 2007. Sales in Washington comprised approximately half of the region’s sales in both 2006 and 2007. Total ENERGY STAR CFL sales in 2007 reached nearly 9.1 million in Washington, nearly 5.1 million in Oregon, more than 2.3 million in Idaho, and nearly 1.6 million in Montana.²³

²² Note that the 2005 sales data in Figure 3-1 have been revised based on the improved methodology; 2005 sales figures shown here may thus not match those reported in MPER2.

²³ Time series data at the state level is not presented herein because while the current NEEA contractor calculates sales by state based on actual store-level data, the prior contractor extrapolated total regional sales to the state level proportionally based on the each state’s population; the numbers thus are not comparable.

Figure 3-3
Estimated ENERGY STAR CFL Sales in the Northwest by State, 2006 and 2007*



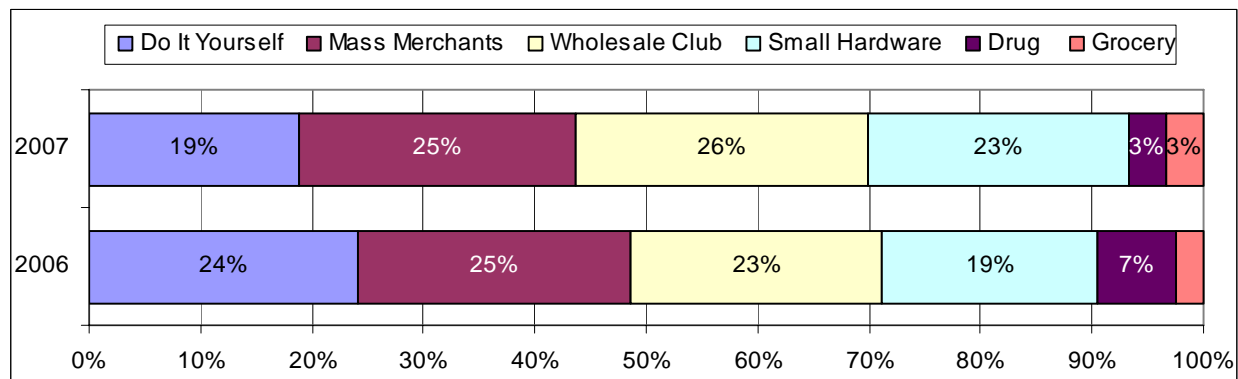
2006 n = 10,751,907; 2007 n = 18,083,247. Excludes non-ENERGY STAR CFL sales.

Sources: Fluid Market Strategies, 2008b and 2007b.

* 2006 sales include NEEA estimate of 1.5 million WAL-MART CFLs sold region-wide in 2006 (see KEMA, 2007 [MPER3] Appendix A for more detail).

Figure 3-4 shows the proportion of Northwest CFL sales across store types for 2006 and 2007. The proportion of sales in DIY stores has dropped by 5 percentage points between 2006 and 2007, while sales through wholesale clubs and small hardware stores have increased slightly. Between 2006 and 2007, drug store CFL sales dropped by approximately 4 percentage points.

Figure 3-4
Estimated ENERGY STAR CFL Sales in the Northwest by Store Type, 2006* and 2007



2006 n = 10,751,907; 2007 n = 18,083,247. Excludes non-ENERGY STAR CFL sales.

Sources: Fluid Market Strategies, 2008b and 2007b.

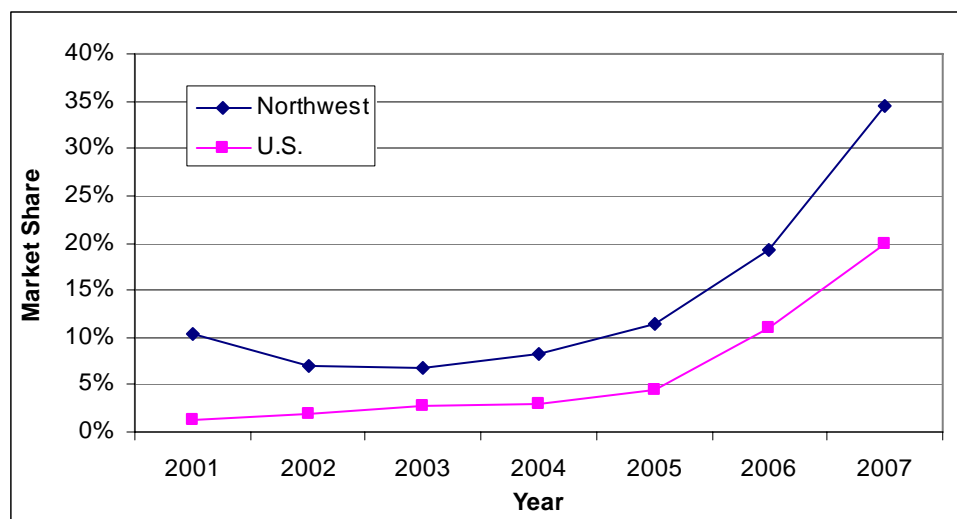
* 2006 sales include 795 CFLs sold through lighting specialty stores which represent less than 0.01 percent of total 2006 sales. (No CFL sales through lighting specialty stores were tracked in 2007.) 2006 sales also include NEEA estimate of 1.5 million WAL-MART CFLs sold region-wide in 2006 (see KEMA, 2007 [MPER3] Appendix A for more detail).

3.5.2 ENERGY STAR CFL Market Share

Figure 3-5 shows estimates of ENERGY STAR CFL market share of total medium screw-base residential light bulb sales for the Northwest and for the United States as a whole. Estimates of ENERGY STAR CFL market shares for the U.S. were obtained from a California market study that tracks residential bulb

sales for California and the United States.²⁴ CFL market shares for the Northwest were estimated by combining Northwest CFL sales with an estimate of Northwest non-CFL sales.²⁵ As shown, estimated market shares in the Northwest exceed estimated U.S. market shares by a substantial margin. Northwest market share for 2007 is estimated at 34 percent, compared with 20 percent for the U.S. as a whole.²⁶

Figure 3-5
Estimated ENERGY STAR CFL Market Share
of Total Residential Medium Screw-Base Lamp Sales for the Northwest and U.S., 2001-2007



Sources: NW ENERGY STAR CFL sales: PECL, 2001–2006; Fluid Market Strategies, 2008b and 2007b. U.S. and NW population estimates 2000-2007: U.S. Census 2007. U.S. market share and non-CFL sales (2000-2005): Itron, 2006. U.S. market share 2006 and 2007: U.S. EPA, 2008b.

3.6 Other Important External Developments in the CFL Market

Section 3.1 above describes the most recent version of the ENERGY STAR qualifying criteria for CFLs, which requires critical improvements in CFL performance, color temperature, safety, and testing. In addition to this important recent development, many other noteworthy developments have affected the CFL market in the United States and beyond. These include increased attention to global warming; Wal-Mart’s sustainability initiatives; and regulation of light efficacy both inside and outside of the United States. These developments are described below.

²⁴ Itron, 2006.

²⁵ We estimated a relationship between national per capita CFL sales and non-CFL sales (excluding California) and applied that function to Northwest per capita CFL sales to estimate Northwest non-CFL sales.

²⁶ The method used to calculate Northwest CFL market share in MPER1 and MPER2 applied national non-CFL sales estimates per capita to the Northwest population and yielded lower estimates of Northwest CFL market share (e.g., 11% for 2006). However, this method probably overestimated non-CFL sales in the Northwest (resulting in lower CFL market share) because Northwest CFL market share is so much higher than national market share. The new methodology takes into account that non-CFL sales per capita decrease as CFL sales per capita increase.

3.6.1 Increased Attention to Global Warming

As oil prices reach \$110 per barrel and climate change reaches the mainstream conversation in consumer culture (carbon neutral products, hybrid cars, etc.) and political conversations (green collar jobs, cap-and-auction schemes, etc.), the issue of energy efficiency has once again become prominent.²⁷ CFLs are increasingly seen as a relatively easy, inexpensive way to achieve immediate energy savings and resulting decreases in carbon dioxide (CO₂) emissions due to their wide availability, low cost and their huge energy-efficiency potential. The Environmental Protection Agency's ENERGY STAR Change a Light, Change the World campaign has received over 1.2 million pledges from Americans to change at least one incandescent bulb in their homes to a CFL.²⁸ Other "green" websites such as Yahoo! Green have similar pledges, inducing consumers to install CFLs to reduce carbon dioxide emissions and fight global warming. National and local media also suggest CFLs as one of the easiest ways to help increase energy efficiency and mitigate climate change.

3.6.2 Wal-Mart's Sustainability Initiatives

The huge mass retailer set aggressive goals in an attempt to "green" its reputation. Due to the scale of its supply chain and high volume of customers²⁹, Wal-Mart has the ability to make a dramatic market impact. One of the corporation's sustainable products goals was to sell 100 million CFLs by 2008. That goal was reached in October of 2007³⁰, with support from NEEA and other program administrators, state and regional lighting initiatives. According to Wal-Mart, "selling CFLs makes it easier for its customers to be part of the carbon solution."

3.6.3 Regulation of Light Efficacy

In early 2007, Australia introduced a plan to phase out incandescent bulbs and replace them with CFLs. Other countries and the European Union followed suit.³¹ The state of California legislature considered an outright ban on incandescent bulbs in late 2007. The nationwide energy bill that was signed into law by President Bush in December 2007 mandates that general service bulbs must meet increased efficacy requirements over the next 4 to 12 years.³² The Energy Independence Security Act's increased efficacy requirements will be fully effective by 2014. Increases in efficacy requirements for incandescent reflectors and fluorescent bulbs will become effective within 36 months of the Act's signing. The increased efficacy requirements for general service incandescent bulbs will be fully effective by 2014. Advanced incandescent bulbs and halogen bulbs will meet the early requirements, while CFLs and light emitting diodes (LEDs) will likely meet the long-term goals.³³

²⁷ Frank, 2008.

²⁸ EPA, 2008b.

²⁹ More than 68,000 supplier partnerships, 1.5 million associates (i.e., retailer sales staff) and 100 million customers per week (Wal-Mart Corporation, 2008b.)

³⁰ Wal-Mart Corporation, 2008a.

³¹ Asia Pacific Economic Corporation, 2008.

³² U.S. House of Representatives, 2007.

³³ *Ibid.*

4. Market Actor Interview Findings

4.1 Overview

During early 2008, senior KEMA consultants completed interviews with 20 market actors who participated in the Fall 2007 Change a Light (FCAL) promotion as well as two industry observers who have broad perspectives on the national market for CFLs as well as insights regarding NEEA’s market interventions. Interview guides for manufacturer representatives, retail representatives, and industry observers are provided in Appendix A.

We conducted interviews with representatives of 6 of the 7 participating CFL manufacturers and representatives of 11 of the 16 retailers who sold discounted CFLs through the promotion (Table 4-1). For the 16 retailers, we attempted to reach corporate-level contacts at each chain, but we were unable to reach all of these contacts. Two of the stores represented by these contacts sold a high volume of CFLs through the 2007 FCAL promotion (8 to 10 percent each), so we spoke with a handful of store-level contacts (store managers or lighting department managers) to obtain their perspectives on satisfaction with the Fall promotion and opportunities for improving the promotion. The 11 retail chains represented by the individuals interviewed as part of the evaluation sold approximately 85 percent of the total ENERGY STAR CFLs sold through the FCAL promotion in 2007.³⁴

Table 4-1
Market Actor Sample Frame and Completed Interviews

Respondent Group	Sample Frame (n)	Completed Interviews	
		n	% of Frame
Manufacturer representatives	7	6	85%
Retailer representatives, Corporate level	16	9	56%
Retailer representatives, Store level	N/A	5	N/A
Industry Observers	N/A	2	N/A
Overall	23	22	N/A

Market actors were asked to comment on their satisfaction with the 2007 FCAL promotion and provide their perspectives on the effects of CFL promotions on sales, availability, diversity (the range of styles available in the marketplace), price, quality, and consumer acceptance of CFLs, with a particular focus on NEEA’s CFL promotions. They were also asked for their opinions on remaining CFL market barriers and potential effects of the 2007 Energy Bill.

4.2 Fall 2007 Change a Light Promotion

4.2.1 Satisfaction

Representatives of CFL manufacturers and retail chains that participated in NEEA’s 2007 Fall Change a Light promotion were asked to rate their satisfaction with the promotion on a scale of 1 to 5 where 1 means, “not at all satisfied” and 5 means “extremely satisfied.” Of the 6 manufacturers’ representatives, 5

³⁴ Fluid Market Strategies, 2008b.

were able to provide a rating: 3 provided a rating of 4, one provided a rating of 2, and the last provided a rating of 1. All of the representatives who provided high ratings mentioned the promotion's success in increasing CFL sales and praised Fluid Market Strategies' implementation of the promotion. Of the two who provided low ratings, one cited frustration with what he felt was an "inflexible" sell-through date for the promotion (rating of 1) and the other reported that his company wanted to work with retailers that were excluded from the promotion (rating of 2).

Retail representatives were asked also to indicate their satisfaction with the 2007 FCAL Promotion, both overall and specifically pertaining to the marketing support, using the same 1 to 5 scale (where 5 means "very satisfied" and 1 means "not at all satisfied"). The retail representatives gave the promotion an average rating of 4.1 and the marketing support an average rating of 4.0. Only one retailer representative reported that he was "not at all satisfied" with the promotion because they had difficulty providing store-by-store sales reports. This was also the only retailer representative to indicate that his chain would not participate again due almost entirely to the difficulty of providing store-level sales data.

4.2.2 Suggested Improvements to FCAL

Three improvements to FCAL were made by two or more representatives of CFL manufacturers that participated in the 2007 FCAL promotion:

- Stipulate high-quality product specifications in the RFP (mentioned by 3 manufacturers' representatives);
- Address CFL recycling issues (mentioned by 2); and
- Broaden the types of retailers that can participate (2).

Appendix C provides additional detail on these suggested improvements.

4.3 Market Effects

Interviewers asked market actors to comment on the effects that promotions have had on the CFL market, specifically with regard to NEEA's promotions. Nearly all of the market actors commented that it is difficult to isolate the effects of one promotion versus another, or to differentiate between the effects of CFL promotions and other influences on the market. CFL manufacturers in particular were quick to comment that the media has drawn a great deal of attention to CFLs (particularly during 2007, but also in prior years), and other factors (such as Oprah Winfrey's endorsement of CFLs, Al Gore's *An Inconvenient Truth*, and increased competition in the CFL market), and that the extent to which each of these has influenced the market is unclear.

In addition, the majority of the CFL manufacturers' representatives commented that they generally think about the market in terms of retailers rather than regions. For example, one manufacturer's representative mentioned that one of her firm's retail partners has a warehouse in Oregon that distributes to stores in both Oregon and California, and she tracks all of these sales together (by retail chain) rather than separately (by state). For reasons such as this, most CFL manufacturers were unable to provide detailed comments on NEEA's promotions. Representatives of retail chains, however, were generally more able to provide feedback specifically with regard to NEEA's promotions and other regional efforts. All together, market actors provided some useful insights on the effects of CFL promotions in general – and NEEA's

promotions specifically – with regard to CFL sales, availability, diversity, price, quality, and consumer acceptance of CFLs. Details are provided below.

4.3.1 CFL Sales

When asked to comment on the effect of the Fall 2007 Change a Light promotion on CFL sales in the region, manufacturers had a difficult time quantifying the effects for the reasons described above. With the exception of one manufacturer who felt that FCAL had little or no effect on CFL sales, the manufacturers’ representatives agreed that the promotion had at least some effect on increasing their retail partners’ CFL sales. One manufacturer’s representative commented that CFL sales in one chain increased by more than 30 percent during the FCAL promotion and attributed approximately two-thirds of that increase to the promotion itself, but others were not able to comment on the percentage (or could provide only broad estimates, e.g., “[FCAL] was not responsible for 90 percent of the sales increase and not 5 percent, but somewhere in the middle”).

As shown in Table 4-2 below, of the nine corporate-level retailer representatives we interviewed, eight reported that CFL sales increased during the 2007 FCAL promotion when compared to expected sales in absence of the promotion. When averaged, their responses suggest that their CFL sales would have been approximately 69 percent lower percent if the FCAL discounts were not available. The retail representatives reported that their CFL sales through the 2007 FCAL promotion represented from 30 to 75 percent of their total annual CFL sales.

**Table 4-2
Expected Difference in 2007 CFL Sales without 2007 FCAL**

Expected Difference in Sales	Number of Responses (n=9)
0% to -20%	1
-20% to -40%	0
-40 %to -60%	2
-60% to -80%	3
-80% to -100%	3
Average Expected Difference in Sales	-69%

4.3.2 CFL Availability

Several of the manufacturers commented that one of the major effects of CFL promotions is their effect on CFL availability in a variety of retail channels and geographies.³⁵ Manufacturers’ representatives felt that in the absence of CFL promotions, most grocery, drug, and discount stores in particular would either have no CFLs at all available, or would have “maybe one or two CFL SKUs” at high prices. “Without promotions,” commented one representative, “there is no product available at a reasonable price except for big box and hardware.” Others echoed his sentiment, reporting that “CFL incentives keep CFLs available in retail channels that serve lower-income and/or rural populations; without the incentives, these stores wouldn’t carry [CFLs] because they couldn’t get them cheaply enough.”

³⁵ Retailer interviews did not address CFL availability.

Two of the manufacturer’s representatives were able to comment specifically on the role of NEEA’s promotions on increasing CFL availability in the Northwest, and both provided high ratings of 4 or 5 on a 1 to 5 scale where 1 means “not at all influential” and 5 means “extremely influential.”

4.3.3 CFL Diversity

Manufacturers’ representatives reported that in many store types and geographies, the range of CFL styles and wattages available (diversity) is still low. Three representatives commented that many stores will only carry specialty CFLs if they can obtain them from manufacturers at discounted prices. One manufacturer’s representative felt that NEEA’s promotions have had relatively little influence on increasing CFL diversity in the region (a rating of 2 on 1 to 5 scale where 1 means “not at all influential” and 5 means “extremely influential”), citing that past promotions have excluded specific wattage categories and/or specialty lamp types.

Retailers were asked whether they foresee any differences in sales potential for different CFL styles. Table 5-4 summarizes their responses; decorative bulbs (such as candelabra-base and globe CFLs) were mentioned most frequently.

**Table 4-4
Retail Representative Perspectives on CFL Styles with Greatest Sales Potential**

CFL Style	Number of Responses
Decorative bulbs (e.g., candelabra, globe)	4
Recessed can/floods	3
Mini-twists	3
Dimmable bulbs	2
All specialty bulbs	2
n	14

4.3.4 CFL Price

The manufacturer interviews included a question to elicit representatives’ opinions regarding the average CFL retail price paid by consumers in the region over time. All manufacturers agreed that promotional prices are in the \$1.00-1.99 range for a single-pack of single-wattage bare spiral CFLs under 30 Watts. During non-promotional periods, all representatives agreed that price varies by retail channel. Large home improvement and mass merchandise stores generally have them in stock for \$3-4 a bulb, but Wal-Mart sometimes offers CFLs for \$1.40 per bulb through a particular manufacturer. Fewer manufacturers could comment on prices in other channels but several mentioned that in drug stores, prices generally start around \$6.99-7.99 during non-promotional periods.

