Are We There Yet? An Assessment of a Decade of Northwest Lighting Market Transformation Efforts

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ABSTRACT

This paper assesses the Northwest Energy Efficiency Alliance's (NEEA) residential lighting market interventions, which were ongoing from 1997 to 2007. NEEA met its project goals by the end of 2007 with compact fluorescent lamp (CFL) sales of over 18 million in 2007. The paper concludes that 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 paper concludes that the Northwest lighting market is transformed for 60-watt incandescent replacements according to NEEA's program theory. However, there may still be a need for targeted, strategic market interventions in the near-term to sustain recent market progress and realize the project's long-term impacts.

Introduction

This paper describes the history of NEEA's residential lighting market interventions from 1997 through 2007. Project strategies included mass marketing, manufacturer incentives, product quality initiatives, leveraging regional and national residential lighting promotions, retailer training and merchandising support, and ongoing monitoring and support of the region's CFL supplier infrastructure. Over the course of a decade of market interventions, the Northwest lighting market experienced a dramatic increase in CFL purchases, with market shares growing from less than one percent to nearly 20 percent [NEEA 2007]. Throughout this time period, NEEA sponsored annual evaluations to track market progress and to provide ongoing corrective guidance to the project implementation team.

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's Board of Directors approved two residential lighting projects in June 1997: ENERGY STAR® Fixtures and LightWise Bulbs. The project objectives were to accelerate the awareness and use of high-efficiency 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 projects 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 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.

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 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 such as salesperson training and point-of-purchase displays to retailers to promote ENERGY STAR products to consumers and coordinated the availability of financial incentives (for nearly 5 million CFLs from 2005 to 2007). 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) [Titus, et al 2005]. Finally, the project supported the advancement of new lighting technologies (e.g., dimmable and reflector CFLs) and supported efforts to encourage the proper disposal of burned-out CFL lamps.

Project Goals and Market Progress Indicators

The overall project objective was to achieve greater efficiency in lighting products and to transform the residential lighting market to one where high efficiency lights are more regularly used. The specific project goals along with the market progress indicators that were measured during the lifetime of the project are shown below in Table 1.

Evaluation Activities

This paper draws from historical evaluations and market research studies undertaken to support NEEA's residential lighting initiatives over the last decade. These prior studies included several waves of consumer telephone surveys; lighting retailer shelf surveys; retail store manager surveys; and in-depth interviews with utilities, program staff and market actors. The paper also leverages the final market progress evaluation report (MPER), conducted in 2008, which included about 65 in-depth interviews with market actors, national lighting market industry observers, utilities and NEEA project staff. This research was intended to substantiate the residential lighting market evolution, the validity of the program theory, and determine the extent to which NEEA's interventions contributed to market change.

Table 1. General Project Goals and Market Progress Indicators

Goal	Market Progress Indicator
Increase product market penetration through increased sales	CFL 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

Program Theory and Logic Model

NEEA's decade-long market interventions were guided by a program theory, which states the underlying logic guiding the program's actions and its expected near- and long-term effects. NEEA project staff developed a generic logic model towards the end of the project that both retrospectively and prospectively defined the elements of the program theory. This section presents and tests each of those program theory elements. At the end of the section, an updated logic model is presented that illustrates the relationship between program theory elements.

NEEA sponsored baseline residential lighting market research prior to the deployment of its first round of lighting programs in 1997. This research consisted of a literature review of market conditions nationwide and supplier and consumer surveys, and identified market barriers to the adoption of energy efficient lighting products (shown in Table 2). [Pacific Consulting Services, et al 1998]. Based on our review of prior residential lighting market research studies and evaluation reports, we confirmed that the market barriers that were identified by NEEA's residential lighting logic model existed prior to the project's initiation in the late 1990s.

Table 2. 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	LightWise MPER1
		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]

The logic model identified three market opportunities that existed prior to the program's inception, which were also confirmed. Table 3 shows the market opportunities and the evidence used to confirm their existence.

In Table 4 we identify the activities listed in the logic model, which were used to address the 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 2005] [KEMA 2006] [KEMA 2007].

Table 3. Market Opportunities Validation Summary

Logic Model Element	Confirmed?	Evidence	Source
Limited Number of Manufacturers	Yes	There were several large bulb manufacturers and many small manufacturers producing CFLs in the late 1990s	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]

Table 4. 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/manufacturer 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

The logic model identified outputs that were theorized to follow from the project's activities. We confirmed that each of the outputs listed in the program theory occurred as a result of the project's activities described above (Table 5). Table 6 shows the short-term market outcomes that were expected in one to three years as a result of the project's activities. Table 7 shows the long-term market outcomes that were expected in four to six years as a result of the project's activities. Table 8 shows the project impacts that were expected in 7 to 10 years as a result of the project's activities, if the short- and long-term outcomes are achieved.

