

Redirecting Residential Lighting Programs for Market Transformation

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ABSTRACT

Over the past decade and more, utilities in New England have invested heavily (over \$100,000,000) in a variety of residential lighting programs as a conservation resource. More recently, these program efforts have shifted to a regional market transformation emphasis. This paper reviews key market and institutional changes in the last two years, such as the utility acceptance of reduced power quality specifications for lighting, the development of an ENERGY STAR® CFL specifications, the revitalization of the CEE Lighting Committee, and reduced prices for CFLs. These changes have enabled utility efforts to make clearly defined progress towards key market transformation goals, although some characteristics of resource acquisition programs persist.

Following these market and institutional changes, this paper also outlines a newly developed three-year market transformation plan for residential lighting in New England. The new regional plan shifts the emphasis from rebates to marketing, and adds unique nationally coordinated elements, such as a proposed design competition and procurement efforts, to overcome stubborn barriers related to the availability of high-quality, energy-efficient fixtures for the residential lighting market. The plan also enhances coordination with new construction efforts, which now include an increased emphasis on efficient lighting.

Introduction

Electric utility companies in the Northeast have been offering energy efficient lighting products and programs to their residential customers since the late 1980's. Since then, millions of lighting products have been provided to customers and many millions of dollars have been invested. Unfortunately, the program implementation strategies, marketing messages, and even the products and the performance specifications of the products varied considerably among the utility sponsors in these early years. As a result, the regional and national impacts of these initiatives may have been somewhat dissipated and localized due to these variations in the utilities' approaches.

The Northeastern Residential Lighting Initiative began in 1997 and includes the areas served by approximately 40 electric utilities and administrators of system benefit monies in Connecticut, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont, representing approximately 43,100,000 residential customers. The regional initiative is designed to support the development, introduction, sale and use of energy efficient, high quality residential lighting products. The overall goal of the Initiative is to continue to create and sustain positive changes in the residential lighting market, increasing availability, consumer acceptance and use of energy efficient hard-wired and screw-based lighting technologies. The regional approach allows for a variety of specific activities and

interventions. In some cases, utilities have joined together to achieve economies of scale in the design, development and delivery aspects of the Initiative and to send a strong, clear, consistent message to consumers, retailers and manufacturers.

Working through the Northeast Energy Efficiency Partnerships, Inc. (NEEP), the sponsors of the Initiative in the Northeast have developed a three year Market Transformation Plan to serve as a guide for the effort to transform the residential lighting market. The development of the Plan was contingent on the results of some critical national efforts, such as improved technical specifications for ENERGY STAR® lighting products and national procurement effort described in the following sections. The Plan provides for a rigorously supported retail sales effort, catalog sales, a lighting fixture design competition and a technology procurement component. In addition, the Plan has been designed to provide for regular assessment of impacts resultant from the market interventions so that adjustments to program strategies and tactics can be effected on a timely basis.

National and Regional CFL Specifications Intersect

During the development phase of the Northeast Regional Lighting Initiative in 1997, the sponsors elected to promote energy-efficient fixtures and CFLs in order to more adequately address the needs of the residential lighting market. It was agreed to use the ENERGY STAR® specification as a means to establish product eligibility for fixtures, but a similar national specification was not available for CFLs. In the absence of an ENERGY STAR® designation for CFLs the sponsors, adopted the name “StarLights” to differentiate the qualified CFLs from those that were not. The NEEP regional CFL Specification included provisions for start time of the CFLs, their color temperature, product lifetime, power factor of greater than .9 and total harmonic distortion (THD) levels of less than 33% along with other criteria meant to assure product quality and operating efficiency. The power quality provisions were adopted by the electric utilities to protect their distribution systems from untoward disturbances.

Lighting manufacturers were notified of the regional specifications in advance of the promotional efforts for the Initiative. Feedback was received from CFL manufacturers that the power quality criteria was unnecessarily stringent and that there would be no little or no benefit to the users or the sponsors from enforcement of the power quality standards.