Two of the manufacturers’ representatives were able to comment on the influence of NEEA’s promotions on lowering CFL prices in the region. On a 1 to 5 scale where 1 means “not at all influential” and 5 means “extremely influential,” one of the representatives rated NEEA’s influence as a 3 or 4 out of 5, and the other rated NEEA’s influence as a 4. Retailers were also asked to assess the importance of CFL promotions to reducing the prices of all CFL bulbs in the Northwest. Using the same scale, the corporate

and store-level retailer representatives gave ratings that ranged from a minimum of 3 to a maximum of 5, yielding an overall average rating of 4.2.

4.3.5 CFL Quality

Many of the manufacturers' representatives commented on recent improvements in CFL start-up time, longevity, efficacy, color rendering, and size (smaller). Several felt that despite recent quality improvements to dimmable CFLs, dimmable CFLs still need the most improvement and customer acceptance for specialty lamps in general is in its infancy. More than one manufacturer's representative commented that the ENERGY STAR standard does not go far enough to regulate CFL quality, and that there is a great deal of disparity among the overall quality of ENERGY STAR CFLs.

Interviewers asked the retail representatives in our sample – all of whom were familiar with NEEA's CFL promotions – to assess the importance of CFL promotions to improving consumer satisfaction with CFL bulbs in the Northwest. Using a scale of 1 to 5, where 5 means very important, retail representatives gave ratings that ranged from a minimum of 2 to a maximum of 5, yielding an overall average rating of 3.8.

4.3.6 Consumer Acceptance of CFLs

Many of the manufacturers' representatives reported that CFL promotions have had major effects on consumer acceptance of CFLs. One representative reported that acceptance has increased “dramatically” because of CFL promotions, and commented that “a great number of people who purchase during the promotions are first-time adopters.” Several commented that acceptance for specialty lamps is much lower than for spirals, and one expressed the opinion that “higher quality bulbs and higher incentives will lead to higher acceptance.”

Only one of the manufacturers' representatives was able to comment on the influence of NEEA's promotions on increasing consumer acceptance of CFLs in the region. On a 1 to 5 scale where 1 means “not at all influential” and 5 means “extremely influential,” this representative rated NEEA's influence as a 4. Retailers were also asked to assess the importance of CFL promotions to improving the consumer acceptance of CFL bulbs in the Northwest. Using the same scale as manufacturer representatives, the corporate and store-level retail representatives gave ratings that ranged from a minimum of 3 to a maximum of 5, yielding an overall average rating of 4.3.

Retailer representatives were asked to also assess the importance of CFL promotions in the Northwest to increasing the rate at which those consumers purchase CFLs. Using the same scale of 1 to 5, retail representatives gave ratings that ranged from a minimum of 2 to a maximum of 5 and also yielding an overall average rating of 4.2.

4.3.7 Other Effects

The manufacturers' representatives described two other effects of CFL promotions: increased retailer marketing of CFLs and spillover. Retail representatives mentioned not only increased marketing of CFLs, but also increased awareness of and knowledge regarding CFLs among store staff and consumers as well as an increase in store foot traffic as a result of CFL promotions.

4.3.7.1 Retailer marketing

Three of the manufacturers' representatives reported that one of the greatest effects of CFL promotions is on retailer marketing of CFLs. The three representatives agreed that CFL promotions motivate retailers to draw attention to CFLs by positioning them in "eye-catching locations" such as aisle end-caps or "right up front by the cash registers." Because of the reduced price offered to retailers by manufacturers, the retailers' net profit margin for the discounted CFLs is likely higher than for other (non-discounted) products. One manufacturer's representative reported that "the promotions are, in effect, providing an incentive to retailers to really push the product." Another commented that "promotions... give the stores an incentive to market these products versus something else." Approximately 64 percent of the retail representatives we interviewed reported that during a CFL promotion, CFLs are more prominently displayed in their stores than during non-promotional periods. Two respondents also reported that their chains market CFL promotions through various advertising media.

4.3.7.2 Spillover

Several manufacturer's representatives commented that during CFL promotions, their retail partners' sales of non-discounted CFLs also increase somewhat. One representative commented that she urges retailers to display the discounted CFLs in close proximity to their other CFL stock so consumers are exposed not only to the promotional items but also to the full suite of CFLs offered by the retailer. These comments assume that the retailers offer a range of CFL styles and wattages. In this context, half of the representatives commented that CFL promotions should include bare spiral CFLs as a "carrot" to attract customers to CFLs and potentially use the spirals as a "lead-in to open [them] up to other styles such as specialty items."

4.4 Remaining Market Barriers

Market actors identified several remaining market barriers for CFLs, including consumer education; CFL price; mercury and CFL disposal; and CFL quality (particularly with regard to specialty lamps). In addition, several retailer representatives indicated that the appearance of CFLs still pose a barrier to many consumers.

4.4.1 Consumer Education

Nearly all of the manufacturers' representatives felt that education is the primary remaining market barrier for CFLs, particularly with regard to choosing the appropriate CFL for each application. Several commented that many consumers are unaware that specialty CFLs (such as globes and flood lamps) exist. One of the industry observers indicated that ENERGY STAR has produced materials for retailers that provide consumers with information of this nature, and has also updated its website with information about how to choose the right CFL. More than one manufacturer's representative mentioned that the issue needs to be addressed by multiple stakeholders, including ENERGY STAR, the manufacturers, energy-efficiency program sponsors, and retailers.

Many of the retailer representatives with whom we spoke commented that consumers are still, to a large extent, befuddled by the array of CFL choices and would benefit from having more information, such as charts or tables, positioned at the CFL shelves. One retail representative likened such a chart to those that consumers expect to find in automotive part stores which allows the consumer to match his or her car model to applicable replacement parts. This representative felt that consumers would be willing to do the

necessary in-store reading if it meant improving their chances of purchasing the appropriate CFL for the intended application.

4.4.2 CFL Price

Many manufacturers' representatives expressed concern that CFL prices are still too high for many consumers during non-promotional periods, particularly prices for specialty lamps. Retailers were asked to provide the average price in 2007 for a twister-style in their store(s) and reported prices ranging from \$1.00 to \$5.00 apiece, with an average price of \$2.89. Most retailers indicated that the price of the promoted CFL returns to normal as soon a promotion ends and reported selling all of the promoted stock by the end or the promotion (and, in many cases, before the end).

4.4.3 Mercury and CFL Recycling

Several manufacturers' representatives and industry observers felt that recent media attention to the mercury content of CFLs could dissuade consumers from buying CFLs. They report that information has not been disseminated regarding the magnitude of the issue as compared to that of other mercury-containing items in a typical household (e.g., thermometers and thermostats) and that recycling options are not available in many areas. One industry observer felt that the following three steps are necessary to address the mercury issue:

1. Reduce the amount of mercury in each lamp³⁶;
2. Make sure energy-efficiency program sponsors are relating a consistent message to consumers; and
3. Develop a regional and national recycling infrastructure for CFLs.

While retailers were not specifically interviewed regarding CFL recycling, two retailers raised the subject. As previously indicated, one retailer indicated that they have received a lot of letters from customers expressing concern regarding the mercury content of CFLs.

4.4.4 Specialty CFL Quality

Numerous manufacturers' representatives mentioned that dimming technologies continue to be a challenge for CFLs. One industry observer mentioned that creating dimmable CFLs is challenging because different dimmer switch technologies require corresponding dimming capabilities in CFLs, and a CFL that works on a dimmer switch produced by one manufacturer may not work on a dimmer switch produced by another manufacturer. She reported that the National Electrical Manufacturers' Association (NEMA) is working to address the issue by creating a dimmer protocol that will be consistent across switch manufacturers.

4.4.5 CFL Appearance

Several retail representatives indicated that the appearance of many types of CFLs remain an obstacle for many consumers. In particular, several felt that the candelabra-base CFLs and many bare spiral CFLs are

³⁶ The new ENERGY STAR criteria 4.0 (which go into effect at the end of 2007) set a cap of 5 milligrams of mercury for lamps to qualify for the ENERGY STAR label.

still too large to be acceptable to many consumers. Several retail representatives reported that some customers have complained that twister-style CFLs are “ugly.”

4.5 Effects of 2007 Energy Bill

In December 2007, the U.S. Congress passed a new Energy Bill. One component of the bill calls for a gradual phase-out of inefficient lamps over the next 4 to 12 years. Interviewers asked manufacturers’ representatives for their impressions of the Bill’s effects. Most expect a gradual transition toward energy-efficient lighting, including CFLs. A representative of a manufacturer that produces a broad range of lamp types commented that “[consumers] will have a similar range of choices to what they have now, but the difference will be that some technologies will be more energy-efficient than they are now. Incandescents are not going to be banned; they’re going to become more efficient.”

5. Utility Program Manager Interview Findings

5.1 Approach

During March and April 2008, experienced KEMA consultants conducted telephone interviews with energy-efficiency program managers from utilities throughout the Northwest. Contacts were sampled from a list provided by NEEA. KEMA staff endeavored to interview all ten of the investor-owned and large utilities and thirty of the medium and small utilities located in the Northwest (Table 5-1). While top priority was given to the utilities that provide funding to NEEA, other utilities were selected at random for participation in the interviews. We completed 40 interviews with utility program managers.

Table 5-1
Utility Interview Sample Frame, Targets and Completed Interviews

Utility Type	Sample Frame	Targeted Completes	Completed Interviews
Large utilities & IOUs	10	10	10
Medium and small utilities	129	30	30
Total	139	40	40

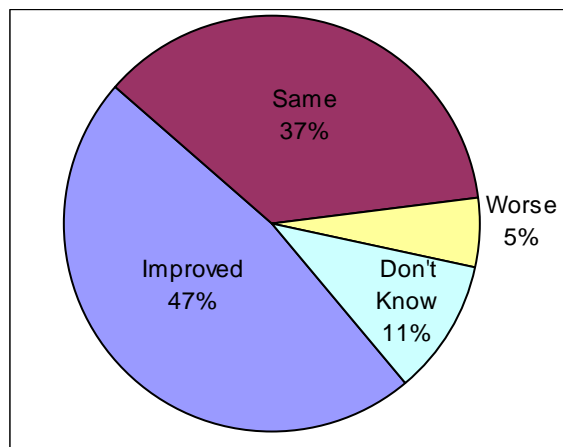
Interviews collected information on utility program managers' satisfaction with the Fall 2007 Change a Light (FCAL) CFL campaign and, more broadly, their perspectives on the past decade of market transformations in the Northwest and NEEA's contributions to those efforts. We provide a copy of the interview guide in Appendix A.

5.2 Fall 2007 Change a Light Campaign

NEEA's Fall 2007 Change a Light (CAL) promotion replaced the Savings with a Twist (SWAT) promotion of prior years. All of the large and investor-owned utilities in the sample participated in the 2007 promotion (compared with approximately 80% during SWAT). Among the medium and small utilities in the sample, approximately half of the program managers reported that they participated in the 2007 FCAL promotion and a similar proportion reported participating in the 2006 SWAT promotion.

Eighteen utility program managers reported having participated in both the 2007 FCAL and 2006 SWAT promotions. Among these, nearly half reported that the 2007 FCAL promotion was better than the prior year's SWAT promotion (47%; see Figure 5-1). All together, more than 8 out of 10 program managers reported that their level of satisfaction with the fall promotions was maintained or improved between 2006 and 2007. Several program managers expressed dissatisfaction that their utility logos no longer appeared on the promotional materials, leading a small number of program managers to report that their satisfaction with NEEA's fall CFL promotions declined between 2006 and 2007.

Figure 5-1
Utility Program Manager Satisfaction with 2007 FCAL Promotion Versus 2006 SWAT Promotion



n = 21.

5.3 CFL Market Barriers

Interviewers asked all of the 2008 interview participants to comment on changes in the Northwest CFL market over the past several years with regard to the following four topics:

- CFL availability;
- CFL diversity (the range of CFL styles and wattages available to the consumer);
- CFL affordability (price); and
- Consumer satisfaction with CFLs.

The interviewers then asked respondents to comment on NEEA's contributions to these changes.

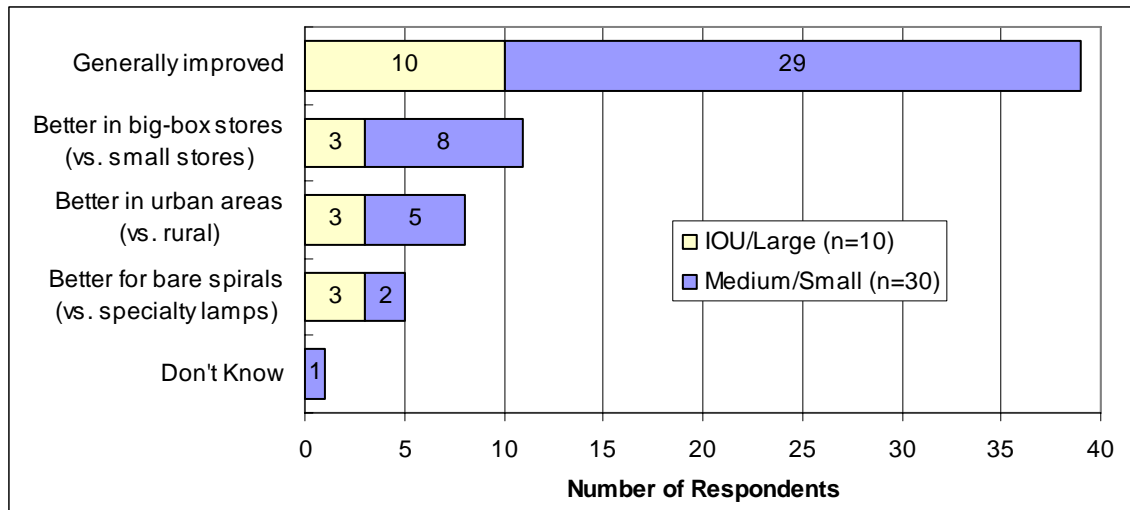
5.3.1 Availability

Nearly all utilities questioned reported that, overall, the availability of CFLs has improved in the Northwest over time. Some of the respondents commented that availability disparities typically depend upon one of three factors:

- **Geography.** Utility program managers report that CFLs occupy a far smaller percentage of the total light bulb shelf-space in rural stores than in urban stores, resulting in fewer CFLs being available to rural purchasers.
- **Store type.** In general, interview participants reported that CFL availability in big-box stores (such as large home improvement stores and mass merchandise stores) is far better than in the smaller retail chains and independent stores.
- **CFL style.** Program managers reported that the availability of specialty CFLs is lower than bare spiral CFLs, and commented that this disparity is particularly apparent in rural stores, smaller chains, and independent stores.

Program managers' comments regarding CFL availability are summarized in Figure 5-2 below.

Figure 5-2
Utility Program Manager Perspectives on CFL Availability in the Northwest

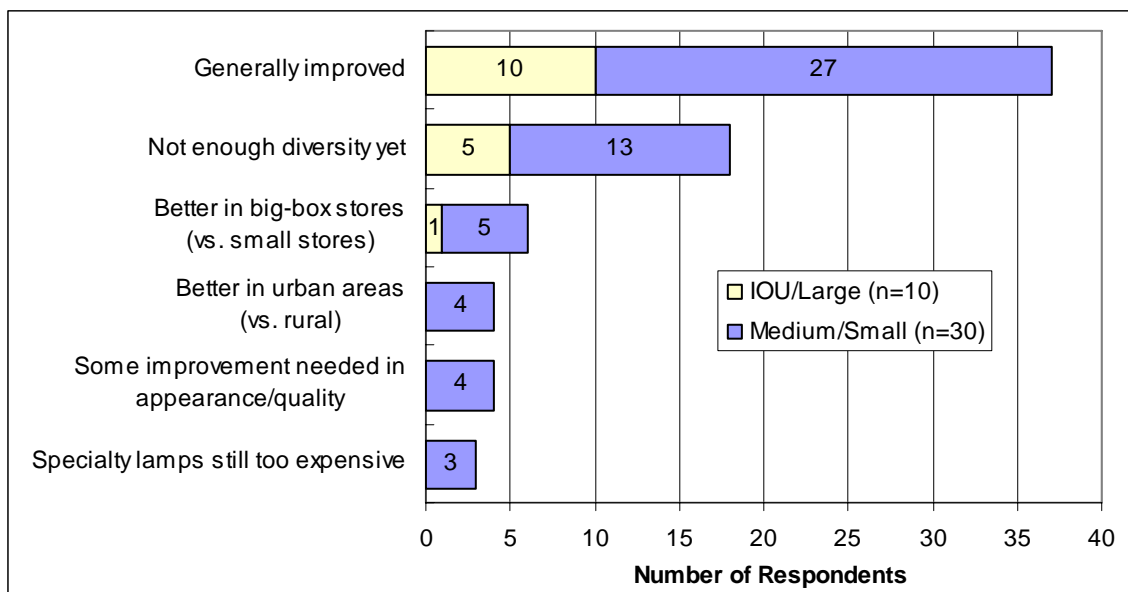


n = 40. Multiple responses allowed.

5.3.2 Diversity

More than 90 percent of the utility program managers in our sample reported that, overall, CFL diversity (the range of available styles and wattages) has improved in the Northwest over time (Figure 5-3). However, nearly half report that the range of CFL styles and wattages available to the consumer is not yet enough. As with CFL availability, a handful of program managers reported that there is more diversity in larger chains and in more urban areas.

Figure 5-3
Utility Program Manager Perspectives on CFL Diversity in the Northwest

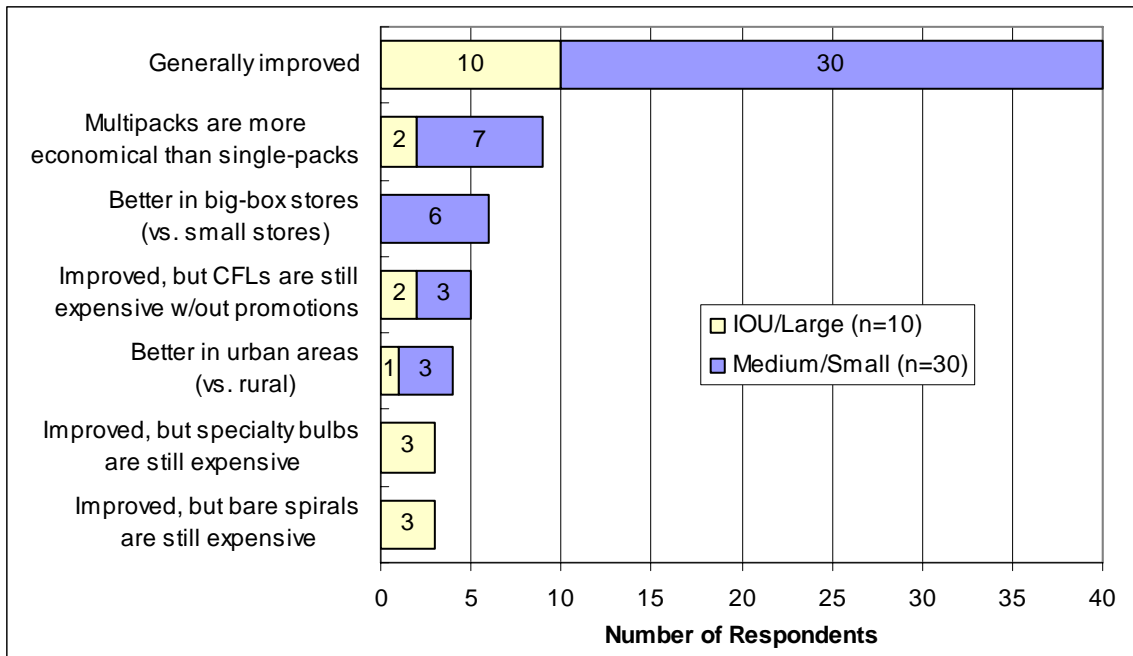


n = 40. Multiple responses allowed.