Table 5. 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, it 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 manufacturer buydown regionwide in 1998, but focused on retailers for the next few years and did not coordinate incentives; 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 bulb samples off store shelves for testing	Residential Lighting Program MPER1
ENERGY STAR specification changes	Added	NEEA provided leadership and involvement in 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. 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 $16 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
Consumer intend to buy CFLs again (continued)	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 7. 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 upcoming 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 2008] [3][KEMA 2008] [4][Gilmore Research Group 1999]

Table 8. 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, 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 during non-promotion in some channels	Consumer Products MPER3[2] and MPER4[3]
Ave. price remains below $2 per bulb	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

Logic Model Element	Has Impact Occurred?	Evidence	Source
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]

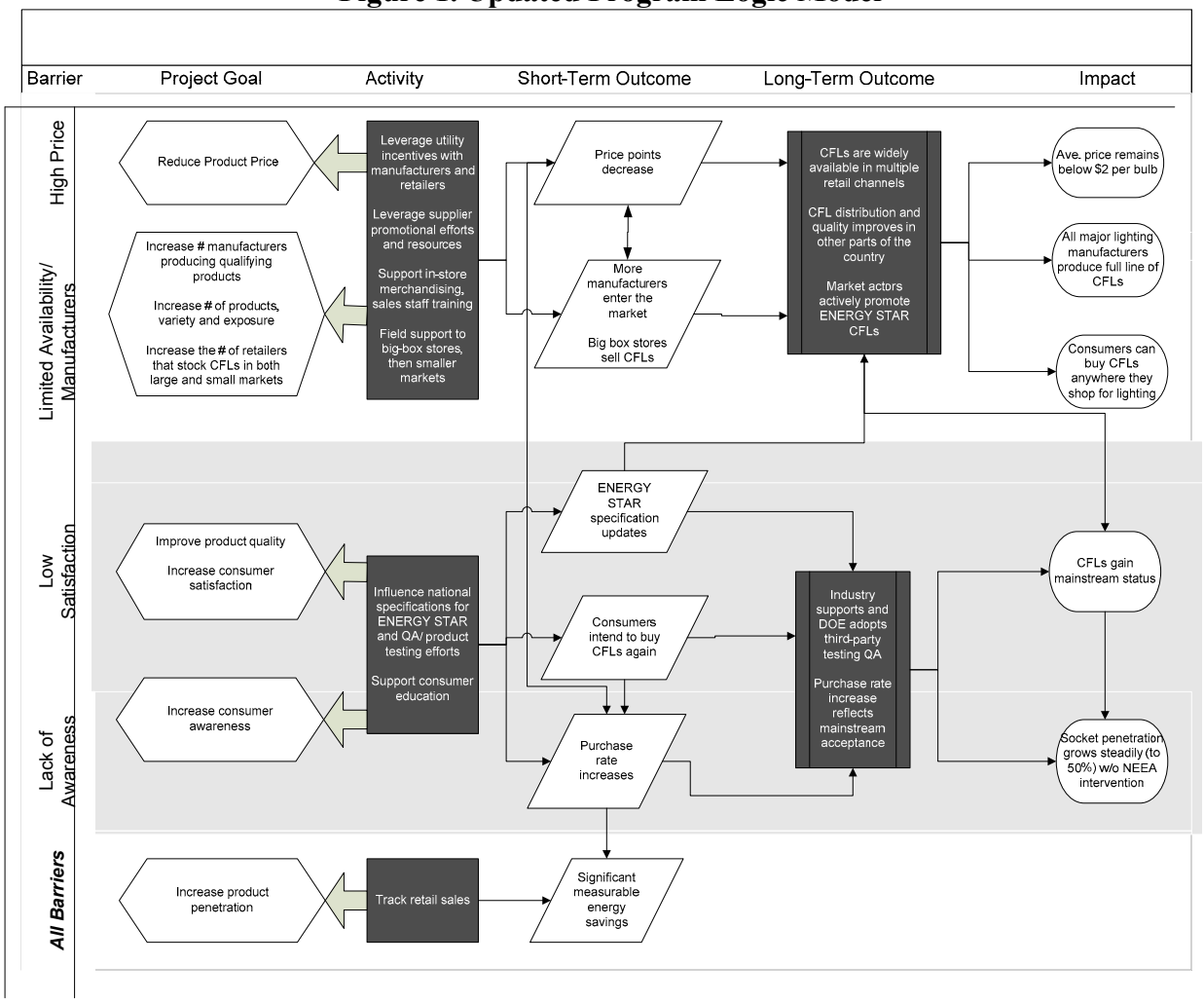
Figure 1 presents an updated program logic model prepared for the Consumer Products MPER4, indicating the relationships between project activities as they relate to goals and barriers, and the expected outcomes and impacts.

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.