To further investigate the matter, a meeting with lighting manufacturers was scheduled at the Rensselaer Lighting Research Center by the Consortium for Energy Efficiency (CEE) in March of 1998. This meeting marked a turning point for CEE’s Residential Lighting Committee which had lapsed into dormancy due to a lack of issues that affected the national constituents of CEE. The meeting was attended by representatives of the electric utility industry, lighting manufacturers and the lighting research community. The manufacturer’s made the following points at the meeting regarding NEEP’s proposed THD and power factor requirements:

- Meeting the power quality requirements was technologically feasible but additional components had to be added to the CFLs which increased the physical dimensions of the products and reduced the number of applications.
- Adding the components increased the cost of the CFLs.
- The additional components may adversely impact the reliability of the CFLs.
- The benefits from the power quality requirements were transparent to the consumers.

The utility sponsors recognized that if the manufacturers were correct in their position, requiring CFLs to meet the NEEP power quality Specification could possibly undermine the success of attempts to transform the residential lighting market. Products built to the NEEP Specification would be larger, possibly less reliable and more expensive than otherwise would be the case. Additionally, there was evidence that the CFL market was already bifurcated in the Northeast (Xenergy 1999), with some consumers buying utility program qualifying products that were expensive but had a rebate associated with them, and other consumers simply purchasing lower cost CFLs that did not meet program specifications. It became clear that the power quality specification issue needed to be resolved, and, preferably at a national level, to enable market transformation efforts to continue to progress.

Following this initial meeting, the CEE Lighting Committee began to coordinate activities to investigate the power quality issue. Simultaneously, there were discussions among the sponsors of residential lighting programs elsewhere in the country regarding the need to establish an ENERGY STAR® CFL program. CEE, working with the Natural Resources Defense Council (NRDC) and the National Electrical Manufacturers Association (NEMA) began the process of reviewing research and studies that would help to quantify the benefits and costs of requiring high power quality lighting products. This effort culminated with a presentation of findings at a meeting of CEE's Residential Lighting Committee in December 1998.

The recommendation, delivered by a representative of NEMA suggested that the energy-efficiency benefits of installing lower power quality CFLs far outweighed any deleterious effects that they might cause to either the local electric distribution system or the wiring within any residence. (Yandek, 1998) Armed with this research, NEEP and the other members of the CEE Residential Lighting Committee began to work with the US Environmental Protection Agency (EPA), the Department of Energy (DOE), and NEMA to develop and propose an ENERGY STAR® Specification for CFLs. In mid-1999, the work was completed and an ENERGY STAR® Specification was finalized. (DOE has jurisdiction over the CFL product line, and EPA adopted similar power quality specifications to cover their ENERGY STAR® Fixtures program.)

The results of these efforts were designed to produce high quality, albeit lower power quality CFLs that were lower in price, smaller in size, and more reliable. While it is too soon to review the reliability issue, it is clear that better quality CFLs are now available, frequently at retail prices of less than \$10. It now appears that this first generation of ENERGY STAR® CFLs is well positioned for success in the marketplace.

The Three-year Plan

With the major hurdle of developing national specifications completed, NEEP reviewed a variety of local, regional and national research information to develop a regional three-year plan for the NEEP initiative. Highlights of the research are summarized below.

CFL Market

- The 1998 Baseline Study of the Northeastern Residential Lighting Market indicated that

almost 85% of consumers in the Northeast were familiar with CFLs, while 30% of consumers currently use them. Nearly two-thirds of consumers report that they are likely to purchase energy-efficient lighting products. That percentage increased to 85% when consumers were informed that efficient lighting products last longer than incandescent counterparts. (ODC, 1998)

- Supermarkets are one of the primary locations for light bulb purchases but rarely offer much of a selection of CFLs. (ODC, 1998)
- The average number of CFL products on display at home improvement centers dropped from 1996 to 1999; from 44.3 models to 18.8. However, the percentage of CFLs meeting the program's eligibility criteria increased over the same time period. (XENERGY, 1999)
- Over 80% of first time CFL purchasers reported that they were satisfied with the products that they had purchased. (XENERGY, 1999)