5.3.3 Affordability

All of the utility program managers reported that CFL affordability has improved over time. Many of the respondents volunteered CFL affordability disparities or inadequacies as shown in Figure 5-4, below. Although the interviewers did not directly question respondents about CFL multi-packs, nearly one quarter of the respondents volunteered that the multi-packs are economical and, for many consumers, are a viable option to single-packs.

Figure 5-4
Utility Program Manager Perspectives on CFL Affordability in the Northwest

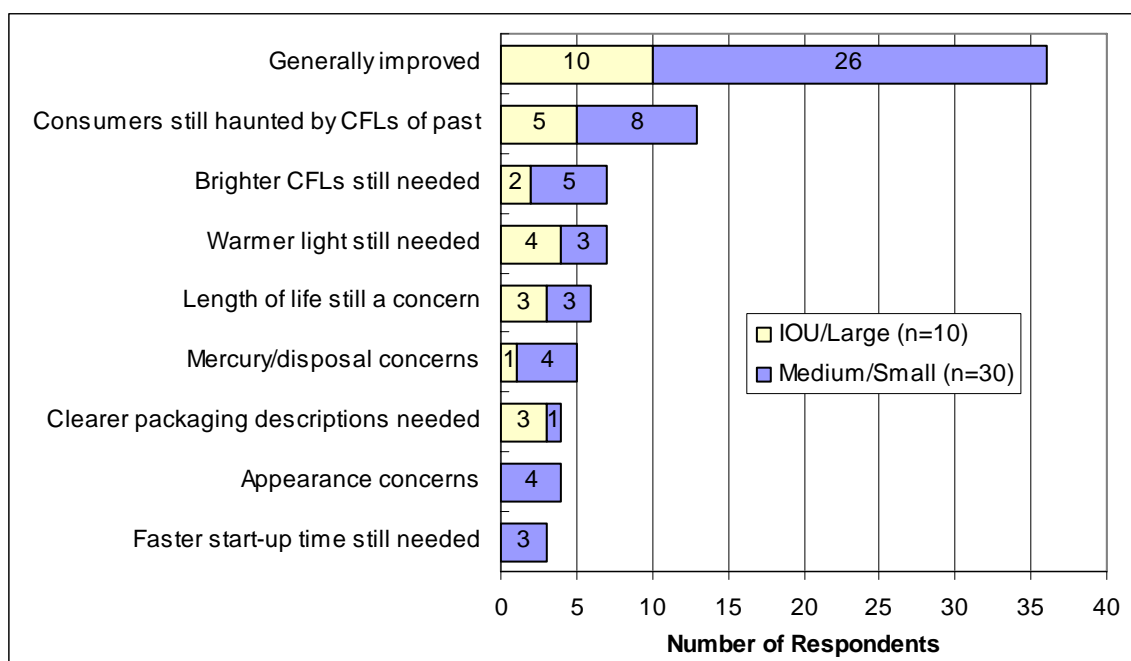


n = 40. Multiple responses allowed.

5.3.4 Consumer Satisfaction

Approximately 90 percent of the utility program managers in the sample reported that consumer satisfaction with CFLs has improved over time in the Northwest. However, more than a third reported the impression that some consumers' early experiences with poor-quality CFLs have made them reluctant to try them again. Several utility program managers report that improvements are still needed with regard to specific CFL attributes (such as brightness, warmth of light, and length of life) to improve customer satisfaction with CFLs.

Figure 5-5
Utility Program Manager Perspectives on Consumer Satisfaction with CFLs in the Northwest



n = 40. Multiple responses allowed.

5.3.5 NEEA's CFL Promotions

For each of the four market barriers identified above, interviewers asked the program managers a brief series of questions:

1. On a scale of 1 to 5 where 1 means "not at all important" and 5 means "very important," how important have NEEA's CFL promotions been in increasing [CFL availability, diversity, affordability, consumer satisfaction with CFLs]?"
2. For what fraction of changes [in CFL availability, diversity, affordability, consumer satisfaction with CFLs] is NEEA responsible?"

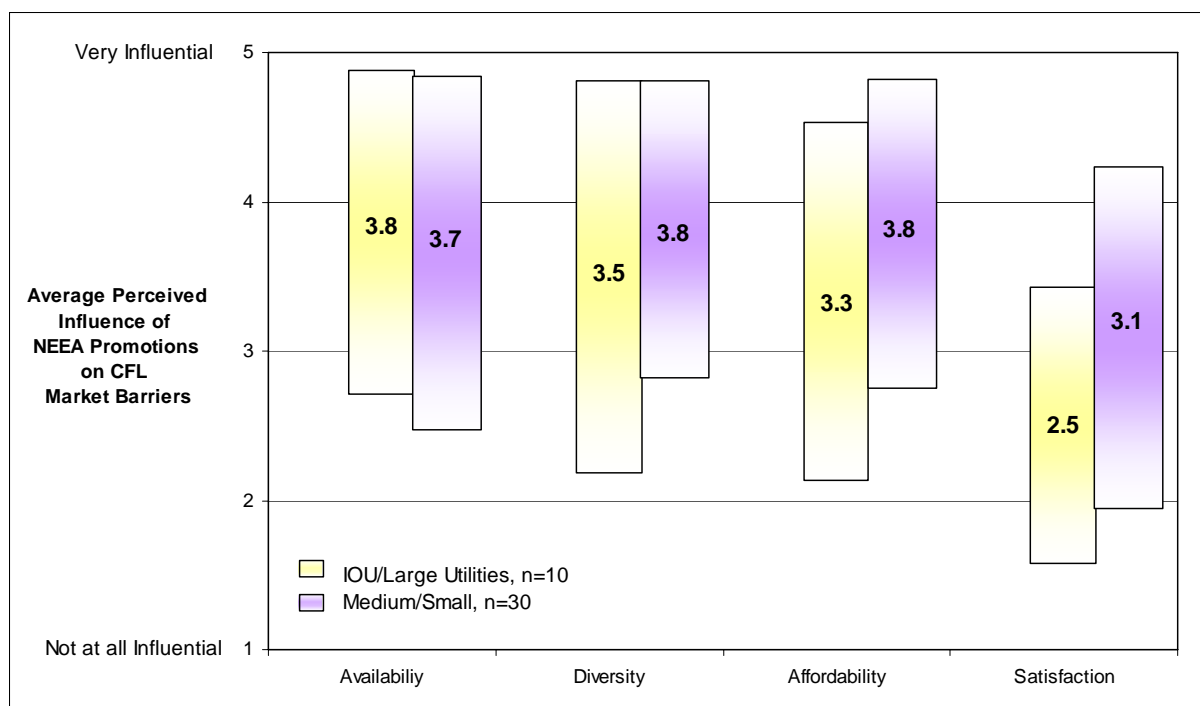
The utility program managers' responses to these questions are presented in the subsections below.

5.3.5.1 Importance of NEEA’s CFL Promotions

Interviewers asked utility program managers to rate the influence of NEEA’s CFL promotions on reducing the barriers of CFL availability, diversity, affordability, and consumer satisfaction with CFLs using a 5-point scale where 1 means that NEEA’s promotions were “not at all influential” and 5 means they were “very influential.” All of the utility program managers report that NEEA’s promotions were at least somewhat influential.

Figure 5-6 shows both the average of utility program managers’ responses regarding each of the four barriers and the extent to which the majority of responses varied from the average (each bar shows the range within which approximately two-thirds of the responses occurred, i.e., plus/minus one standard deviation).³⁷ Overall, utility program managers report that NEEA had the greatest influence on CFL availability, closely followed by diversity and affordability. Utility program managers report that NEEA’s promotions have had slightly less influence on consumer satisfaction with CFLs, which is to be expected given that these effects were not the intended outcomes of NEEA’s promotions but rather its leadership role in PEARL and support of third-party product testing initiatives.

Figure 5-6
Perceived Influence of NEEA’s Promotions on CFL Market Barriers



n = 40.

5.3.5.2 NEEA’s Contribution to Overcoming Market Barriers

Of the program managers who were able to rate the influence of NEEA’s CFL promotions on overcoming four key CFL market barriers in the Northwest, interviewers elicited comments on the proportion of those

³⁷ The standard deviation of an averaged set of data helps to deemphasize extreme responses.

changes for which NEEA was responsible. The program managers found this a difficult question to answer, so the “don’t know” response was common. However, several utility program managers were able to provide estimates; Table 5-2 displays the average of these estimates for the four key barriers (CFL availability, diversity, affordability, and consumer satisfaction with CFLs). Although utility program managers reported a wide range of responses, most respondents reported that NEEA is responsible for at least half of the improvements that have occurred in the Northwest market for CFLs with regard to these barriers.

**Table 5-2
Perceived Contribution of NEEA’s Promotions in
Overcoming CFL Market Barriers in the Northwest**

NEEA's Contribution	Availability	Diversity	Affordability	Satisfaction
Average of Responses	53%	67%	61%	51%
Range of Responses	20 - 95%	38 - 95%	0 - 100%	15 - 95%
n	15	8	12	7

Utility program managers mentioned many other factors as having contributed to the reduction of CFL market barriers in the Northwest (Table 5-3). Approximately two-thirds of the utility program managers in our sample mentioned that product improvements driven by manufacturers or consumer complaints have helped address some of the barriers in the Northwest CFL market. A similar proportion mentioned economies of scale in CFL production. More than half of the program managers in our sample mentioned media attention to environmental concerns (such as global warming).

**Table 5-3
Utility Program Manager Perspectives on Other Factors
That Have Reduced CFL Market Barriers in the Northwest**

Factor	Responses	
	n	%
Product improvements (driven by manufacturers or consumer complaints)	27	68%
Economies of scale in CFL production	26	65%
Media attention to environmental concerns	21	53%
Utility marketing and educational efforts	15	38%
Product Improvements driven by ENERGY STAR	10	25%
Increased retailer willingness to stock CFLs	9	23%
CFL Volumes/Profits Attracted Manufacturers	7	18%
Wal-Mart’s commitment to CFLs	6	15%
BPA promotions	6	15%
Discounts on multi-pack CFLs	6	15%
Rising energy costs	5	13%
n	40*	

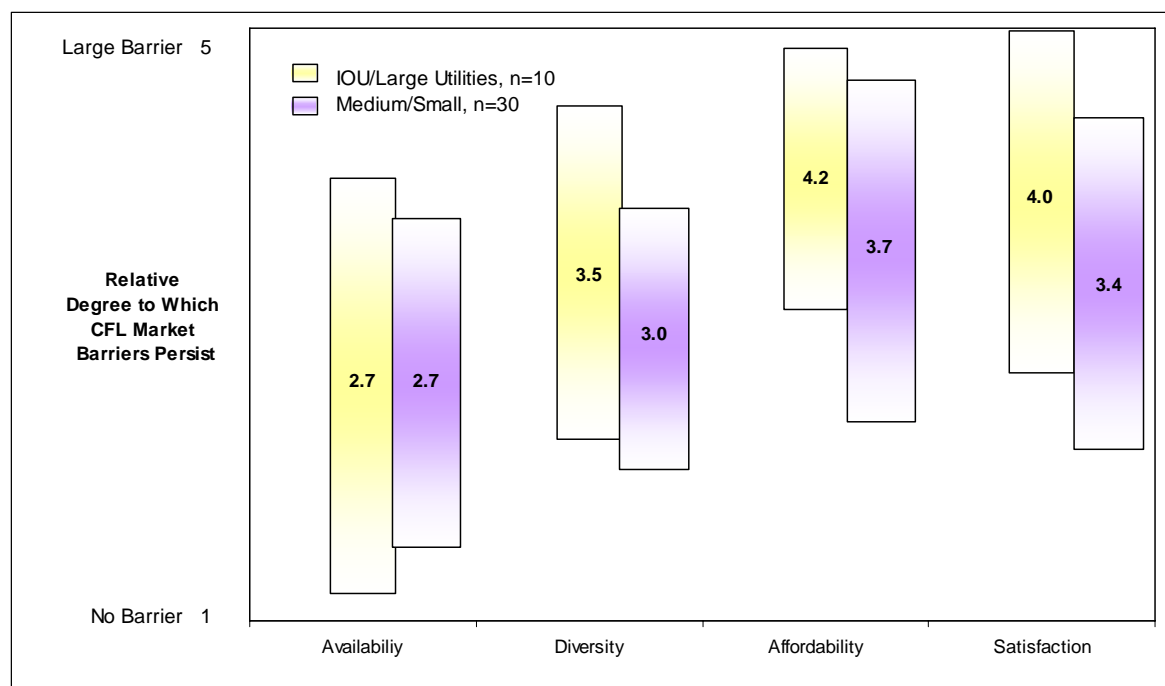
* Multiple responses allowed.

5.4 Remaining CFL Market Barriers

5.4.1 Availability, Diversity, Affordability, and Consumer Satisfaction

Each of the utility program managers were asked to rank four historical CFL market barriers: availability, diversity, affordability and consumer satisfaction. They were also asked to indicate whether any of these no longer posed a barrier to the CFL market. Figure 6-7 conveys the relative ranks of the four barriers. Each bar represents the range within most of the assigned ranks occurred,³⁸ and the midpoint represents the average rank. As implied in Figure 5-6 above, respondents reported that consumer satisfaction with CFLs is the greatest remaining market barrier; CFL availability was found to be the least of the remaining barriers. In fact, nearly 20 percent of utility program managers felt that product availability has been completely eliminated as a barrier to CFL purchases in the Northwest.

Figure 5-7
Utility Program Manager Perspectives on the Relative Degree to Which CFL Market Barriers Persist



n = 40.

5.4.2 Mercury Content

Interviewers asked the program managers whether they had encountered concerns from their customers regarding the mercury content of CFLs. Of the utility program managers in our sample, 90 percent of the respondents representing small/medium utilities and all of those representing IOUs and large utilities reported that their customers have raised such concerns. The overwhelming consensus was that concerns

³⁸ Each bar shows the range within which approximately 67 percent of the responses occurred (i.e., one standard deviation).

regarding mercury content are presently impacting CFL purchases to a small extent, but that the impact seems to be on the upswing. A handful of utility program managers even reported recent experiences in which some of their customers declined giveaway CFLs solely due to mercury concerns.

5.5 Current Needs/Directions of Utilities in the Northwest

Toward the end of each interview, interviewers asked the utility representatives to discuss any sort of assistance they would like NEEA to provide over the next couple of years. Interviewers elicited the program managers' suggestions with regard to residential lighting promotions or other lighting projects and with regard to consumer products in general.

5.5.1 Lighting Needs

Utility program managers' needs with regard to the lighting market related to two broad categories: programmatic needs and needs regarding improvements to specific CFL attributes.

5.5.1.1 Programmatic needs

In general, the utility program representatives expressed a desire for NEEA to continue its role in supporting marketing and educational campaigns. They suggest that NEEA should continue making inroads to reach customers who have never used CFLs as well as customers who were lost due to past CFL quality issues. Two-thirds of the representatives in our sample reported that they would like NEEA to continue to provide one or more types of educational materials (general information regarding CFLs, guidance regarding CFL disposal, materials for utilities to disseminate) and numerous respondents suggested that NEEA should distribute its educational materials more widely throughout the Northwest and not only to utilities but to other entities. Nearly half requested that NEEA support a CFL recycling program and a similar proportion requested that NEEA continue to offer CFL promotions. Without prompting, one-third of the utility program managers in our sample reported the impression that the CFL market in the Northwest is not yet fully transformed (13 respondents).

**Table 5-4
Utility Program Manager Needs for Lighting Programs by Utility Size**

Needs	Utility Size						Overall	
	IOU/Large		Medium		Medium			
	n	%	n	%	n	%	n	%
NEEA educational materials regarding CFLs – POP materials	6	60%	15	71%	5	56%	26	65%
NEEA-provided consumer guidance regarding CFL disposal	6	60%	13	62%	1	11%	20	50%
NEEA-provided utility program for CFL disposal	5	50%	12	57%	1	11%	18	45%
NEEA CFL promotions	4	40%	11	52%	2	22%	17	43%
NEEA-provided education materials regarding CFLs – for utility dissemination	2	20%	10	48%	3	33%	15	38%
NEEA marketing campaign to communicate CFL improvements to public (to regain those previously lost due to poor CFL performance)	6	60%	7	33%	2	22%	15	38%
Address dated CFL stock in small or rural stores that prolongs CFL legacy of unsatisfactory products	3	30%	7	33%	4	44%	14	35%
Marketing campaign directed at builders regarding ENERGY STAR homes	4	40%	5	24%	0	-	9	23%
Targeted CFL campaign for rural consumers/retailers	4	40%	3	14%	2	22%	9	23%
n	10	*	21	*	9	*	40	*

* Multiple responses allowed.

5.5.1.2 CFL Attributes

When asked about other (non-programmatic) improvements that would help to further transform the CFL market, the top ten needs reported by utility program managers related to product improvements such as quality, aesthetics, and applicability. Approximately one-third of the interview participants reported that improvements to the light color from CFLs are still needed (Table 5-5). A similar proportion reported that the line of dimmable floodlights for recessed cans needs to be expanded and/or that mercury content in CFLs needs to be dramatically reduced.

**Table 5-5
Utility Program Manager Needs: CFL Attributes**

Need	Responses	
	n	%
Improve light color/warmth of CFLs	15	38%
Expand line of dimmable PARs for recessed cans	12	30%
Reduce/eliminate mercury content	12	30%
Expand line of dimmable CFLs	10	25%
Decrease start-up delay	8	20%
Increase longevity	8	20%
Expand reading-brightness CFLs	8	20%
Expand 3-way CFL product line	7	18%
Improve aesthetics of decorative CFLs (e.g., candelabra-base, globe)	7	18%
Improve aesthetics of twister-style CFLs	7	18%
n	40*	

* Multiple responses allowed.

5.5.2 Other Consumer Products

When asked about their needs regarding other (non-lighting) consumer products, utility program managers requested support for a number of product types. The following products types were each mentioned twice: high-efficiency/heat pump water heaters; low-flow showerheads; mini-split heat pumps; ductless heat pumps; clothes washers; and household appliances in general. Two utility program managers also mentioned a need for increased promotion of the ENERGY STAR Homes program. Both suggested that the program could be improved by incorporating a LEED-like point system.³⁹

³⁹ The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is a third party certification program and the nationally accepted benchmark for design, construction, and operation of high-performance green buildings. LEED is based on a system of credits/points earned for incorporating various sustainable technologies and strategies into the building design or construction. For more details, see <http://www.usgbc.org/LEED>.

6. Assessment of Program Theory

This section of the report provides an assessment of the program theory that was presented in Section 2. We used the results from this study’s primary research (utility program manager, market actor, and program staff interviews) as well as many prior market research and evaluation studies (described in Section 3) as the basis of this assessment. First, we present evidence of the market barriers and market progress presented in the generic logic model presented in Section 2. We indicate the specific element from the model, whether it was confirmed by the research, and the information sources used in our assessment. Then, we present an updated logic model that illustrates the program theory and the relationships between its elements.