- **Increased attention to the problem of global warming**. As oil hits $110 per barrel and climate change reaches the mainstream conversation in both our consumer culture and political conversations the issue of energy efficiency has once again become prominent [Frank 2008]. CFLs are increasingly seen as a relatively easy, low-cost way to achieve immediate energy savings and resulting decreases in CO_2 emissions due to their wide availability, low cost and their huge energy efficiency potential.
- **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 customers[1], 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 2007[2], with support from NEEA and other program administrators, state and regional lighting initiatives.
- **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.[3] The nationwide energy bill that was signed into law in December 2007 mandates that general service lamps must meet increased efficacy requirements over the next 4 to 12 years. 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 lamps will be fully effective by 2014. Advanced incandescent lamps and halogen lamps will meet the early requirements, while CFLs and light emitting diodes (LEDs) will likely meet the long-term goals.[4]

[1] More than 68,000 supplier partnerships, 1.5 million associates (i.e., retailer sales staff) and 100 million customers per week. See http://www.wal-mart.com.
[2] See http://walmartstores.com/media/factsheets/fs_2303.pdf.
[3] See http://www.clasponline.org/files/Phasing%20out%20of%20Ineff%20FINAL_23Jan08.pdf.
[4] See http://www.pserc.org/docsa/Energy_Independence_Security_Act.pdf.

Figure 1. Updated Program Logic Model



Market Progress and NEEA's Influence

Table 9 is a summary of Northwest residential lighting market progress over the last decade. As shown, the project goals were met as evidenced by the various market progress indicators.

Table 9. Summary of Market Progress

Goal	Market Progress Indicator Results	
Increase product market penetration through increased sales	Reach 9 million in CFL sales per year by 2010	Result: Exceeded target with sales of over 18 million in 2007
Reduce product price	CFL prices continue to drop in both large and small markets	Result: Prices dropped from an average of $20 to less than $5 per bulb, with drops in both large and small markets
Increase product availability	Increase in the number of retail stores in the region that stock CFLs	Result: Major increase in stores selling CFLs, from 30 to more than 2,000 – with most stores that sell lighting selling CFLs
	The number of manufacturers that produce program-qualifying CFLs	Result: More manufacturers produce ENERGY STAR qualifying products, with all major light bulb manufacturers doing so and many new market entrants
Increase consumer awareness of CFLs	Increase the rate of CFL awareness and purchase	Result: both the CFL awareness and purchase rate increased substantially, to about 90% and 67% in 2007, respectively
Encourage improvement of ENERGY STAR product quality	Maintaining consumer CFL satisfaction as the purchaser base expands	Result: consumer satisfaction rebounded in 2004 after a slight drop, such that satisfaction was maintained even as the purchaser base doubled from 1/3 to 2/3 of the population
	CFL purchasers make repeat purchases	Result: 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
	Improvements in ENERGY STAR specifications	Result: Several updates to ENERGY STAR specifications during program lifetime, reflecting tighter standards with respect to various product quality attributes and quality assurance procedures

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 very low, more retail stores could stock them – including discount, drug and grocery and rural independent stores. NEEA educated retailers and supported their promotional efforts, helping them succeed in selling CFLs.
- *Consumer purchases*: The promotions' effect on prices allowed the purchaser base to expand beyond 50% of the population, as it attracted new purchasers with very low prices at expanded 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 upcoming ENERGY STAR specification. NEEA's leadership in advancing product quality helped increase consumer acceptance and overcome CFLs' bad reputation.

Is the Market Transformed?

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".

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 conflux of positive publicity and connecting the dots between global warming and CFLs as a very easy and cost-effective solution to the problem.

There could be some backsliding in market progress if in absence of promotions, grocery, drug and discount stores do not offer attractive prices and aggressively promote CFLs. Additional risks to sustaining the recent substantial gains in CFL purchases include increasing media attention on the hazards associated with mercury in CFLs and the risk that manufacturers may focus their research and development dollars on high-efficiency incandescent light bulbs in order to meet upcoming general purpose lighting efficacy levels.

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 [Navigant et al 2008], but household applications will be niche-only for the foreseeable future. In order to achieve the intended market impact of 50 percent CFL residential socket saturation, market actors and industry observers agree that the following CFL market barriers need to be reduced: lack of consumer knowledge about proper CFL applications and the role of specialty CFLs; high prices, inconsistent quality and lack of availability for specialty CFLs; lack of accurate information about CFLs' mercury content; and lack of proper CFL disposal infrastructure.

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 upcoming 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 Northwest lighting market is transformed for 60-watt incandescent replacements according to NEEA's program theory.

Yet market barriers still remain, and market interventions may be needed to realize the intended future project impacts. Future project strategies should focus on educating consumers on proper CFL applications, improving supplier conditions for specialty CFLs, and addressing CFL disposal and consumer concerns about their mercury content. There is likely a role for NEEA and similar organizations nationwide to engage in strategic, targeted market interventions to bridge the gap between today's market and the future of solid state lighting and regulated general purpose lighting efficacy levels.

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