Fixture Market

- The baseline study of the residential lighting market in the Northeast estimated that approximately 177 million lighting fixtures are sold on an annual basis in the U.S. The Northeast accounts for about 17% of the U.S. total. (ODC, 1998)
- The breakdown of fixture shipments by incandescent vs. fluorescent fixtures is changing. In the 1980s, the hardwire fixture split between incandescent and fluorescent fixtures stayed fairly constant at 85% and 15% respectively. In the 1990s, the split has changed to 70% and 30%. (ODC, 1998)
- A new construction consumer survey conducted in CT and MA in 1998 showed that 57% of new construction consumers purchase recessed ceiling fixtures--the highest percentage of any fixture type. The popular use of such lighting was attributed to factors such as the non-obtrusive nature of the lighting, relatively easier installation, and consumer demand. (ODC, 1998)
- The Baseline Study also noted that from a national standpoint, the sales of hardwired fixtures are more or less evenly split between new construction, and renovation/replacement. For the Northeast and the New England states, however, almost 60% of the hardwired fixtures are accounted for by the replacement market. (ODC, 1998)

Review of the research led to the establishment on an overall goal of the Northeast Regional Residential Lighting Initiative: To create and sustain positive changes in the residential lighting market, increasing availability, consumer acceptance and use of energy efficient hard-wired, screw-based and portable lighting technologies. Based on the current status of the market and the opportunities for creating market effects with program investments and activities, the specific goals and objectives for the Initiative for the next three years are necessarily different for CFLs and for energy efficient fixtures. The overarching goals for each technology are as follows:

Compact Fluorescent Lamps

The Overarching Goal: Further the development of a self-supporting market for CFLs.

Energy Efficient Fixtures

The Overarching Goal: Increase the variety of products and the market acceptance of energy efficient, residential lighting fixtures.

Initiative Strategies

Program responses were formulated to attack market barriers identified by the market research. While being consistent with the general Initiative identity, a variety of program strategies will be used, diverging somewhat for the two general product types: screw-base CFL lamps and energy efficient fixtures. Particular attention will be paid to the different sales and distribution channels for each, and to the type of market (e.g., replacement, new construction, renovation, and niche). This implies a range of different approaches to be implemented with a host of market actors and other partners. Table 1 shows the identified key market barriers and the tactics that are being employed to overcome them. The details of some of these strategies are in the process of being developed and will necessarily evolve over time.

Table 1. Key Market Barriers and Program Responses

Market Barriers	Program Elements To Address Barriers
<p>Lack of consumer acceptance of high-efficiency lighting products (CFLs and Fixtures)</p>	<ul style="list-style-type: none"> • Product specifications and compliance testing. • Promote and demonstrate product quality and benefits. • Development of niche markets. • Marketing/consumer education campaign. • Point-of-Sale displays and materials. • Catalog distribution.
<p>Lack of retailer/supplier interest in and support for energy efficient lighting products (CFLs and Fixtures)</p>	<ul style="list-style-type: none"> • Product and program training. • Point-of-Sale displays, materials and demonstrations. • Cooperative marketing incentives. • Continue (reduced rebates in 2000 and 2001) and leverage utility investment, encourage stocking and display of products.
<p>Lack of builder/contractor interest in and support for energy efficient lighting products (Primarily Fixtures)</p>	<ul style="list-style-type: none"> • Program integration with ENERGY STAR® Homes. • Program and sales training. • Product incentives and provision of “Special Products.” • Assistance with design and with product specification, selection and location. Provision of products, design, and marketing assistance for model homes in larger developments. • Conduct design/application contests/awards for builders, architects, and designers. • Develop case studies and lighting design guidelines.
<p>High first cost CFLs and Fixtures</p>	<ul style="list-style-type: none"> • Product rebates and incentives. • Leverage utility investment (and volume) to secure matching rebates and other considerations. • Demonstration and promotion of product (economic) benefits.
<p>Limited product selection and availability (Primarily Fixtures)</p>	<ul style="list-style-type: none"> • Product development and distribution assistance and incentives. • “Special Product” procurement and promotion. • Catalog sales for emerging products. • Support standardization of replacement bulb pin types and increase availability.