6.1 Market Barriers

NEEA sponsored baseline residential lighting market research prior to deploying its first round of lighting programs in 1997. This research consisted of a literature review of nationwide market conditions as well as supplier and consumer surveys, and identified market barriers to adopting energy-efficient lighting products (shown in Table 6-1 below) (Regional Economic Research, 2000). Based on our review of prior residential lighting market research studies and evaluation reports, we confirmed that the market barriers identified by NEEA’s residential lighting logic model existed prior to the project’s initiation in the late 1990s.

**Table 6-1
Market Barrier Validation Summary**

Logic Model Element	Confirmed?	Evidence	Source
High price	Yes	Retail CFLs prices ranged from \$15 to \$25 in January 1996	LightWise MPER1 ¹
		High first cost is the most often mentioned market barrier in early Northwest and other market baseline studies	Residential Consumer Research ²
Limited Manufacturers	Yes	Only 2 manufacturers produced qualifying program product in 1996	LightWise MPER1
Limited availability	Yes	Only 30 Northwest retailers stocked qualified CFLs year-round prior to the program’s inception	LightWise MPER1
		Lack of availability was identified as a primary barrier in early Northwest and other market baseline studies	Residential Consumer Research
Lack of awareness	Yes	Lack of consumer awareness of CFL technology, benefits and cost-effectiveness was mentioned as a primary barrier in early Northwest and other market baseline studies	Residential Consumer Research
		Nearly two-thirds of Northwest lighting retailers self-reported they were not knowledgeable about CFLs in 1996	LightWise MPER1
Low satisfaction	Yes	General concerns about fluorescent technology, performance problems, unattractiveness and incompatibility with existing fixtures, dimmers and timers or photocells was mentioned as a primary barrier in early Northwest and other market baseline studies	Residential Consumer Research

¹ Gilmore Research Group, 1999. ² Regional Economic Research, Inc., 2000.

6.2 Market Opportunities

The logic model identified three market opportunities that existed prior to the program’s inception: the limited number of CFL manufacturers, the huge potential for energy savings from CFLs, and frequent consumer purchases of CFLs at reduced prices. These opportunities were also confirmed by prior residential lighting market research studies and evaluation reports. Table 6-2 shows the market opportunities and the evidence used to confirm their existence.

**Table 6-2
Market Opportunities Validation Summary**

Logic Model Element	Confirmed?	Evidence	Source
Fewer Number of Manufacturers than Retailers and Consumers	Yes	There were several large light bulb manufacturers and many small manufacturers producing CFLs in the late 1990s versus hundreds or thousands of lighting retailers	Lighting Efficient Technology Report 1999 ¹
Huge potential for energy savings	Yes	There were an estimated 162 million residential sockets in the Northwest in 1996 that did not already contain CFLs, with expected savings per CFL of about 34 kWh per year	NEEA 2006 Cost-Effectiveness Model ²
Frequent consumer purchase at relatively lower cost	Yes	An estimated 68 million incandescent bulbs were purchased in the Northwest in 1996, costing \$.50 or less; CFLs were estimated to cost on average \$12 in 1996	NEEA 2006 Cost-Effectiveness Model

¹ Heschong Mahone Group, 1999. ² Northwest Energy Efficiency Alliance, 2007.

6.3 Project Activities

Table 6-3 lists the market interventions identified in the logic model, which were undertaken to address the pre-existing market barriers and intended to lead to the outcomes described below. We verified that these project activities occurred based on review of the project’s market progress evaluation reports dating from 1999 through 2008 (Gilmore Research Group, 1999; Dethman & Associates, 1999; ECONorthwest, 2002; ECONorthwest, 2004; KEMA Inc., 2005; KEMA Inc., 2006; KEMA Inc., 2007).

**Table 6-3
Activity Validation Summary**

Logic Model Element	Verified?	Evidence
Leverage utility incentives with manufacturers and retailers	Yes	The project focused on manufacturer incentives early on, coordinating with utilities to increase consistency and maximize incentive budgets and regional market effectiveness; the last 3 years of the project, NEEA again leveraged utility incentives for the SWAT and FCAL promotions
Support consumer education	Yes	NEEA coordinated and supported consumer education efforts through working closely with lighting retailers and utilities
Support in-store merchandising and sales staff training on benefits	Yes	The project transitioned in the late 1990s from supporting manufacturers to retailers; NEEA provided field personnel who visited lighting retailers across the region to provide a wide range of support, including sales staff training and in-store merchandising
Influence national specifications for ENERGY STAR and quality assurance/product testing efforts	Yes	NEEA was a leader in supporting ENERGY STAR CFL specification changes, starting in the late 1990s push to lower power factor; throughout the project’s lifetime, NEEA project staff were closely involved in national ENERGY STAR working groups to monitor product quality; NEEA was a member of the Program for the Evaluation and Analysis of Residential Lighting (PEARL) and provided retail products for testing as well as funding support
Track retail CFL sales	Yes	In order to track market progress, NEEA directed efforts to track retail CFL sales in the region; both implementation and evaluation contractors supported these efforts, which evolved over time to meet the changing market context and needs of the project
Leverage retail/manufacture promotional efforts and resources	Yes	Adhering to its overarching market transformation vision, NEEA leveraged existing supplier promotional resources throughout the lifetime of the project; NEEA also supported these efforts, from providing cooperative marketing funds to hosting promotional events at retailers
Focus on mass market via big-box retail, then smaller market channels	Yes	NEEA’s approach to supporting lighting retailers began with the larger big-box retail because this channel could buy and sell large volumes of CFLs, which would help stimulate price decreases and consumer demand; later, NEEA focused more on the smaller market channels after prices had dropped so non-traditional retail outlets could stock the product and sell it at attractive prices

6.4 Outputs, Outcomes and Impacts

The logic model identified outputs that were theorized to follow from the project's activities. As shown in Table 6-4, we confirmed that each of the outputs listed in the program theory occurred as a result of the project's activities (described above).

**Table 6-4
Output Validation Summary**

Logic Model Element	Confirmed?	Evidence	Source
Field representatives to support retailer merchandising of ENERGY STAR CFLs, coordinate in-store activities	Yes	The project introduced circuit riders early on to visit utilities and retailers in Idaho and Montana, and expanded to cover the whole territory in 2000 when the project switched its focus from manufacturers to retailers	Residential Lighting Program MPER1 ¹
Offer cooperative marketing support to retailers	Yes	The project established cooperative marketing agreements as a means for supporting retailers in selling ENERGY STAR CFLs in 2000; prior to 2000, the LightWise and Fixture programs provided marketing and distribution resources for rural and small markets, conducted retailer promotions throughout the territory and provided retailer education and marketing	LightWise MPER1 ² and Residential Lighting Program MPER1
Program-designed point-of-purchase (POP) in-store collateral	Yes	Throughout the life of the project, NEEA has produced and provided POP for retailers including product advertisements and displays to educate consumers on the benefits of CFLs	LightWise MPER1, Residential Lighting Program MPER1 and Consumer Products MPER1 ³
Regional CFL buy-down promotion	Yes	The project introduced a manufacturer buydown regionwide in 1998, but focused on retailers for the next few years; later in 2005 the program reintroduced manufacturer incentives through coordinating BPA and utility offerings in its SWAT and FCAL promotions	LightWise MPER1 and Consumer Products MPER3
Leverage ENERGY STAR Change a Light national campaign in marketplace	Yes	Throughout its lifetime the project has coordinated with and leveraged the national ENERGY STAR campaign; the program has worked with the federal ENERGY STAR program (EPA) to implement the national programs in the Northwest	Residential Lighting Program MPER1
As the lighting market matures, coordinate in-store support via manufacturer reps	Yes	The last phase of the project leveraged representatives that were already in place, in line with its market transformation vision	Consumer Products MPER3
Support PEARL/third-party quality testing	Yes	The project was a leader in product quality, assisting with the development of PEARL and providing ongoing support; the project helped fund the PEARL initiative (lighting lab) and the project's field reps pulled CFL samples off of store shelves for testing	Residential Lighting Program MPER1
ENERGY STAR specification changes	Added	NEEA provided leadership and significant technical support for ENERGY STAR CFL specification changes, beginning in the late 1990s with efforts to lower the power factor of CFLs	LightWise MPER1, Residential Lighting Program MPER1

¹ ECONorthwest, 2002. ² Gilmore Research Group, 1999. ³ KEMA, 2005.

Table 6-5 shows the short-term market outcomes that were expected in one to three years as a result of the project's activities.

**Table 6-5
Short-Term Market Outcome Validation Summary**

Logic Model Element	Outcome Occurred?	Evidence	Source
Increased CFL awareness	Yes	87% of Northwest consumers were aware of CFLs in 2006, up from 68% in 2004	Consumer Products MPER3 ¹
Price points decrease	Yes	Prices for a sample of CFLs on retail shelves decreased from \$19 to \$10, from 1997 to late 1998	LightWise MPER2 ²
		Lighting shelf survey data, weighted in an attempt to reflect average retail sales price, indicated an average price of \$4 in early 2006	Consumer Products MPER3
		Regional suppliers said promotional CFLs are sold for \$1, and non-promotional CFL prices range from \$1.40 to \$8, depending on the retail channel, in 2008	Consumer Products MPER4 ³
Purchase rate increases reflecting increased demand	Yes	CFL purchase rate increased from 32 to 67 percent from 2004 to 2006	Consumer Products MPER3
		CFL purchasers bought CFLs 4 times on average in 2004, buying a total of 6 CFLs, with an average of 5 CFLs installed in their home	Consumer Products MPER3
Big-box stores sell CFLs	Yes	The project's lighting retailer database, which contains retailers who sell CFLs, indicates most big-box stores in the region selling CFLs in 2004	Consumer Products MPER1 ⁴
More manufacturers enter the market with new product	Yes	7 manufacturers participated in the 2007 FCAL promotion; up from 6 in 1998 and 2 in 1996	LightWise MPER2 and Consumer Products MPER4
Consumers intend to buy CFLs again	Yes	Three-quarters of Northwest CFL purchasers self-report they are very likely (rated a 5 on a scale from 1 to 5 with 1 = not at all likely and 5 = very likely) to replace burnt-out CFLs with new CFLs in 2006	Consumer Products MPER3
		Nearly half of Northwest CFL purchasers said they are likely to buy CFLs in the coming year in 2006 (rated a 5 on a scale from 1 to 5 with 1 = not at all likely and 5 = very likely), and half of those who are unlikely to buy them say they are storing CFLs (11% say they are too costly; 13% say they do not like the light/brightness)	Consumer Products MPER3
	Yes	About two-thirds of Northwest CFL purchasers are repeat purchasers – this fraction held steady from 2004 to 2006	Consumer Products MPER1, Consumer Products MPER3
Significant measurable energy savings	Yes	The net market effects for the first three years of the project were estimated at 3.8 aMW	2006 ACE Model ⁵

¹ KEMA, 2007. ² Dethman & Associates, 1999. ³ KEMA, 2008. ⁴ KEMA, 2005. ⁵ NEEA, 2007.

Table 6-6 shows the long-term market outcomes that were expected in four to six years. We validated that all of the expected outcomes occurred.

**Table 6-6
Long-Term Market Outcome Validation Summary**

Logic Model Element	Outcome Occurred?	Evidence	Source
Increased consumer satisfaction	Yes	Consumer self-reported satisfaction with CFLs stayed about the same from 1998 through 2007 – with a slight dip in 2003, rebounding in 2004 to about half giving a 9 or 10 on a 10 point scale with 1 = not at all satisfied and 10 = very satisfied (mean between 7.5 and 8.0) – however the purchaser base expanded from early adopters to mass market during this period	Consumer Products MPER3 ¹
Market actors actively promoting ENERGY STAR CFLs	Yes	There is very high consumer awareness of the ENERGY STAR brand; market actors report that in 2008 they actively promote ENERGY STAR CFLs since consumers recognize the label and it helps to sell more CFLs.	National ENERGY STAR survey ² ; Consumer Products MPER4 ³
CFLs are widely available in multiple/traditional retail channels	Yes	250 Northwest retailers stocked qualified CFLs year-round in 1997, up from 30 prior to the project's inception – including traditional retail channels such as big-box stores	LightWise MPER1 ⁴
		The lighting retailer database used for project implementation, which in theory contains all retailers that sell CFLs in the Northwest, grew from 1,516 to 2,550 at the end of 2006 including many small hardware stores, drug and grocery stores and local general merchandise stores serving both large and small markets across the Northwest	Consumer Products MPER3
Purchase rate increase reflects mainstream acceptance	Yes	Two-thirds of Northwest consumers have bought CFLs in 2006 – reflecting consumer acceptance in both urban and rural markets	Consumer Products MPER3
CFL distribution and quality improves in other parts of the country	Yes	Market actors and industry observers report in 2008 that CFL distribution has improved nationwide, with sales even in non-program areas at unprecedented levels; product quality has also improved nationwide due to evolving ENERGY STAR specifications and quality assurance protocols	Consumer Products MPER4
Industry supports and DOE adopts third-party testing QA	Yes	The 2008 ENERGY STAR specification will include third-party funded quality assurance, which is the culmination of the ongoing product quality testing efforts of PEARL	Consumer Products MPER4

¹ KEMA, 2007. ² EPA, 2008c. ³ KEMA, 2008. ⁴ Gilmore Research Group, 1999.

Table 6-7 shows the project impacts that are expected in 7 to 10 years if the short- and long-term outcomes are achieved. Most of the expected long-term impacts have not yet completely occurred.

**Table 6-7
Project Impact Validation Summary**

Logic Model Element	Has Impact Occurred?	Evidence	Source
Socket penetration grows steadily (to 50%?) without NEEA intervention	To be determined – saturation at 8% in 2006	In 2006, Northwest residential socket penetration was estimated at 8 percent	Single-Family On-Site Assessment ¹
Consumers indicate they can buy CFLs anywhere they shop for lighting	Partial	Availability is not mentioned as a reason for not buying CFLs by consumers in 2006; consumers report buying CFLs at wide variety of stores, including hardware, food and drug stores in 2006 – though the most common store is DIY and mass merchandise in 2006; market actors interviewed in 2008 say that this is true for twister-style CFLs during promotions, but probably not true for specialty CFLs and perhaps twister-style CFLs without promotions in some channels	Consumer Products MPER3 ² and MPER4 ³
Average CFL price remains below \$2 each	No - only during promotions with twister style CFLs and in Wal-Mart	Suppliers mention that CFLs are sold at \$1 during promotions, but cost on between \$1.40 and \$8 per bulb when promotions aren't running	Consumer Products MPER4
All major lighting manufacturers regularly produce full line of CFLs (range of wattage, some specialty)	Partial –the specialty CFLs on the market are not widely accepted by consumers	All major lighting manufacturers regularly produce spiral or twister-style CFLs in a wide range of wattages as of 2008, but the market for specialty CFLs is in its infancy	Consumer Products MPER4
CFLs gain mainstream "status"	Yes	Consumers across the country are buying CFLs, and lighting retailers throughout the country are selling them; even in areas without promotions, Wal-Mart is selling CFLs as low as \$1.40 per bulb; increased attention on climate change has lead to extensive media attention on CFLs; legislation in the U.S. and worldwide is being enacted that will further increase CFL adoption	Consumer Products MPER4

¹ RLW Analytics, 2007. ² KEMA, 2007. ³ KEMA, 2008.

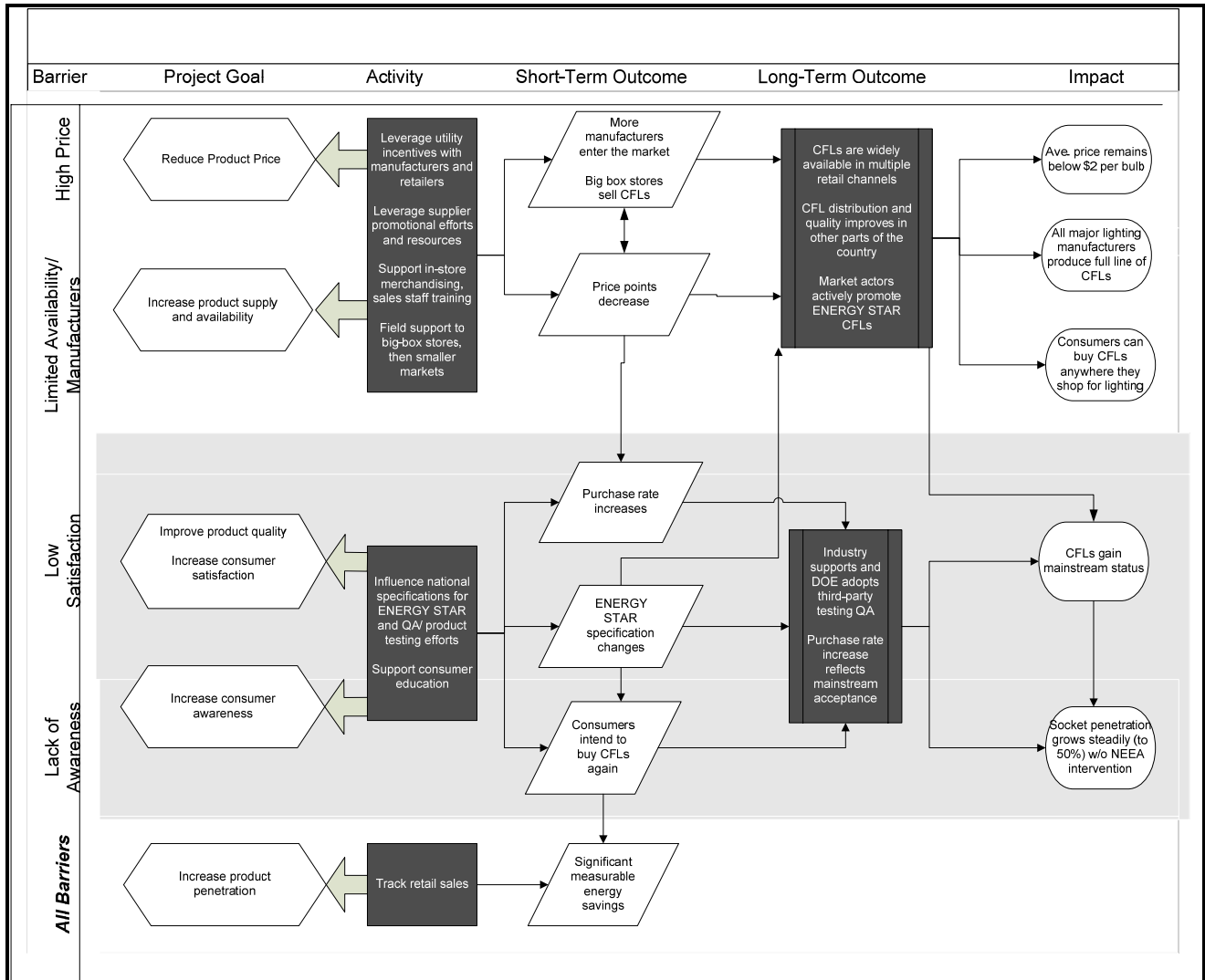
6.5 External Developments

There were several key external developments that also affected the lighting market towards the end of the project's lifetime, which affected the rate of CFL adoption. These include increased attention to the problem of global warming, Wal-Mart's sustainability initiatives, and regulation of bulb efficacy in the United States and elsewhere. Section 3.6 provided additional detail on these developments.

6.6 Updated Program Logic Model

Based on our assessment of NEEA's program theory, we updated the generic logic model that was shown in Section 2. Figure 6-1 below presents an updated program logic model, indicating the relationships between project activities as they relate to goals and barriers, and the expected outcomes and impacts.

**Figure 6-1
Updated Program Logic Model**



7. Review of Cost-Effectiveness Model Assumptions

We reviewed the 2006 Alliance Cost-Effectiveness (ACE) model and key assumptions for ENERGY STAR Lighting (dated June 1, 2007). Where feasible, this evaluation assessed revisions to the model since our prior review of the model in 2004 (for Consumer Products MPER1).⁴⁰ Relevant data sources from current or prior evaluations and market research studies serve as the basis of this assessment.

7.1 Overview

The ENERGY STAR Lighting ACE model produces estimates of cumulative energy and peak demand savings and associated reductions in carbon dioxide emissions for the region's residential lighting programs. The model estimates baseline levels of measure adoption and then assigns credit to the region's programs for the difference between observed levels of measure adoption and the baseline.

7.2 Model Components

7.2.1 Electricity Savings

The model estimates electricity savings based on installation rate, hours of use per day, watt reduction, take-back and space heat interaction.

The model was modified slightly from the prior model based on KEMA's MPER1 findings and incorporation of newer data. This evaluation did not address electricity savings parameters.

7.2.2 Measure Life

The model calculates measure life as a function of rated hours and hours of use per day.

The model was modified slightly from the prior model based on KEMA's MPER1 findings and incorporation of newer data. This evaluation did not address measure life parameters.

7.2.3 Measure Cost

The model was updated based on Consumer Products MPER1⁴¹ and MPER3⁴² findings. First cost is assumed to be \$4 per CFL from 2006 through 2015. We included a question in our supplier interviews regarding their opinion as to the average CFL retail price paid by consumers in the region over time. All manufacturers agreed that promotional prices are in the \$1.00 to \$1.99 range for a single bare spiral CFL under 30 Watts. Outside of promotions, all agreed that pricing varies by retailer. Large home improvement and mass merchandise stores generally stock single-pack bare spiral CFLs for \$3 to \$4 per bulb, but Wal-Mart occasionally offers similar CFLs for \$1.40 per bulb with a particular manufacturer. Fewer manufacturers could comment on prices in other channels, but several mentioned that in drug stores, prices generally start around \$6.99 to \$7.99 during non-promotional periods.

⁴⁰ Since then, the model has undergone two revisions in 2004 and 2007.

⁴¹ KEMA Inc., 2005

⁴² KEMA Inc., 2007

Based on this information from suppliers, there is no evidence to suggest that the model's assumption of \$4 average cost is incorrect, or that the average price paid for CFLs has changed significantly since the prior research was conducted that estimated the \$4 average price.

7.2.4 Annual Operations and Maintenance Costs

Annual operations and maintenance costs are a function of CFL and incandescent bulb life and incandescent bulb cost.

The model was modified slightly from the prior model based on KEMA's MPER1 findings. This evaluation did not address operations and maintenance parameters.

7.2.5 Baseline Units

The baseline estimate is the theoretical level of CFL sales that would have occurred in absence of regional market interventions. The baseline is theoretical and difficult to estimate because there is no way to really verify what would have happened in absence of NEEA's interventions, utility promotions, and other regional promotions. This is particularly true in the Northwest due to the nature of NEEA's interventions, which are intended to leverage other regional and national initiatives, and the synergistic effects of other complementary upstream lighting programs nationwide. As such, it is nearly impossible to untangle regional versus other effects.

KEMA worked with NEEA to develop a simple methodology leveraging existing data sources to estimate baseline CFLs for 2007. We used an estimate of 2005 CFL sales per household in regions of the country where there were no lighting programs (0.25 CFLs per household) and adjusted it to apply it to the Northwest's population (0.33 CFLs per household). We then applied a rate of growth equal to the expected rate of growth in the overall CFL market to yield a baseline estimate for 2007 (0.96 CFLs per household or 4.6 million CFLs). Refer to Appendix D for more detail about the methods used for this analysis and for references to the data sources.

7.2.6 Total CFL Sales

Baseline units are subtracted from an estimate of total CFL sales to yield regional net market effects. The model uses estimates of sales from NEEA's Consumer Products Lighting implementation contractor, which are produced by weighting and extrapolating sample data from participating lighting retailers. The model also forecasts sales for future years by assuming growth of 1 million per year over 2005 sales levels (estimated at 5.1 million) until they reach 22 million, which is when 85 percent of all screw-based sockets are assumed to have CFLs.

Total ENERGY STAR CFL sales for 2008 were estimated by NEEA's implementation contractor as more than 18.1 million bulbs.

- *Historical annual CFL sales.* The project's implementation contractor has vastly improved the collection of tracking data. Nonetheless, it is still difficult to calculate the proportion of the region's total CFL sales that are tracked by the project. The data undoubtedly represent a greater proportion of the region's total 2007 sales than in prior years, but a number of stores (particularly drug and grocery chains) are still excluded from the 2007 database.

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- *Future CFL sales growth.* We asked suppliers to comment on the expected trend in future CFL sales. All manufacturers feel that CFL sales will continue to increase, particularly for the mid-wattage models (between 13 and 30 Watts). They also report that the market will move toward smaller sizes (in terms of size, not wattage) – especially for bare spiral models – and sales will increase for specialty products, particularly for reflector bulbs. Only one of the manufacturers could estimate an expected percentage change in sales, reporting the impression that if the utilities continue to promote CFLs until at least 2012, CFLs will represent approximately 60 percent of the medium-screw based bulb market share. Without continued CFL promotions, he felt this might only reach 30 to 40 percent.

8. Synthesis of Findings

8.1 Market Progress and NEEA's Influence

The Northwest ENERGY STAR Consumer Products Lighting project had five key goals:

- Increase consumer awareness of CFLs;
- Increase CFL availability;
- Reduce CFL price (increase CFL affordability);
- Increase CFL market penetration through increased sales; and
- Encourage improvement of ENERGY STAR product quality.

Evidence of market progress toward these goals was tracked by various market progress indicators. This section describes market progress toward each goal (as summarized in Table 8-1 below) and summarizes evidence regarding NEEA's role in achieving these goals.

**Table 8-1
Summary of Market Progress**

Goal	Market Progress Indicator(s)	Results
Increase consumer awareness of CFLs	The rate of CFL awareness and purchase	Both the CFL awareness and purchase rate increased substantially, to about 90% and 67% in 2007, respectively
Increase product availability	The number of retail stores in the region that stock CFLs	Major increase in stores selling CFLs, from 30 to more than 2,000
	The number of manufacturers that produce program-qualifying CFLs	More manufacturers produce ENERGY STAR qualifying products, with all major light bulb manufacturers doing so and many new market entrants
Reduce product price	Average CFL price in both large and small markets	Prices dropped from an average of \$20 to less than \$5 per bulb, with drops in both large and small markets
Increase product market penetration through increased sales	Regional CFL sales per year	Met target of 9 million units annually by 2006 and exceeded target in 2007 with sales of over 18 million
Encourage improvement of ENERGY STAR product quality	Rate of consumer CFL satisfaction	Consumer satisfaction rebounded in 2004 after a slight drop, such that satisfaction was maintained even as the purchaser base doubled from one- to two-thirds of the population
	Rate of CFL purchasers making repeat purchases	Two-thirds of CFL purchasers in 2006 are repeat purchasers, and three-quarters of CFL purchasers are very likely to replace CFLs that burn out with new CFLs
	Updates in ENERGY STAR specifications	Several updates to ENERGY STAR qualifying criteria during program lifetime, reflecting tighter standards with respect to various product quality attributes and quality assurance procedures

8.1.1 Awareness of CFLs

NEEA monitored progress toward its goal of increased rate of consumer awareness of CFLs using the marketing progress indicators of increased consumer awareness and purchase rates for CFLs. CFL awareness increased to 90 percent as of 2006, with the purchase rate expanding to approximately two-

thirds of the Northwest population. Many market actors and industry observers commented that CFL promotions in general have had dramatic effects on the rate of consumer adoption of CFLs and that NEEA's promotions have been influential at increasing consumer acceptance of CFLs. Industry observers remarked that NEEA and Northwest utility CFL promotions increased consumer awareness through increasing the channels in which CFLs are sold. Suppliers and industry observers noted that the recent media attention on CFLs as an easy way for consumers to address the issue of global warming has substantially increased consumer awareness of CFLs.

8.1.2 CFL Availability

NEEA tracked progress toward its goal of increased CFL availability using the market progress indicators of increases in the number of retail stores in the region that stock CFLs and number of manufacturers that produce CFLs. Prior project evaluations have provided evidence of a dramatic increase in the number of stores selling CFLs – from approximately 30 prior to the program's inception to more than 2,000 in 2007 – and many more lighting manufacturers currently produce ENERGY STAR qualifying CFLs than in the past (including all major bulb manufacturers as well as many new market entrants).

Additional evidence of increased CFL availability is provided by ENERGY STAR data on the number of CFL models available to consumers in the U.S. over time. The data show that the number of CFL models more than doubled between 2006 and 2007, with the number of bare spiral models increasing by roughly 85 percent.

CFL manufacturers report that in the absence of CFL promotions, many store types – grocery, drug, and discount stores in particular – would have no CFLs available to consumers at all, or would offer one or two models at prohibitive prices. Results from the interviews with utility program managers echoed this assertion, and program managers report that NEEA's CFL promotions have had a greater influence on CFL availability in the region than on any other market barrier. While only half of the program managers with whom we spoke could quantify the effects of NEEA's promotions on CFL availability, those who could report that NEEA's promotions are responsible for more than half of the market progress toward increased CFL availability in the region. Industry observers and NEEA project staff indicated that NEEA's promotions were extremely impactful on CFL availability, expanding CFLs to retail channels that would never have stocked them outside a promotion. Early NEEA interventions addressed supply constraints by working with manufacturers, which lead to an increase in program-qualifying products.

8.1.3 CFL Affordability

NEEA's goal was to reduce the average consumer price for CFLs in the region, and market progress was measured by dropping CFL prices in both large and small markets throughout the Northwest. Throughout the course of NEEA's market interventions, CFL prices dropped from an average of \$20 to less than \$5 per bulb. While only a handful of CFL supplier representatives were able to comment on NEEA's role in lowering prices, those who were able reported that NEEA's programs were at least somewhat influential. Results from our utility program manager interviews supported this conclusion, and on average reported that NEEA is responsible for approximately 60 percent of the market's progress toward lower CFL prices.

Industry observers also indicated that NEEA's CFL promotions helped lower the price of CFLs by offering low promotional prices through a wide array of retailers, causing increased consumer demand and in turn an increase in supplier competition. NEEA focused first on big-box stores in the region, which could sell a large volume of CFLs. This large volume, coupled with the West Coast energy crisis and the

increasing demand in California and in other regions, increased the scale of production and lead to lower CFL prices throughout the nation.

8.1.4 CFL Sales and Market Penetration

NEEA's goal was to increase CFL market penetration through increased CFL sales in the Northwest. The project set a goal of 9 million in CFL sales per year by 2010, and in 2007 sold more than twice as many CFLs (roughly 18 million). Participating retailers sold nearly 1.8 million CFLs through NEEA's Fall Change a Light promotion in 2007, and sales through the promotion accounted for nearly 10 percent of the region's total CFL sales in that year. Of the CFL supplier representatives, utility program managers and industry observers we interviewed in support of this study, nearly all reported that NEEA's promotions have had some influence on increasing CFL sales in the region.

8.1.5 CFL quality

To monitor market progress with regard to CFL quality, NEEA relied upon three market indicators: consistent consumer CFL satisfaction with CFLs over time (despite the expanding purchaser base); repeat purchases of CFLs among consumers; and improvements in ENERGY STAR specifications. Evidence of these indicators is as follows:

- **Consumer CFL satisfaction with CFLs.** After dipping slightly in 2004, consumer satisfaction rebounded and stayed relatively high even as the purchaser base doubled from one-third to two-thirds of the Northwest population. Representatives of CFL suppliers (manufacturers and retailers) and utility program managers report that NEEA's CFL promotions have had moderate influence on increasing consumer satisfaction with CFLs.
- **Repeat purchases.** In 2006, two-thirds of the consumers who purchased CFLs were repeat purchasers, and three-quarters of CFL purchasers reported that they are very likely to replace CFLs that burn out with new CFLs. A handful of CFL supplier representatives commented that NEEA's promotions have been influential in terms of increasing consumer acceptance of CFLs in the region.
- **Improvements in ENERGY STAR specifications.** EPA updated the ENERGY STAR qualifying criteria several times during the Consumer Products lighting project lifetime, reflecting tighter standards with respect to various product quality attributes and quality assurance procedures. One industry observer reported that NEEA's role in supporting early CFL quality assurance initiatives was "critical." NEEA also provided leadership and continued support of PEARL's testing initiatives and ENERGY STAR's upcoming shift to manufacturer-supported third-party testing.

8.2 Key Impacts of NEEA Interventions

Based on feedback from market actors, program staff and industry observers, NEEA's interventions impacted the market in three major ways:

- *Supplier conditions.* The promotions first targeted big-box stores, which could buy and sell in volume. Low promotional prices increased consumer demand, which in turn created supplier competition and lead to lower prices. Once prices became relatively low, more retail stores could

stock them – including discount, drug, grocery, rural, and independent stores. NEEA educated retailers and supported their promotional efforts, helping them succeed in selling CFLs.

- *Consumer purchases.* The promotions’ effects on prices allowed the purchaser base to expand beyond 50 percent of the population by attracting new purchasers with relatively low prices at an expanded range of retail outlets.
- *Product quality.* NEEA was a leader in supporting the evolving ENERGY STAR specifications and addressing early CFL design flaws. NEEA was an early and influential member of PEARL and laid the groundwork for the eventual inclusion of third-party product testing into the 2008 ENERGY STAR qualifying criteria. NEEA’s leadership in advancing product quality helped increase consumer acceptance and made strides toward overcoming CFLs’ negative reputation. These market outcomes were crucial to creating the opportunities for CFLs to become one of the major responses to address global warming, through media saturation, Wal-Mart’s sustainability initiatives and lighting efficacy legislation.

8.3 Remaining Market Barriers

Despite the market improvements described above, market actors (including representatives of CFL manufacturers and retailers as well as industry observers), program staff, and utility program managers identified several remaining market barriers for CFLs:

- **Inadequate consumer education.** Most market actors report that consumer education is the primary remaining market barrier for CFLs, particularly with regard to choosing the appropriate CFL for each application. Although the ENERGY STAR program has produced materials for retailers and website content to address the issue, the market actors in our sample report that more needs to be done.
- **Lack of widespread and sustained CFL availability.** While there have been vast improvements in CFL availability in the Northwest over the past decade, utility program managers and other market actors report that there are still great variations in availability by geography, store type, and CFL style. CFLs are still more available to consumers in urban versus rural areas, big-box stores are more likely to have an array of reasonably-priced CFLs in stock than other store types, and while bare spiral CFLs are available in many store types, several have not started stocking many (or any) specialty bulb styles. Many utility program managers, representatives of CFL manufacturers and retailers, and industry observers commented that CFL availability would drop off sharply if CFL promotions were discontinued in the region.
- **Varying CFL pricing.** Many interviewees expressed concern that CFL prices are still too high for many consumers during non-promotional periods. In general, specialty bulbs are very expensive compared to their incandescent-equivalents. Some commented that prices for most bulb types need to reach approximately \$2 per bulb before consumers will consider them as the “default lighting choice” rather than incandescent bulbs.
- **Inconsistent CFL quality.** Despite dramatic improvements in CFL quality over the past decade, additional improvements to CFL quality are needed, particularly for specialty bulbs. Representatives of CFL manufacturers and retailers repeatedly commented that dimming technologies continue to be a challenge for CFL manufacturers, possibly because of compatibility issues with the various dimmer switch technologies. Specialty bulb quality and consumer

understanding of appropriate applications will become increasingly important as CFL socket penetration continues to increase.

- **Lack of awareness regarding mercury and CFL disposal issues.** Recent media attention to the mercury content of CFLs could dissuade consumers from buying them. Many market actors feel that the public has not been adequately educated regarding the quantity of mercury in CFLs as compared with other items in their homes (e.g., thermometers and thermostats).
- **Inadequate CFL recycling infrastructure.** Market actors expressed a need for CFL recycling options, which are currently unavailable in many areas.

8.4 Project Cost-Effectiveness

This study provided some data and analysis that will be used to determine the project's cost-effectiveness. We provided an estimate of baseline units, which is the theoretical level of CFL sales that would have occurred in absence of regional market interventions, by combining and assessing existing CFL sales data. The baseline estimate for 2007 was 4.6 million CFLs, or nearly 1 CFL per household. We also provided some anecdotal information from our supplier interviews regarding measure cost. Suppliers indicated that non-promotional CFL price greatly depends on the retail channel, with Wal-Mart offering them as low as \$1.40 each, home improvement and mass merchandise stores offering them for between \$3 and \$4 per bulb, and drug stores pricing them at around \$7 or \$8 each.

8.5 CFL Promotions

NEEA's Fall Change a Light (FCAL) promotion was similar to the 2006 Savings with a Twist (SWAT) promotion with a continued focus on twister-style CFLs, non-traditional distribution channels and rural markets. Most promotional CFLs were sold for less than \$1.00 per bulb and nearly 1.8 million CFLs during the third and fourth quarters of 2007. The promotion was extended into 2008 for a handful of retailers because of shipment delays and product availability issues as well as requests from the retailers, and an additional 452,253 CFLs were sold during the first quarter of 2008 for a total of 2.2 million FCAL CFLs sold in 2007 and 2008.

Representatives of CFL manufacturers and retail chains that participated in NEEA's 2007 Fall Change a Light (FCAL) reported high general satisfaction with the promotion, and retailer representatives reported high levels of satisfaction with the marketing support associated with the promotion. Among the suggested improvements to the promotion were:

- NEEA should stipulate high-quality product specifications in the RFP that go beyond recommended bulb efficacy;
- The promotion should address CFL recycling issues; and
- NEEA should broaden the types of retailers that are allowed to participate in the promotion.

BPA ran a CFL promotion in 2007 and into 2008 which also leveraged the national ENERGY STAR Change a Light campaign, but the spring promotion focused on DIY, mass merchandise, and membership retail outlets. The promotion's primary focus was on specialty bulbs but a full range of styles were included in the promotion with incentive amounts ranging from \$1.25 to \$2.25 per bulb. Sales through the promotion reached nearly 1.8 million CFLs during 2007, with the majority of bulbs sold during the first quarter of 2007.

9. Conclusions and Recommendations

9.1 Conclusions

NEEA met its residential lighting project goals by the end of 2007 after a decade of market interventions. CFL sales in 2007 were over 18 million, the majority of Northwest households are repeat CFL purchasers, and robust quality assurance procedures are included in the 2008 ENERGY STAR CFL specification. NEEA's market interventions were instrumental in creating the right supplier conditions and product quality standards such that consumer acceptance expanded dramatically over the last few years. By 2006, increased positive media attention, Wal-Mart's sustainability initiatives and lighting efficacy legislation helped propel CFLs into mainstream status.