Promotional and Marketing Activities

Specific promotional and marketing activities that support of the Initiative vary to reflect the interests of the sponsoring entity, the timing of the beginning of the effort and the regulatory climate within which they operate.

The elements of this effort include:

- Contractor-provided support to lighting retailers;
- Retailer sales representative training;
- Regularly scheduled maintenance visits to retailers;
- Distribution of Point of Sale materials directed to consumers;
- Staffing for special promotional events;
- “Instant” Rebates for CFLs and ENERGY STAR® fixtures in New England and Long Island: The level of the rebates varies geographically within the region and by product. Rebates for CFLs range from \$5.00 to \$8.00 while the fixture rebates are from \$10.00 to \$20.00 with increased, tiered rebates offered for higher end products and established on a case-by-case basis. The market will be monitored on an ongoing basis and adjustments made accordingly.
- Catalog sales featuring a variety of CFLs and fixtures at discounted prices accompanied by consumer education in an effort to gain consumer awareness and acceptance of the products.

In early 2000, the sponsors began to develop an integrated ENERGY STAR® Homes, Lighting and Appliance advertising and public relations campaign. This campaign was intended to further consumer awareness and understanding of the ENERGY STAR® concept while providing for specific elements of the campaign to be tailored to address the particular attributes of technologies. The new campaign will use television, radio, print and newspaper advertisements directed to consumers. This overall effort will be supported by substantial Point-Of-Sale (POS) materials that will be produced using the theme, artwork and style of the general awareness advertising.

Evaluation and Reporting

Evaluation efforts in the 2000-2002 period will focus on the development of market progress reports to provide timely feedback on the status of the market and the progress made toward meeting the initiative’s goals and objectives. In order to make evaluation results as accessible as possible to the many stakeholders participating in the program, efforts will be made to increase the frequency while decreasing the length and density of evaluation reports, and to integrate market progress reporting with reporting of fiscal and program activity data. Market progress reports will be designed to emphasize:

- Tracking of the market-based progress indicators;
- Performing key data collection and analysis activities similar to those performed for previous market progress studies and other regional market research and evaluation projects;
- Supporting any regional metrics established for the program;

- Providing prompt feedback on the effect of changes in program design on market response, including changes in rebate levels and qualifying standards.

New Strategies to Influence Fixtures

Efficient residential fixtures have not experienced the same type of product evolution as CFLs. While there are a few products currently available in the marketplace, many of these products are designed for the lowest price points in the market, and innovation from fixture manufacturers to introduce new products is sadly lacking. (One exception to this has been the introduction of CF torchieres.) Consumer choices are limited, and it appears that most fixture manufacturers do not believe that efficient fixtures represent a market opportunity sufficient to motivate their investments in the development of new products.

Despite the differences in the current product advancement between CFLs and efficient fixtures, the fixtures market may offer the best opportunity for market transformation. A key barrier to market transformation for both products is first cost; and at least in the case of fixtures, overall product costs vary substantially based on other factors, such as quality and aesthetics. Installing a fixture also represents relatively permanent energy savings.

Getting the attention of fixture manufacturers will obviously require different strategies than have been employed to date. One proposed concept is to establish a national design competition as a way to focus manufacturer attention on the market potential for a new generation of residential fixtures based on an efficient technology base. A technology procurement is also being proposed at the same time as a way to secure a particular product with strong demand. The technology procurement effort is initially targeted at recessed cans, of which 19 million are purchased annually in the U.S. for the residential market,

The expected outcomes of the proposed national efforts to influence the fixture market are to:

- Focus manufacturer attention on creating new, attractive fixture models or lines based on energy-efficient light sources.
- Create a significant public relations/marketing campaign to promote energy-efficient residential fixtures.
- Increase the availability of reasonably priced, energy-efficient residential lighting fixture options.
- Promote efficient lighting as a leading edge, smart (value-laden), and elegant choice in residential lighting design.
- Through linkages with local initiatives, increase retailer, contractor, and consumer attention to a new generation of lighting fixtures, resulting in increased sales of efficient fixtures.

A final outcome, still under development, is to create better local linkages with the residential new construction and renovation markets to encourage the use of efficient fixtures.

Outline of the Design Competition

The basic concept is to create a competition with sufficient appeal to compel fixture manufacturers to use their design, manufacturing, and marketing capabilities to create new models and fixture lines that offer better efficiency and value to consumers, and to aggressively promote these products in the marketplace.

Proposed elements of the competition, all of them subject to change as the effort develops, include the following:

1. Create multiple categories for competition, with several awards in each. The proposed categories are:

- Best outdoor fixture
- Best bathroom fixture
- Best ceiling fixture
- Best floor and/or table lamp
- Best technology innovation
- Best marketing campaign

2. The fixture and marketing awards would meet the technical requirements of and be linked to ENERGY STAR®.

3. Offer awards of sufficient value in each category to garner the respect and interest/involvement of the industry. These awards might include cash (placeholder of \$50,000 for the winner in each category, with smaller awards for second, third, etc.), almost certainly involve publicity, and may involve direct orders (e.g. for catalog programs or for sales displays). Determination of the final award structure will be based on interviews with manufacturers.

4. The awards program will be co-sponsored (or work closely with) existing industry market support/communications mechanisms; such as industry magazines, architecture /interior design magazines, Light Fair, and others.

5. The awards program will be well publicized, including editorial space from co-sponsors, a major public relations campaign to national consumer media, and, at the local level, promotions/marketing in conjunction with lighting showrooms and other retail outlets.

6. The competition should be planned as a multi-year effort, with a three-year initial phase.

There is panoply of detailed decisions about elements of the competition that will need to be decided upon over time. These include such significant details as what should the selection criteria be and who should do the judging. Also critical is how the competition can ensure that contest winners are indeed manufactured in reasonable quantities to serve the market.

Besides promoting elegant design solutions for lighting, there are a number of potential technology improvements that could be supported through a design competition or other strategy. These include:

- Multiple lamps/fixtures “driven” by a single remote ballast
- Improved fixture housing designs to provide ballast accessibility from within conditioned space
- Use of heat sink technology to dissipate ballast/fixture heat
- Development of universal multi-wattage ballasts

- Development of new ballast technologies whose performance is not affected by elevated fixture temperatures
- Development of high efficiency optical reflectors to maximize coefficient of utilization

While some parties involved with residential lighting issues strongly support the design competition concept, others are interested in considering other ideas to promote better fixture development. In an effort to gain broad support, the CEE Residential Lighting Committee has now commissioned a thorough review of the fixture market and several detailed sub-markets to help determine a national strategy.

Outline of the Technology Procurement

One promising approach to addressing the residential recessed can problem is to initiate a technology procurement aimed at pulling new, efficient and affordable residential recessed cans into the market. Technology procurement is a method to pull new energy-efficient technologies and products into the marketplace through competitive procurements backed by large volume buyers. Generally, it involves a multi-step process involving:

- Organization of target large volume buyers and market influencers (such as utilities),
- Interaction with those buyers to define their technology needs in the form of technical specifications, and to establish their commitments (or intentions) to purchase new products meeting those specifications,
- Vetting of those specifications with potential manufacturers of the newly defined product,
- Issuance of a competitive solicitation to potential suppliers, requesting bids for new products meeting those specifications, as well as the price at which they are willing to offer the products,
- Selection of one or more winners from those bids,
- Implementation of promotion/marketing program to maximize the purchase of the newly available products

Various forms of technology procurement have been used by the Swedish National Energy Administration, the New York Power Authority, U.S. DOE, U.S. EPA, and CEE. Examples include Sweden's Energy-Efficient Window Procurement, CEE/NYPA/DOE's Apartment Size Refrigerator Program, Super Efficient Refrigerator Program (SERP), DOE's Sub-CFL Technology Procurement, and EPA/International Energy Agency's Copier Procurement. Based on their success with the Sub-CFL technology Procurement, DOE has provided initial support to the Pacific Northwest National Laboratory to lead this procurement effort. Several utilities or market transformation groups are likely to add additional support.