The expected short- and long-term Northwest lighting market outcomes have occurred, and according to the program theory, the expected impacts should be realized within the next few years. Is the market transformed? Based on past evidence, the program theory logic suggests that answer is an unequivocal yes. However, if we look forward and predict what market outcomes will occur in absence of continued interventions, the answer is probably "not yet" because of the uncertainty surrounding the sustainability of widespread CFL availability and low prices. Interviews with utility program managers substantiate this: although we didn't pose the question directly, a third of those we interviewed commented that the market is not yet fully transformed without prompting from the interviewers.

The recent and dramatic market developments have taken place as a result of the expansion of retail channels selling CFLs and the CFL purchaser base beyond early adopters, as well as hospitable external conditions. These market outcomes resulted from promotions that allowed non-traditional retail outlets to sell CFLs at very attractive prices. The dramatic market gains were also made possible by a confluence of concern regarding global warming and positive publicity from energy-efficiency program sponsors and the general media suggesting that CFLs are a very easy and cost-effective step toward addressing to the problem.

There could be some backsliding in market progress if grocery, drug and discount stores do not offer attractive prices and aggressively promote CFLs in the absence of CFL promotions. Many representatives of CFL manufacturers, retailers, and utilities in the Northwest assert that CFLs will disappear from many of these channels or that the chains will stock only one or two CFL models at prohibitively high prices if CFL promotions do not continue. An additional threat to sustaining the recent substantial gains in CFL purchases is the increasing media attention on the hazards associated with mercury in CFLs.

There are still market barriers and opportunities that could be addressed through market interventions to ensure that the full potential for CFL energy saving impacts is realized. Solid state lighting has advanced appreciably in the past few years, but household applications will be niche-only for the foreseeable future. To achieve the intended market impact of 50 percent residential socket saturation with CFLs, market actors and industry observers agree that the following CFL market barriers need to be reduced:

- Inadequate consumer education regarding proper CFL applications and the role of specialty bulbs;
- Lack of widespread and sustained availability;
- Varying CFL pricing (particularly in some regions/store types; particularly for specialty bulbs),

- Inconsistent quality (particularly for specialty bulbs);
- Lack of accurate information about the potential hazards of CFLs' mercury content; and
- Lack of proper CFL disposal infrastructure.

9.2 Recommendations

To ensure that NEEA's expected project impacts occur, we recommend that NEEA play a continued role in addressing these market barriers. Below we list remaining barriers in the CFL market and our specific recommendations to address them. These recommendations are based on our understanding of today's CFL market and barriers and our expectation for progress in the near-term (for example, the next two years). As such we suggest that NEEA assess the region's residential lighting market in approximately two years to determine whether future support is still necessary, and if so, to guide future strategies.

Inadequate consumer education regarding proper CFL applications and the role of specialty bulbs.

- Continue to support ENERGY STAR's efforts to educate consumers regarding how to select the proper CFLs for specific applications.
- Continue to support retailers and manufacturers to educate consumers on proper CFL applications.
- Continue to support local utilities to directly educate consumers on these issues.

Lack of widespread and consistent availability and affordability.

- Continue strategic, targeted market interventions that address availability in non-traditional retail channels, leveraging local utility and supplier resources.
- Continue relationships with suppliers and the national ENERGY STAR program to support the development of the specialty CFL market.

Inconsistent quality (particularly for specialty bulbs).

- Continue to support CFL quality assurance initiatives.
- Continue to support utility promotions in the region and ensure that they include high-quality products.
- Continue relationships with regional suppliers to encourage high-quality product supply and sales.

Lack of accurate information about the potential hazards of CFLs' mercury content and disposal infrastructure.

- Continue to provide input in developing a consistent message for consumers regarding the mercury issue.
- Continue supporting local utilities and suppliers to educate consumers on mercury issues.
- Continue to work with various stakeholders at the regional and national level to support the development of disposal infrastructure.

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A. Data Collection Instruments

- A.1 Manufacturer Representative Interview Guide
- A.2 Retail Representative Interview Guide
- A.3 Industry Observer Interview Guide
- A.4 Utility Program Manager Interview Guide

A.1 Manufacturer Representative Interview Guide

[FCAL_NUMBER] = # CFLs discounted by FCAL 07 promotion in the Northwest

[CFL_TYPE] = Styles/wattages of CFLs produced and sold through the FCAL 07 promotion

[SPRING_NUMBER] = # CFLs discounted by Spring CAL 07 promotion in the Northwest

[EXPLAIN PURPOSES OF INTERVIEW.]

[PROVIDE ASSURANCES OF CONFIDENTIALITY.]

[IF NECESSARY, EXPLAIN THAT “NORTHWEST” INCLUDES ID, MT, OR AND WA.]

Introduction

I’m calling to talk with you about the 2007 Change a Light promotions in the Northwest. There were two Northwest Change a Light promotions in 2007 – one in the Spring that was sponsored by the Bonneville Power Administration and Energy Trust of Oregon, and another in the fall that was sponsored by Northwest ENERGY STAR with support from the Northwest Energy Efficiency Alliance. [IF PAST PARTICIPANT: Before 2007, the Fall Change a Light promotion was called the “Savings with a Twist” promotion.]

I1. Are you familiar with the Change a Light promotions in the Northwest?

0. No

1. Yes

99. Don’t know/refused

IF I1 = 1, VERIFY THAT RESPONDENT IS FAMILIAR WITH BOTH THE SPRING AND FALL PROMOTIONS AND IS NOT CONFUSING THESE WITH OTHER PROMOTIONS (E.G., NATIONAL CAMPAIGN, WAL-MART CAMPAIGN, ETC.)

IF I1 = 0 OR 99, PROVIDE MORE DETAIL ON PROMOTIONS. IF STILL UNFAMILIAR, DETERMINE MORE APPROPRIATE CONTACT.

Manufacturer Characteristics

I’d like to start by getting a little bit of background information on the types of lighting products your company manufactures. Does your company produce... bulbs? hard-wired fixtures? torchieres or table lamps? ceiling fans?

[FOR EACH CATEGORY, IF NECESSARY] Do you produce compact fluorescent [...] only, or do you produce compact fluorescent [...] in addition to other types? NOTE “OTHER TYPES” MAY INCLUDE INCANDESCENT, HALOGEN, LED, ETC.]

Product Type	1 = YES; 0 = NO; 99 = DK/REF	
	M1a. CFLs	M1b. Non-CFLs
1. Bulbs		
2. Hard-wired fixtures		
3. Torchieres/table lamps		
4. Ceiling fans		

M2a. Does your company produce any CFL types other than the common twister (or spiral) style CFLs?
0. No
1. Yes
99. Don't know/refused

M2b. [IF M2a = 1] What types or styles of specialty CFLs does your company manufacture?

M3. About what percent of your total light bulb sales do CFLs represent?
[RECORD PERCENT. DK = -88. REFUSED = -99.] _____

M4. Approximately what proportion of the CFLs you produce are ENERGY STAR qualified?
[RECORD PERCENT. DK = -88. REFUSED = -99.] _____

M5. What is the value of the ENERGY STAR brand to your company?
[DO NOT READ LIST. ACCEPT MULTIPLE RESPONSES.]
1. Differentiates from other products
2. Allows for participation in utility programs
3. Allows access to specific retailers (Details: _____)
4. Access to third-party testing (PEARL)
5. Sustainability message
6. Good for the environment
7. National brand
8. National message
9. Other (Explain: _____)

Effects of Change a Light Promotions

Let's talk about the 2007 Change a Light promotions in the Northwest starting with the fall promotion. Recall that the Fall Change a Light promotion provided lighting manufacturers with buydowns of between roughly 50 cents and 2 dollars per bulb for CFLs.

P1. According to our records, you sold [CFL_TYPE] through the Fall 2007 promotion. Why did you choose these particular products?

P2. Our records also show that you sold [FCAL_NUMBER] CFLs through the Fall promotion in the Northwest. Do you think sales of these CFLs would have been higher, lower, or about the same during this period if the manufacturer buydowns had **NOT** been available?
1. Lower
2. Higher
3. About the same
99. Don't know/refused

P2a. [IF P2 = 1. Lower] By what percentage do you estimate your sales would be lower during this period if these manufacturer buydowns for CFLs were not available?
[RECORD PERCENT. DK = -88. REFUSED = -99.] _____

I want to make sure I understand you correctly. You estimate that your Northwest CFL sales would have been [P2a] percent **lower** without the manufacturer buydown. So if you actually sold 100 promotional CFLs, you think you'd have sold only about [100-P2a] in that period if the incentives hadn't been available? [IF RESPONSE ≠ YES, CLARIFY ESTIMATED SALES DECREASE]

P2b. [IF P2 ≠ 1. Lower] Why do you say that?

P4a. Roughly what proportion of your TOTAL 2007 CFL sales in the Northwest did the [FCAL_NUMBER] **Fall** Change a Light 2007 promotional CFLs represent?
[RECORD PERCENT. DK = -88. REFUSED = -99.] _____

P4b. Our records show that you sold approximately [SPRING_NUMBER] CFLs through the **Spring** Change a Light promotion. Roughly what proportion of your TOTAL 2007 CFL sales in the Northwest did the **Spring** Change a Light 2007 promotional CFLs represent?
[RECORD PERCENT. DK = -88. REFUSED = -99.] _____

P4c. [SKIP IF RESPONDENT IS ABLE TO ANSWER P4a AND P4b] All together, roughly what proportion of your total 2007 CFL sales in the Northwest did the Spring and Fall Change a Light promotions represent?
[RECORD PERCENT. DK = -88. REFUSED = -99.] _____

P5. Besides the incentives, do you think the spring and/or fall Change a Light promotions did anything else to help you sell CFLs?
0. No
1. Yes
99. Don't know/refused

P5a. [IF P5 = 1. Yes] Can you describe what else the promotions did to help you sell CFLs?
[NOTE ANY DISTINCTIONS BETWEEN SPRING/FALL PROMOTIONS.]

P6. The Northwest Change a Light promotions have offered incentives during the Spring and Fall. When these incentives were not available, what typically happened to the price of the CFLs that you sold through the promotion?
1. Some discount was maintained for awhile
2. The entire discount was maintained for awhile
3. No discount was offered for these products in non-promotional periods
4. Don't offer these products during non-promotional periods
88. Other (specify: _____)
99. Don't know/refused

P6a. [IF P6 = 1 or 2] Typically how long would some discount be maintained before your CFLs return to their normal price?

P6b. Does this differ based on the type of product, retail channel, or anything else? [PROBE FOR DIFFERENCES IN RESPONSE TO P6a BY TIME OF YEAR, FALL VS. SPRING PROMOTION, ETC.]

P6c. What would you say was the average price for a less than 30-Watt twister-style CFL in the Northwest during 2007? [PROBE FOR DIFFERENCES BY TIME OF YEAR, STATE, ETC.]

P7. What effects, if any, do you think the Northwest's Change a Light promotions have on CFLs for which they do not provide incentives?

Satisfaction with Change a Light Promotions

T1. Using another scale of 1 to 5 – this time, where 1 = “not at all satisfied” and 5 means “very satisfied,” how satisfied were you with the **Fall** 2007 Change a Light CFL promotion in the Northwest?

[RECORD RATING (1 TO 5). DK = -88. REFUSED = -99.] _____

T1a. [IF T1 = 1, 2, or 3] Why do you say that?

T2. Using the same 1 to 5 scale, how satisfied were you with the **Spring** 2007 Change a Light CFL promotion in the Northwest?

[RECORD RATING (1 TO 5). DK = -88. REFUSED = -99.] _____

T2a. [IF T2 = 1, 2, or 3] Why do you say that?

T3. Do you think the Northwest's Change a Light promotions could be improved in any way? [IF YES, DESCRIBE. SPECIFY SPRING/FALL/BOTH.]

T4. How do the Northwest Change a Light campaigns compare with national campaigns and other regional campaigns? [PROMPT: Are there any features of these other campaigns that might be effective if used in the Northwest? SPECIFY SPRING/FALL/BOTH.]

T5. If CFL discounts were offered to you again through the Change a Light promotions in the Northwest, would you participate again?

- 0. No
- 1. Yes
- 2. Maybe
- 99. Don't know/refused

T5a. [IF T5 = 0 or 2] Why do you say that? [PROBE FOR REASONS OR FOR CONDITIONS UNDER WHICH THEY WOULD PARTICIPATE OR DISTINCTIONS BETWEEN FALL/SPRING CAMPAIGNS.]

Long-Term Effects of Northwest Energy-Efficiency Programs

L0. Prices for many types of CFLs have decreased over the past several years. What factors do you think contributed to this price drop?

- L1. Various programs in the Northwest have offered CFL incentives to manufacturers for many years. What effects, if any, do you think these incentives have had on the prices for CFLs?
[DISTINGUISH WHETHER EFFECTS DESCRIBED ARE FOR PROMOTIONAL CFLs ONLY OR FOR ALL CFLs. NOTE MENTION OF ANY SPECIFIC CAMPAIGNS OR CAMPAIGN SPONSORS.]
- L1a. [IF L1 = Lower prices] On a scale of 1 to 5 where 1 means “not at all important” and 5 means “very important,” how important have these Northwest CFL promotions been in reducing the prices of all CFL bulbs?
[RECORD RATING (1 TO 5). DK = -88. REFUSED = -99.] ____
- L2. Energy-efficiency programs in the Northwest have been requiring CFLs to meet ENERGY STAR quality standards for several years. Most recently they have required that CFLs have higher lumen-to-watt ratings. What effects, if any, do you think that these program requirements have had on CFL quality?
- L2a. [IF L2 = “improved quality”] On a scale of 1 to 5 where 1 means “not at all important” and 5 means “very important,” how important have these requirements been in improving CFL quality? [i.e., CFL types/styles/wattages for which incentives have not been available.]
[RECORD RATING (1 TO 5). DK = -88. REFUSED = -99.] ____
- L2b. Do you think that Northwest Change a Light promotions have affected the quality of all CFLs, or only the CFL models and styles included in the promotions? [WHY?]
- L3. Energy-efficiency programs have been promoting CFLs for many years, through incentives as well as advertising. On a scale of 1 to 5 where 1 means “not at all important” and 5 means “very important,” how important have these energy-efficiency programs been in improving customer familiarity and acceptance of CFLs?
[RECORD RATING (1 TO 5). DK = -88. REFUSED = -99.] ____
- L4. Are there any negative effects of CFL promotions? [IF NECESSARY: There is some concern that the focus of CFL promotions on ENERGY STAR products could hinder development and introduction of new CFL styles for which ENERGY STAR has not yet developed standards, for example.] [IF YES, DESCRIBE NEGATIVE EFFECTS.]

CFL Supply Chain & Market Trends

- S1. How would you characterize the current market for CFL products in the Northwest in terms of competitive distribution? For example, are there a few major players responsible for the major share of product sales? Or are there a large number of major players?
- S2. Are there any facets of the market structure for compact fluorescent products (bulbs/fixtures) that are unique to the Northwest? [IF YES, DESCRIBE.]
- S3. We’re interested in how your CFL products move through the market. Can you tell me where a typical CFL stops along its journey from the manufacturing facility to the shelf in a retail store?

- S3a. How long does this process generally take – from the date you order CFLs from a specific manufacturing facility to the date they arrive in a retail store? [PROBE FOR SEASONAL OR OTHER DIFFERENCES.]
- S4. Are there factors inherent in the manufacturing, importing or distributing processes that have restricted the production and supply of CFL products in the past year or so? [IF YES, DESCRIBE. IF NECESSARY, PROMPT WITH EXAMPLES – E.G., SHORTAGES OF MANUFACTURING INPUTS (LABOR, RAW MATERIALS), IMPORTATION ISSUES, ETC.]
- S4b. [ASK IF S4 ≠ DK] Has there been any progress recently to reduce these barriers?
- S4c. [ASK IF S4 ≠ DK] What can be done to overcome these barriers? [PROBE AS TO WHETHER THERE IS A ROLE FOR NEEA, NEMA, DOE, EPA, ENERGY TRUST, UTILITIES, OTHER ORGANIZATIONS IN OVERCOMING BARRIERS.]
- S5. Have you experienced any difficulties supplying the market or meeting the demand for CFLs in the Northwest over the past few years, or do you anticipate any such difficulties in the next few years? [IF YES, PROBE FOR DIFFERENCES BY PRODUCT STYLE/WATTAGE, STORE TYPE, STATE, ETC.]
- S6. Have you seen any changes in the supply chain for CFLs in the Northwest over the past few years, or do you anticipate any such changes within the next few years? [IF YES, DESCRIBE CHANGES, POSSIBLE UNDERLYING REASONS FOR CHANGES.]
- S7. [ASK IF NOT COVERED IN S6.] Over the past few years, have there been any major new market entrants in the U.S. or the Northwest (manufacturers or retailers) that have had any noteworthy effect on the Northwest market for CFLs? [IF YES, DESCRIBE ENTRANTS, EFFECTS.]
- S8. What are your expectations for CFL sales in 2008 and beyond? [IF NECESSARY: total sales – promotional + non-promotional CFLs. PROBE FOR REASONS BEHIND THESE EXPECTATIONS.]
- S8a. Do you foresee any differences in sales potential for different CFL styles, or in different store types, or any other differences? [PROBE FOR DIFFERENCES BY PRODUCT STYLE/WATTAGE, STORE TYPE, ETC.]

In December 2007 Congress passed a new Energy Bill. One component of the bill calls for a gradual phase-out of low-efficacy lamps over the next 4 to 12 years.

- S9a. [IF M1B1=1 (MANUFACTURES INCANDESCENTS)] How do you think this legislation will affect your production of incandescent lamps? [PROBE: Will you stop producing incandescents by a certain date? Or will you phase out production? When do you think this will occur?]
- S9b. [IF M1B1≠ 1 (DOES NOT MANUFACTURE INCANDESCENTS)] How do you think this legislation will affect production of incandescent lamps? [PROBE: Do you think incandescent bulb manufacturers will stop producing them by a certain date or phase out production? When do you think this will occur?]

S10. How do you think the legislation will affect retailers who carry incandescent lamps? [PROBE: Do you think they'll continue to sell incandescents until they sell through their stocks? Any other effects?]

Those are all of the questions I have for you today. Thank you so much for your time and your valuable comments.

[CLOSE.]

A.2 Retail Representative Interview Guide

[FCAL_NUMBER] = # CFLs discounted by FCAL 07 promotion in the Northwest

[CFL_TYPE] = Styles/wattages of CFLs produced by the relevant manufacturer and sold through the FCAL 07 promotion

[SPRING_NUMBER] = # CFLs discounted by Spring CAL 07 promotion in the Northwest

[EXPLAIN PURPOSES OF INTERVIEW.]

[PROVIDE ASSURANCES OF CONFIDENTIALITY.]

[IF NECESSARY, EXPLAIN THAT “NORTHWEST” INCLUDES ID, MT, OR AND WA.]

Introduction

I’m calling to talk with you about the 2007 Fall Change-a-Light promotion in the Northwest. The promotion was sponsored by Northwest ENERGY STAR with support from the Northwest Energy Efficiency Alliance. [IF PAST PARTICIPANT: Before 2007, the Fall Change-a-Light promotion was called the “Savings with a Twist” promotion.]