The technology procurement project proposed here could take any number of forms, but at its core would be:

- An effort to organize large volume buyers and market influencers to participate; the buyers would play a key role in defining the target products and the program approach
- A competitive procurement, initiated with a Request for Proposals, that would contain product technical specifications, a bid scoring system, and a description of the manner in which buyers would procure the new products,

- Issuance of supply agreements to winning bidders that set the terms and prices by which purchasers can directly purchase products from the winning bidders
- A substantial effort involving marketing and project support; working with utilities and other market influencers, buyers would be made aware of the opportunity to purchase new products

The project could pull together a number of organizations to jointly develop specifications and market promotion plans for affordable, efficient recessed cans. (The specifications would need to be consistent with the ENERGY STAR® lighting fixtures specification.) The specifications would define a product that project participants believe is both needed and would be purchased in substantial quantities. The RFP could be issued with various types of commitments and offers of support from participating organizations. The sponsoring groups might even offer cash to award finalists for the development of prototypes to be evaluated and approved in a final round of awards. Multiple awards to several companies for a range of product types would be a desired outcome.

To greatly increase the likelihood of market acceptance, the project could also seek the involvement of builders and major retailers to help develop specifications and solicit their guidance on how to design the program to make it work for them.

At the time of writing this paper, the decision as to whether sponsors would issue an RFP containing a firm commitment to purchase a minimum quantity of product (such as done in the Apartment Size Refrigeration Program) is unresolved. An alternative approach would be to release an RFP containing only expressions of intent to buy and estimates of expected sales volume (such as done in the Sub-CFL Program).

If several regional market transformation organizations and utilities were to participate, it is likely that several fixture manufacturers could be convinced that there is sufficient future product demand and marketing support to justify significant investments in new product development.

The project would not end with the successful market introduction of new products in response to the RFPs. In order for the project to be truly effective, there would have to be substantial follow-up efforts with builders, retailers, and consumers to educate them on the availability and advantages of the new products.

Links to the New Construction Market

A final element of the residential fixtures market transformation approach is to develop some improved mechanisms to move efficient fixtures into the new construction market. As a first step, it has been widely acknowledged that better fixtures were needed, and likely at a better price.

NEEP is working with CEE and others to develop a strategic plan to influence the new construction market. At the regional level, the Lighting Initiative is working more closely with the ENERGY STAR® homes program to develop opportunities to increase initial market penetration.

Conclusion

The sponsors of the NEEP Residential Lighting Initiative have looked beyond their geographic region and taken steps to coordinate their activities with the operators of other

residential lighting programs to achieve the goal of transforming the residential lighting market. The sheer size of the residential lighting market and the complexity of the interactions among the market players have caused the regional group to adopt this strategy. In formulating a three year plan to guide its activities, the NEEP group has incorporated a comprehensive course of action that includes steps to maximize the success of the current market, and, through the development of the Design Competition and Technology Procurement efforts, intends to influence the development of tomorrow's products.

While the effort described in this paper articulates an approach that has some key elements still in development, it is hoped that this nationally coordinated approach will work better with manufacturers and other key market players by creating a clear direction for the development of new and improved residential lighting products. With the many changes outlined in the current strategies, residential lighting programs are beginning to leave their resource acquisition roots behind, and are focused more clearly on strategies that are expected to yield sustainable results.

At this point, NEEP believes that the critical changes that will lead to a sustained market for CFLs have been made. Products are generally of high quality, and they are smaller in size, which means that they can fit more applications. Most critically, changing the technical specifications on a national basis have resulted in some substantial price drops, which means that more customers will try these products. While marketing efforts are still required to bring CFLs into the mainstream, the products are better positioned for success than at any time in their history.

NEEP has now turned its major developmental efforts to fixtures, where very substantial barriers remain. NEEP, PNNL, CEE, and others are embarking on a set of coordinated efforts that we hope will improve product performance, appearance, price and acceptance in the fixtures market. We are also further investigating the new construction market, so that these improved products can move directly into the hands of builders and new housing consumers.

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