- I1. Are you familiar with the 2007 Change-a-Light [and prior Savings with a Twist] promotion(s) in the Northwest?
- 0. No
 - 1. Yes
 - 99. Don’t know/refused

IF I1 = 1, VERIFY THAT RESPONDENT IS NOT CONFUSING THESE WITH OTHER PROMOTIONS (E.G., SPRING CAL, NATIONAL CAMPAIGN, WAL-MART CAMPAIGN, ETC.)

IF I1 = 0 OR 99, PROVIDE MORE DETAIL ON PROMOTIONS. IF STILL UNFAMILIAR, DETERMINE MORE APPROPRIATE CONTACT.

Retailer Characteristics

I’d like to start by getting a little bit of background information on the types of lighting products your stores in the Northwest sell. Do your stores sell... bulbs? hard-wired fixtures? torchieres or table lamps? ceiling fans?

[FOR EACH CATEGORY, IF NECESSARY] Do you sell compact fluorescent [...] only, or do you sell compact fluorescent [...] in addition to other types? NOTE “OTHER TYPES” MAY INCLUDE INCANDESCENT, HALOGEN, LED, ETC.]

Product Type	1 = YES; 0 = NO; 99 = DK/REF	
	M1a. CFLs	M1b. Non-CFLs
1. Bulbs		
2. Hard-wired fixtures		
3. Torchieres/table lamps		
4. Ceiling fans		

-
- M2a. Do your stores sell any CFL types other than the common twister (or spiral) style CFLs?
0. No
 1. Yes
 99. Don't know/refused
- M2b. [IF M2a = 1] What types or styles of specialty CFLs do your stores sell?
- M3. About what percent of your total light bulb sales [in the Northwest] do CFLs represent?
[RECORD PERCENT. DK = -88. REFUSED = -99.] _____
- M4. Approximately what proportion of the CFLs you sell [in the Northwest] are ENERGY STAR qualified?
[RECORD PERCENT. DK = -88. REFUSED = -99.] _____
- M5. What is the value of the ENERGY STAR brand to your company?
[DO NOT READ LIST. ACCEPT MULTIPLE RESPONSES.]
1. Differentiates from other products
 2. Allows for participation in utility programs
 3. Allows access to specific retailers (Details: _____)
 4. Access to third-party testing (PEARL)
 5. Sustainability message
 6. Good for the environment
 7. National brand
 8. National message
 9. Other (Explain: _____)

General Effects of Energy-Efficiency Programs

Next I'd like to talk with you about CFL promotions in general.

- G1. What do you think are the main effects that CFL promotions (such as utility promotions) have on the way that you do business in your stores? [Note: This question does not pertain to the store's own sales on CFLs.] [DO NOT PROMPT WITH EXAMPLES.]
- G1a. Which of the things you just mentioned would you say is *the* main effect of these types of CFL promotions on your stores?
- G2. [IF NOT ADDRESSED IN G1] Do CFL promotions generally affect your marketing strategies? (If yes, how?)
- G3. [IF NOT ADDRESSED IN G1] Do CFL promotions generally affect where you position CFLs in your stores? (If yes, how?)
- G4. Generally when you run CFL promotions in your stores, do you stock the same SKUs as you do during non-promotion periods, or are the promotional CFLs completely separate SKUs?

Satisfaction with Fall Change-a-Light Promotion

Now let's talk specifically about the Fall 2007 Change-a-Light promotion in the Northwest. The promotion provided lighting manufacturers with financial incentives to reduce their prices to retailers for spiral-style CFLs.

- T1. Using a scale of 1 to 5 where 1 means "not at all satisfied" and 5 means "very satisfied," how satisfied were you with the Fall 2007 Change-a-Light CFL promotion in the Northwest?
[RECORD RATING (1 TO 5). DK = -88. REFUSED = -99.] _____
- T1a. [IF T1 = 1, 2, or 3] Why do you say that?
- T3. Do you think the Northwest's Fall 2007 Change-a-Light promotion could be improved in any way?
[IF YES, DESCRIBE.]
- T4. How did the Fall 2007 Change-a-Light promotion compare with national campaigns and other regional campaigns? [PROMPT: Are there any features of these other campaigns that might be effective if used in the Northwest?]
- T4b. Did you participate in any of NEEA's prior Savings with a Twist fall promotions?
0. No
1. Yes
99. Don't know/refused
- T4c. How did the Fall 2007 Change-a-Light promotion compare with prior SWAT promotions?
- T5. If CFL discounts were offered to you again through a promotion like the Fall 2007 Change-a-Light promotion in the Northwest, would you participate?
0. No
1. Yes
2. Maybe
99. Don't know/refused
- T5a. [IF T5 = 0 or 2] Why do you say that? [PROBE FOR REASONS OR FOR CONDITIONS UNDER WHICH THEY WOULD PARTICIPATE.]

Effects of Fall Change-a-Light Promotion

- P2. Our records show that you sold [FCAL_NUMBER] CFLs through the promotion in the Northwest. Do you think sales of these CFLs would have been higher, lower, or about the same during this period if the Fall 2007 Change-a-Light incentives had **NOT** been available?
1. Lower
2. Higher
3. About the same
99. Don't know/refused

P2a. [IF P2 = 1. Lower] By what percentage do you estimate your sales would be lower during this period if these Change-a-Light incentives for CFLs were not available?
[RECORD PERCENT. DK = -88. REFUSED = -99.] _____

I want to make sure I understand you correctly. You estimate that your Northwest CFL sales would have been [P2a] percent **lower** without the Fall Change-a-Light incentives. So if you actually sold 100 promotional CFLs, you think you'd have sold only about [100-P2a] in that period if the incentives hadn't been available?
[IF RESPONSE ≠ YES, CLARIFY ESTIMATED SALES DECREASE]

P2b. [IF P2 ≠ 1. Lower] Why do you say that?

P4a. Roughly what proportion of your TOTAL 2007 CFL sales in the Northwest did the [FCAL_NUMBER] Fall Change-a-Light 2007 promotional CFLs represent?
[RECORD PERCENT. DK = -88. REFUSED = -99.] _____

P5. Besides the incentives, do you think the Fall Change-a-Light promotion did anything else to help you sell CFLs?
0. No
1. Yes
99. Don't know/refused

P5a. [IF P5 = 1. Yes] Can you describe what else the promotion did to help you sell CFLs?
[NOTE ANY DISTINCTIONS BETWEEN SPRING/FALL PROMOTIONS.]

P6. After the Fall 2007 Change-a-Light promotion ended, what happened to the price of the CFLs that you sold through the promotion?
1. Some discount was maintained for awhile
2. The entire discount was maintained for awhile
3. No discount was offered for these products in non-promotion periods
4. Don't offer these specific CFLs during non-promotion periods
5. Don't offer any CFLs during non-promotion periods
88. Other (specify: _____)
99. Don't know/refused

P6a. [IF P6 = 1 or 2] After a CF: promotion, how long is some discount typically maintained before your CFLs return to their normal prices?

P6c. What would you say was your average price for a twister-style CFL in 2007? [PROBE FOR DIFFERENCES DURING/AFTER PROMOTION]

P7. What effects, if any, do you think the Fall 2007 Change-a-Light promotion had on CFLs the *other* CFLs you sell (the ones for which the promotions did not provide incentives)?

Long-Term Effects of NEEA's Energy-Efficiency Programs

L0. Prices for many types of CFLs have decreased over the past several years. What factors do you think contributed to this price drop?

-
- L1. Various programs in the Northwest have offered CFL incentives to manufacturers for many years. What effects, if any, do you think these incentives have had on the prices for CFLs? [NOTE MENTION OF ANY SPECIFIC CAMPAIGNS OR CAMPAIGN SPONSORS.]
- L1a. [IF L1 = Lower prices] On a scale of 1 to 5 where 1 means “not at all important” and 5 means “very important,” how important have these Northwest CFL promotions been in reducing the prices of all CFL bulbs?
[RECORD RATING (1 TO 5). DK = -88. REFUSED = -99.] _____
- L3. Energy-efficiency programs in the Northwest have been promoting CFLs for many years, through incentives as well as advertising. On a scale of 1 to 5 where 1 means “not at all important” and 5 means “very important,” how important have these energy-efficiency programs been in improving customer familiarity and acceptance of CFLs?
[RECORD RATING (1 TO 5). DK = -88. REFUSED = -99.] _____
- L5. On the same 1 to 5 scale, how important do you think NEEA’s 2007 Fall Change-a-Light promotion [and its prior Savings with a Twist promotions] was/were in increasing consumer satisfaction with CFLs?
[RECORD RATING (1 TO 5). DK = -88. REFUSED = -99.] _____
- L6. On the same 1 to 5 scale, how important do you think NEEA’s 2007 Fall Change-a-Light promotion [and its prior Savings with a Twist promotions] was/were in increasing the rate at which consumers purchase CFLs?
[RECORD RATING (1 TO 5). DK = -88. REFUSED = -99.] _____

CFL Market Trends

- S8. What are your expectations for CFL sales in your stores in the Northwest during 2008 and beyond? [Distinguish among total sales, promotional sales, and non-promotional sales. PROBE FOR REASONS BEHIND THESE EXPECTATIONS.]
- S8a. Do you foresee any differences in sales potential for different CFL styles?
- S9a. In December 2007 Congress passed a new Energy Bill. One component of the bill calls for a gradual phase-out of low-efficacy lamps over the next 4 to 12 years. How do you think this legislation will affect your sales of incandescent lamps? [PROBE: Will you stop selling incandescents by a certain date? Or will you phase out sales? When do you think this will occur?]
- S10. Do you have any other comments regarding CFL promotions in the Northwest?

Those are all of the questions I have for you today. Thank you so much for your time and your valuable comments.

[CLOSE.]

A.3 Industry Observer Interview Guide

We are evaluating the ENERGY STAR® Consumer Products lighting promotions for the Northwest Energy Efficiency Alliance (NEEA). NEEA is interested in understanding how the market for CFLs has evolved over time and what effects their programs have had on the market. Right now we're interviewing a small number of industry experts to gather their market insights.

1. Can you describe your organization's role in the lighting market? How has it changed over time?
2. What's been your organization's primary focus with regard to lighting? How has your organization intervened in the market over time?
3. What effects do you think these interventions have had?
4. What do you think are the major factors influencing CFL sales at present? [E.g., utility promotions, Wal-Mart]
5. [If not addressed above] How would you describe the general effects that utility promotions have had on the market for CFLs? [Comment specifically on NEEA's promotions if possible.]
6. NEEA is interested in understanding the effects that their CFL promotions have had on the CFL market in the Northwest and how these effects may have interacted with other influences on the market. What do you think?
7. How would you describe the long-term effects of CFL promotions [if possible: in the Northwest] on...
 - CFL availability
 - CFL diversity
 - CFL sales
 - CFL prices
 - Consumer satisfaction with CFLs
 - Other effects?
8. What are the remaining market barriers for CFLs? What can be done to address them?
9. What sort of assistance do you think your organization needs to provide to the market for residential lighting products over the next couple of years? What role do you see for energy-efficiency program sponsors (utilities, NEEA, etc.)?
10. How will we know when the CFL market has been transformed? (E.g., market penetration = x, or a certain level of growth over time?)
11. What trends do you anticipate for future CFL sales [in the Northwest]? What role do you think CFL promotions have to play in this?

A.4 Utility Program Manager Interview Guide

Hello, my name is _____ and I am calling from KEMA, Inc. We are evaluating the ENERGY STAR® Consumer Products lighting promotions for the Northwest Energy Efficiency Alliance (NEEA). Right now we're interviewing a small number of utility contacts to gather feedback and insights on those promotions. I'd like to get feedback on your perception of these programs over the past few years, what has worked well for you, what aspects have not, or what the projects could have done better. I appreciate the time you have taken to speak to me and would like to keep our interview at 30 minutes or less. Please keep in mind that your answers are confidential and will be grouped together in aggregate only. Your name will not be used in any reports or documents.

Utility Programs

1. Can you tell me a little bit about your current lighting promotions? Other current consumer products promotions? [Probe for details on product types, discount amounts, discounted prices, approximate volume of promotions - # rebates/incentives, # participants, budget, etc.]
2. What are your future plans for lighting promotions? [Probe for the next couple of years and beyond]

NEEA's Contribution to Current CFL Market Status

3. What trends have you seen in CFL availability in the Northwest over time? (**Probe** for differences by CFL style [bare spiral vs. specialty], geography [state, urban/rural], retail channel)
 - On a scale of 1 to 5 where 1 means "not at all important" and 5 means "very important," how important have NEEA's CFL promotions been in increasing the availability of CFLs?
 - What other factors have contributed to these changes?
 - For what fraction of these changes is each factor responsible?
4. What trends have you seen in terms of the different types of CFLs available in the Northwest over time? (Probe as described above)
 - On a scale of 1 to 5 where 1 means "not at all important" and 5 means "very important," how important have NEEA's CFL promotions been in increasing the diversity of CFLs available in the Northwest?
 - What other factors have contributed to these changes?
 - For what fraction of these changes is each factor responsible?
5. What trends have you seen in CFL prices in the Northwest over time? (Probe as described above)
 - On a scale of 1 to 5 where 1 means "not at all important" and 5 means "very important," how important have NEEA's CFL promotions been in increasing the affordability of CFLs?
 - What other factors have contributed to these changes?
 - For what fraction of these changes is each factor responsible?

6. What trends have you seen in consumer satisfaction with CFLs in the Northwest over time? (Probe as described above)
 - On a scale of 1 to 5 where 1 means “not at all important” and 5 means “very important,” how important have NEEA’s CFL promotions been in increasing consumer satisfaction with CFLs?
 - What other factors have contributed to these changes?
 - For what fraction of these changes is each factor responsible?
7. To what extent do CFL availability, diversity, affordability, and consumer satisfaction still impact CFL purchases in the Northwest? (Probe as described above)
 - What other barriers, if any, do you think exist in your service territory?
 - What can be done to overcome these barriers? (And by whom?) [PROBE for NEEA’s role if not mentioned.]
8. Have you encountered concerns on the part of consumers regarding the mercury content in CFLs?
 - [If yes] Do you think these concerns have impacted purchases?
 - How have you handled these concerns?
9. Outside of the northwest, how do you think CFL supply and market shares have changed over time [in the rest of the country]?
 - What factors contributed to these changes? [NEEA and non-NEEA influences]
 - Do you think that NEEA’s promotions have had any influence on CFL distribution and/or quality in other parts of the country?
 - For what fraction of these changes are NEEA and other factors responsible?

NEEA’s CFL Promotions

10. Did your utility participate in NEEA’s 2007 Fall Change-A-Light (FCAL) promotion? [IF NO, SKIP TO Q12]
 - What component(s) of the promotion did you think were most successful?
 - What could have been done to improve the promotion?
11. What effects did NEEA’s the 2007 FCAL Promotion have on:
 - CFL sales in your service territory;
 - CFL prices in your service territory;
 - Other effects?
12. On a scale of 1 to 5 where 1 means “not at all satisfied” and 5 means “very satisfied,” how satisfied were you in general with the 2007 FCAL promotion?
 - [If satisfaction rating <4] Why do you say that?
13. Has your utility participated in any of NEEA’s prior “Savings with a Twist” CFL promotions?
 - How did prior promotions compare with the 2007 FCAL promotion?

-
14. How would you describe the long-term effects of energy-efficiency programs for lighting in the Northwest?
- On total CFL sales in your service territory;
 - On CFL prices in your service territory;
 - Other effects?
15. On a scale of 1 to 5 where 1 means “not at all important” and 5 means “very important,” how important have NEEA’s CFL promotions been in encouraging lighting manufacturers to support/promote ENERGY STAR?
16. On that same scale, how important have NEEA’s CFL promotions been in improving consumer acceptance of CFLs?

CFL Quality

17. What trends have you seen in terms of changes in CFL product quality over time? (Probe for differences by product type, retail channel, etc.)
- On a scale of 1 to 5 where 1 means “not at all important” and 5 means “very important,” how important have NEEA’s CFL promotions been in increasing the availability of CFLs?
 - What other factors have contributed to these changes?
 - For what fraction of these changes is each factor responsible?
18. What do you think is left to do with regard to CFL quality? (How do you see product quality changing in the future?)

Future Outlook

19. What trends do you anticipate for future CFL sales in the Northwest? [near- and long-term] (Probe for geography [state, urban/rural], retail channel)
20. What is the current CFL market share in your service territory?
- Do you think that you need to take an active role in further increasing market share of CFLs in your service territory? (Do you have a goal? Or do you think it will increase as a result of natural occurrences in the market place [e.g., consumer awareness, legislative measure, manufacturer marketing]?)
 - (IF MORE ACTIVE ROLE IS NEEDED) If so, is there something specific NEEA could do to help you increase market penetration?
21. What sort of assistance would you like NEEA to provide over the next couple of years for residential lighting promotions or other lighting projects?
- What specific needs does your utility have with regard to residential CFLs?
 - What specific needs does your utility have with regard to other consumer products?

B. Market Characterization – Additional Details

B.1 CFLs

B.1.1 Bulb Styles

Bare spiral and mini-spiral (also known as twister and mini-twister) CFL models are the most common styles of ENERGY STAR qualified CFLs, representing nearly two-thirds of the total models produced in 2007. However, today there is a wide variety of qualified CFL models on the market. Table B-1 lists the styles of qualified CFL models available in order from most to least commonly produced in 2007.

The number of bare mini-spiral CFL models produced in 2007 increased by 85 percent over the number produced in 2006, from 476 to 882 models. Bare mini-spiral CFL accounted for 37 percent of total CFL models produced in 2007 (up from 26% of total models produced in 2006) while the number of bare spiral models decreased by 8 percentage points within the same period (from 36% in 2006 to 28% in 2007). This may reflect the shift toward smaller-sized spiral CFLs to which the manufacturers' representatives alluded (see Section 1 for details).

Table B-1
Number of ENERGY STAR CFL Models by Style, 2006 and 2007

CFL Style	2006		2007		Change From 2006 to 2007	
	# Models Produced	% of Total Models Produced	# Models Produced	% Change in # Models	# Models Produced	% of Total Models Produced
Bare- mini-spiral (mini-twister)	476	26%	882	37%	406	85%
Bare spiral (twister)	655	36%	671	28%	16	2%
Covered reflector	236	13%	336	14%	100	42%
Covered A-line	135	7%	165	7%	30	22%
Covered globe	114	6%	141	6%	27	24%
Other	212	11%	210	9%	8	32%
Total	1,818	100%	2,405	100%	587	4%

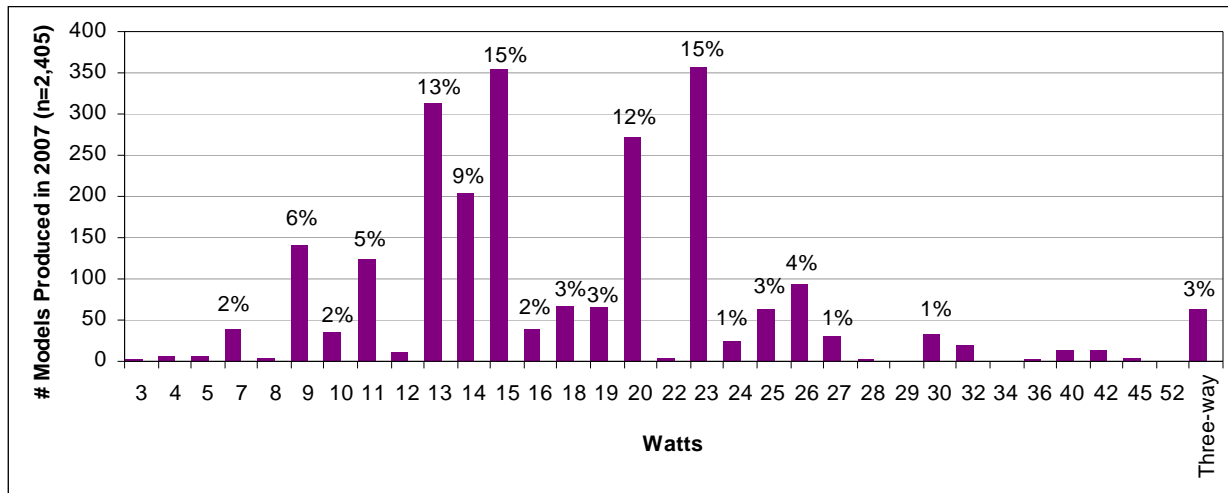
* "Other" model types include bare triple-tube, covered bullet, bare quadruple-tube, covered candle, bare twin-tube, bare circuline, and covered post, each of which represents less than 5 percent of ENERGY STAR CFL models produced in 2007.

Source: U.S. EPA, 2008d.

B.1.2 Bulb Wattage

ENERGY STAR CFL wattages range from 3 Watts to 52 Watts. Figure B-1 provides the numbers of separate CFL models currently manufactured by CFL wattage category as of the end of 2007. Seventy-one percent of the qualified models produced in 2007 were between 13 and 23 Watts, while 15 Watt and 23 Watt CFLs each represent 15 percent of the total models produced. Three-way CFLs represent 3 percent of the models produced in 2007.

Figure B-1
Number of ENERGY STAR CFL Models by Bulb Wattage, 2007



Source: U.S. EPA, 2008d.

B.1.3 Bulb Manufacturers

Table B-2 shows the ten manufacturers that produced the largest number of CFL models in 2007. Combined, these companies produce 43 percent of the total ENERGY STAR CFL models available. Less than 14 percent of the CFL models manufactured in 2007 were produced by the three largest multi-product lighting manufacturers (Osram Sylvania, GE, and Philips). Several of the top CFL producers are active only (or primarily) in the energy-efficient lighting market.

Osram Sylvania moved up from the number 2 spot in 2006 to the number 1 spot in 2007, swapping places with TCP and increasing the number of models produced by 3 percentage points. Globe Electric, Inc. is new to the top 10 list in 2007 (up from number 16 in 2006), forcing Philips Lighting Company from the number 10 spot in 2006 to the number 11 spot in 2007. Globe Electric is headquartered in Quebec, Montreal, and according to the company’s website, its Globe Electric Company (USA) focuses its sales efforts on “retail channels such as food and drug stores, hardware and home improvement stores, and mass market and specialty market retail outlets.”⁴³

⁴³ <http://www.globe-electric.com>

Table B-2
Top 10 ENERGY STAR CFL Manufacturers by Number of Models Produced, 2006 and 2007

Company	# Models Produced in 2007	% Models Produced in 2007
1. Osram Sylvania Inc.	201	8%
2. Technical Consumer Products, Inc.	140	6%
3. Globe Electric, Inc.	126	5%
4. Feit Electric	123	5%
5. GE Consumer & Industrial	79	3%
6. The Home Depot	79	3%
7. Xiamen Topstar Lighting Co., Ltd.	78	3%
8. Greenlite Lighting Corporation	73	3%
9. Fujian Joinluck Electronic Enterprise Co., Ltd.	67	3%
10. Westinghouse Lighting Corporation	57	2%
Total	1,023	43%

Source: U.S. EPA, 2008d.

B.2 Hardwired CF Fixtures

B.2.1 Indoor Fixtures

In 2006, 26 percent of consumers reported that they were familiar with compact fluorescent fixtures (CF fixtures).⁴⁴ As shown in Table B-3, wall- and ceiling-mounted fixtures comprise about three-quarters of the qualified indoor fixture model types produced. There were no major changes in the number of total models produced aside from a small increase in the total number of portable lighting fixtures (7% increase over 2006). The market for hard-wired CF fixtures appears to be growing at a far slower pace than that of CF bulbs.

Table B-3
Number of ENERGY STAR Hard-Wired Interior CF Fixture Models by Style, 2006 and 2007

Fixture Style	2006		2007		Change From 2006 to 2007	
	# Models Produced	% of Total Models Produced	# Models Produced	% of Total Models Produced	# Models Produced	% Change in # Models
Wall-Mounted Lighting Fixture	3,072	37%	3,101	37%	29	1%
Ceiling-Mounted Lighting Fixture	3,039	37%	3,091	37%	52	2%
Suspended Lighting Fixture	1,271	15%	1,236	15%	-35	-3%
Portable Lighting Fixtures	252	3%	270	3%	18	7%
IC-Rated & Air-Tight Recessed Canister	235	3%	235	3%	0	0%
Recessed Canister	143	2%	146	2%	3	2%
Furniture/Cabinet Integrated	96	1%	96	1%	0	0%
Other	317	4%	361	4%	44%	14%
Total	8,319	100%	8,387	100%	68	1%

* "Other" styles include recessed, post top, undercabinet, torchiere, IC-rated recessed canister, air-tight recessed canister, lamp/ballast platform fixture, and recessed troffers, each of which represent less than 1 percent of the total ENERGY STAR qualified hard-wired interior fixture models produced in 2007.

Source: U.S. EPA, 2008d.

Table B-4 shows the ten companies that produced the largest number of qualified indoor CF fixture models in 2007. Together these companies produced nearly two-thirds of models available. In all, 68 manufacturers produce 8,440 qualified indoor fixture models.

American Fluorescent Corporation, Lithonia Lighting, Access Lighting, and Brownlee Lighting each had at least 20 fewer ENERGY STAR qualifying interior fixture models in 2007 than in 2006. As a result, Lightway Industries and Brownlee Lighting slipped slightly in terms of their top-10 ranking. Despite having fewer models available, American Fluorescent and Lithonia Lighting maintained their positions on the top 10 list. The other top 10 interior fixture manufacturers did not change the number of interior fixture models produced between 2006 and 2007.

⁴⁴ KEMA, 2006.

Table B-4
Top 10 ENERGY STAR Interior Fixture Model Manufacturers, 2007

Company	# Models Produced in 2007	% Models Produced in 2007
1. ASL Energy-Efficient Lighting	1,692	20%
2. VIVA Company Ltd.	943	11%
3. American Fluorescent Corp.	795	9%
4. Sea Gull Lighting Products LLC	392	5%
5. Lithonia Lighting	318	4%
6. Lightway Industries	317	4%
7. Access Lighting	286	3%
8. Light Process Company	286	3%
9. LaMar Lighting Company	209	3%
10. Brownlee Lighting	195	2%
Total	5,433	64%

Source: U.S. EPA, 2008d.

B.2.2 Outdoor Fixtures

The outdoor lighting section of the ENERGY STAR website describes a number of different uses and features associated with hard-wired exterior lighting fixtures. These fixtures can utilize either fluorescent or high-intensity discharge lighting technologies. Thirty-four manufacturers produced 1,343 different models of ENERGY STAR hard-wired outdoor lighting fixtures in 2007.

As shown in Table B-5, wall-mounted and post-top fixtures comprise more than three-quarters of the qualified outdoor fixture models produced. There were no major changes in the number of total models produced aside from a small increase in the total number of post-top fixtures (11% increase over 2006).

Table B-5
Number of ENERGY STAR Hard-Wired Outdoor CF Fixture Models by Style, 2006 and 2007

Fixture Style	2006		2007		Change From 2006 to 2007	
	# Models Produced	% of Total Models Produced	# Models Produced	% of Total Models Produced	# Models Produced	% Change in # Models
Wall-Mounted	954	71%	943	70%	-11%	-1%
Post-top	99	7%	110	8%	11%	11%
Ceiling-Mounted	60	4%	60	4%	-	-
Suspended	28	2%	28	2%	-	-
Architectural	24	2%	24	2%	-	-
Other	174	13%	178	13%	4%	2%
Total	1,339	100%	1,343	100%	4	<1%

* "Other" styles include recessed, post top, undercabinet, torchiere, IC-rated recessed canister, air-tight recessed canister, lamp/ballast platform fixture, and recessed troffers, each of which represent less than 1 percent of the total ENERGY STAR qualified hard-wired interior fixture models produced in 2007.

Source: U.S. EPA, 2008d.

Table B-6 shows the ten companies that produce the largest number of qualified indoor fixture models. Combined, these companies produce 78 percent of models available. These manufacturers include some of the same top manufacturers in the indoor fixture market as well as others.

The Minka Group increased its number of qualifying outdoor fixtures by 55 models (from 80 to 135) between 2006 and 2007. None of the other top 10 manufacturers changed the number of models produced. The total number of manufacturers producing qualifying outdoor fixture models increased from 27 in 2006 to 34 in 2007.

**Table B-6
Top 10 ENERGY STAR Outdoor Fixture Model Producers, 2007**

Company	# Models Produced	% Total Models Produced
Light Process Company	187	14%
ASL Energy-Efficient Lighting	181	14%
Xing Nan Lighting Co., Ltd.	171	13%
Minka Group	135	10%
Cooper Lighting	88	7%
Maxim Lighting International	88	7%
Sea Gull Lighting Products LLC	63	5%
HeathCo LLC	54	4%
Thomas Lighting	44	3%
Inter-Global Inc.	38	3%
Total	1,049	78%

Source: U.S. EPA, 2008d.

C. Market Actor Interview Findings – Additional Details

C.1 Suggested Improvements to FCAL

As explained in Section 4.2.2, CFL manufacturers made the following suggestions regarding possible improvements to the FCAL:

- Stipulate high-quality product specifications in the RFP (mentioned by 3 manufacturers’ representatives);
- Address CFL recycling issues (mentioned by 2); and
- Broaden the types of retailers that can participate (2).

C.1.1 Product Specifications

Three of the manufacturers’ representatives commented that NEEA should force participating manufacturers to comply with high-quality product specifications to participate in future CFL promotions. One representative commented that “the specs need to be above ENERGY STAR because while ENERGY STAR is great, it doesn’t go far enough” to regulate CFL quality. Another commented that “regulating CFL efficacy is not enough to ensure quality product.” A third manufacturer’s representative commented that the specification should include a minimum rated lifetime for the products or at least offer lower incentives for products with lower rated lifetimes (e.g., an 8,000-hour lamp versus a 12,000-hour lamp).

Interviewers asked retail chain representatives to estimate the percentage of the CFLs that they stock that are ENERGY STAR products. Respondents reported that the vast majority of the CFLs they stock are ENERGY STAR qualifying bulbs. Several retailers reported that they would stock only ENERGY STAR CFLs (100 percent of the models in stock) if ENERGY STAR had criteria for various specialty CFL categories (such as candelabra-base models).

C.1.2 CFL Recycling

Two of the manufacturers’ representatives suggested that the promotion make some attempt to address CFL recycling issues. One offered no suggestions as to how to do so, but the other suggested giving preference to proposals from manufacturers that include some sort of recycling initiatives and communications than those which do not.

The retailer interview did not specifically address CFL recycling, but two retail representatives raised the subject. The first retailer representative indicated that his chain has received a lot of letters from customers regarding mercury content of CFLs and that they were approached by their local utility to become a drop-off center for used CFLs (they declined because they did not want to take on the associated expenses). The second retailer indicated that it may be difficult to eliminate low-efficiency incandescent lamps because of growing concerns regarding mercury in CFLs.

C.1.3 Retailer Types

Two of the manufacturers' representatives commented that the promotion should broaden the types of retail chains that are allowed to participate. One suggested that NEEA should conduct more outreach to discount stores and smaller chains outside of mass merchandise channels to encourage participation, and the other suggested including large home improvement and other big-box stores in subsequent promotions.

D. Cost-effectiveness Assessment – Methods and Data Sources

memo

To: Anu Teja, Karen Horkitz and Christine Jerko
Northwest Energy Efficiency Alliance

Date: August 15,
2008

From: Tami Rasmussen, KEMA Inc.

Copy: Jenna Canseco and Kathleen Gaffney, KEMA Inc.

Subject: NEEA Residential CFL Baseline

The purpose of this memorandum is to provide NEEA with an independent estimate of residential ENERGY STAR CFL baseline sales, which will be used to determine the impact of the region's residential ENERGY STAR CFL initiatives. The basis of the analysis approach is a recent net effects study for NYSERDA's 2006 ENERGY STAR residential lighting program, which was conducted by Quantec LLC in 2007. The NYSERDA study builds on the experience of several prior net effects studies, and it reflects the latest analytical approaches and data sources for assessing market impacts of upstream lighting programs. We also reviewed other related data sources and made adjustments or substituted key inputs used by the NYSERDA study where justified.

Background

The baseline estimate is the theoretical level of CFL sales that would have occurred in absence of regional market interventions. The baseline is theoretical and difficult to estimate because there is no way to really know what would have happened in absence of NEEA, utility and other regional promotions.

This is particularly true in the Northwest due to the nature of NEEA's interventions, which are intended to leverage other regional and national initiatives, and the synergistic effects of other complementary upstream lighting programs nationwide. As such, it is nearly impossible to untangle regional versus other effects.

Method

There are very limited methodological options as well as hard data sources with which to address this problem. The only promising approach that is applicable for the Northwest is net effects, which is the theoretical total market impacts of a program. Net effects is the difference between total sales for a program area minus baseline sales.

There are various ways to estimate net effects. A recent net effects study for NYSERDA used a comparison of active and inactive regions to develop an estimate of baseline sales, and this method is transferable to the Northwest.⁴⁵

Inputs

The inputs required to estimate baseline sales using the active/inactive region comparison are:

- a. **2005 U.S. residential ENERGY STAR CFL Sales** - the most difficult to estimate, because hard data do not exist and estimates vary widely. Based on the data sources we gathered, estimates varied from 35 million to 90 million for 2005. The 35 million estimate⁴⁶ is too low because it excludes some important distribution channels (including some big box stores and independent stores.) The 90 million estimate⁴⁷ is probably too high. It is based on two sources that indicate that around 100 million CFLs were imported into the US in 2005. Then the estimate is adjusted for residential sales (assumed to be 90%) and then ENERGY STAR sales (assumed to be 91%). Both of those adjustment factors are probably too high. While 90% residential sales is probably appropriate for retail sales, it is too high for all sales channels. The ENERGY STAR adjustment factor is also probably too high, based on consultation with national lighting experts. A third estimate of sales is based on NEMA reports of US sales of CFLs, which is about 100 million⁴⁸, and is adjusted for ENERGY STAR sales (75%) to about 75 million. For this analysis, we'll assume that total U.S. residential ENERGY STAR sales are **75 million**.
- b. **2005 residential ENERGY STAR CFL sales in active regions of the U.S.** – estimated at about 56 million for 2005 based on a recent NYSERDA study, and estimated at 32 million for the same year by NEEA. The 32 million estimate is too low because NEEA's California sales estimate excludes many market channels, and is lower by orders of magnitude than program sales for that year. For this analysis, we'll use **56 million**.
- c. **Number of households in the U.S. in 2005**– estimated at 111.0 million based on U.S. census
- d. **Number of households in active regions of the U.S. in 2005** – estimated at 34.8 million, based on the NYSERDA net effects study
- e. **Number of households in the Northwest in 2005**– estimated at 4.8 million for 2005 based on U.S. census

⁴⁵ Another method to estimate net effects is to compare CFL sales from a comparison state or region that does not have a program. (This approach was used by Glacier Consulting to estimate Wisconsin's upstream lighting program net effects in 2005 and 2006.) This works well where an appropriate comparison state or region exists that has not been affected much by the program area. This method also requires extensive CFL sales data collection from the comparison state, which can be difficult, costly and time-consuming. For these reasons this approach was not considered for this analysis.

⁴⁶ 2005 California Lighting Residential Market Share Tracking Study (Itron)

⁴⁷ 2006 NYSERDA net effects study (Quantec)

⁴⁸ D&R International

- f. **2005 Northwest CFL sales** – estimated at about 6.8 million based on NEEA’s 2006 ACE model
- g. **2007 U.S. residential ENERGY STAR CFL Sales** – NEMA reports of US sales of ENERGY STAR CFLs are projected to be 290 million, which is based on an assumption of 20 percent market shares.

Analysis

The first step is to calculate the 2005 per household residential ENERGY STAR CFL sales for inactive regions, shown in the equation below:

$$((a - b) / (c - d)) = 0.25 \text{ (x, the 2005 inactive per household CFL sales)}$$

Next, this estimate is applied to the 2005 Northwest population, yielding an initial estimate of baseline CFL sales for 2005, shown in the equation below:

$$x * e = 1.2 \text{ million (y, the initial Northwest 2005 CFL baseline)}$$

Baseline Adjustments

There are two issues that need to be taken into account when applying the inactive region baseline to the Northwest. The first suggests that the initial estimate is too low, and the second that the estimate is too high.

Downward adjustment: The Northwest baseline should be adjusted downward because the region’s cumulative lighting market interventions have had effects on the nationwide market for CFLs, impacting CFL sales in inactive regions. Assuming that other regions with similar programs also have impacted inactive region CFL sales, and that impacts are about proportional to the volume of sales in those regions, the Northwest would get credit for roughly 20 percent of the total program impact on sales in inactive areas. But there is no basis for determining how much effect programs have had on inactive areas. If we arbitrarily assume that programs get credit for half of current sales in inactive areas, then the baseline should be adjusted as follows:

$$y - (y * 50\% * 20\%) = 1.1 \text{ million (y1, the interim adjusted 2005 Northwest CFL baseline)}$$

Upward adjustment: The Northwest baseline should be adjusted upward because all else equal the Northwest has higher income and education levels than households in inactive regions.

There is no easily attainable basis for determining how the theoretical baseline should vary across the nation based on demographic differences. The NYSERDA study doubled the initial baseline estimate for New York to account for both demographic differences and the direct effect of neighboring state’s programs. We feel that the demographic differences between the Northwest and inactive regions are on par with differences between New York and inactive regions. However, the effect of neighboring state’s programs (California) on the Northwest should not factor into a baseline adjustment, since California’s programs have impacted the

nation probably fairly equally given the scale of the programs and the effects on worldwide supply and national distribution. So these effects are picked up already in the inactive region baseline. In absence of a more definitive basis for adjustment, we increase the baseline by 50% to account for demographics.

$$y1 * 1.5 = 1.6 \text{ million (} y2, \text{ the adjusted 2005 Northwest CFL baseline)}$$

Extrapolating to 2007

Next, this estimate must be adjusted for 2007. We assume that baseline ENERGY STAR CFL sales grow at the same rate as the overall ENERGY STAR CFL market. Based on projected US ENERGY STAR CFL sales for 2007 (g), the estimated 2007 Northwest CFL baseline is shown below:

$$y2 * ((g - a) / a) = 4.6 \text{ million (2007 Northwest CFL baseline)}$$