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Lighting for Tomorrow: Building on the results of the first national energy-efficient lighting fixture design competition in the United States

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Keywords

Residential lighting, domestic lighting, energy-efficient lighting, compact fluorescent lamps, pin-based, design competition, decorative lighting

Abstract

Lighting for Tomorrow was the first residential lighting fixture design competition conducted in the United States to focus on energy-efficient light sources. Sponsored by the American Lighting Association, the Consortium for Energy Efficiency, and the U.S. Department of Energy, the competition was carried out in two phases between 2002 and 2004. Five winning fixture designs were selected from a field of 24 finalists. The paper describes the competition in detail, including its origins, sponsors, structure and rules, timeline, prizes, selection criteria, and judges. It also describes the results of the competition, including industry response, promotion and publicity efforts, technical and design innovations demonstrated by the winners, and retail placements to date. Finally, the paper offers several lessons for future efforts to promote high-efficiency lighting through the design competition approach.

Background

Fluorescent lighting has not significantly penetrated the residential market in the United States. The overall market share of screw-in compact fluorescent lamps (CFLs) is thought to be two to three percent[i]. In California, intensive marketing campaigns and utility financial incentives have resulted in market penetration of four to five percent.[ii] Other regions, including the Pacific Northwest, Wisconsin[iii], and the Northeast have achieved higher levels for limited time periods. The relative market position of dedicated (pin-based) fluorescent fixtures was around three percent in 2003[iv]. A persistent consumer bias against fluorescent lighting is an underlying cause of this low acceptance of energy-efficient lighting for home applications. Feedback from lighting showrooms in 2002 indicated that available energy-efficient lighting fixtures were not sufficiently stylish for the decorative market.

To test this perception and potentially remedy the shortcoming, the American Lighting Association, the Consortium for Energy Efficiency, and the U.S. Department of Energy initiated a banner program designated Lighting for Tomorrow (LFT) in 2002.

Facts about the competition

Origins

Lighting for Tomorrow, the first nationwide lighting fixture design competition in the United States to focus on energy-efficient residential lighting, was carried out in two phases between 2002 and 2004. Phase I involved conceptual designs illustrated on paper, while Phase II included prototypes and

production fixtures. The purpose of the competition was to expand the variety and availability of attractive, energy-efficient lighting fixtures for residential applications. In particular, the competition sought to generate fixture designs that would be appropriate for sale by lighting showrooms. Discussions with showroom owners and representatives in late 2001/early 2002 revealed their opinions that energy-efficient residential light fixtures were not attractive or decorative enough for the lighting showroom market. Most Energy Star qualified fixtures at that time were basic surface-mounted styles characterized as functional and utilitarian, while lighting showrooms typically sell decorative fixtures, including chandeliers, pendants, sconces, and portable fixtures. (Energy Star is a government-sponsored national rating and labelling program to promote exceptionally efficient energy-consuming products in the United States.)

The idea for a design competition was not new. The process and results of the European Lights of the Future competition had been well documented and were very useful and instructive to the organizers of Lighting for Tomorrow. The impetus to adapt such a competition to the U.S. market grew out of discussions and market research initiated in 2001 on two parallel fronts: 1) the American Lighting Association (ALA), the Consortium for Energy Efficiency (CEE), and the Energy Star program had begun discussions to identify the market barriers to wider adoption of high-efficiency residential lighting, and 2) the U.S. Department of Energy (DOE), through Pacific Northwest National Laboratory (PNNL) was planning a program to encourage new designs for energy-efficient portable lighting fixtures, building upon a technology procurement approach that PNNL had employed successfully with regard to sub-compact fluorescent lamps in 1999-2001.[v]

ALA and CEE held a design "charette" during the 2002 ALA Annual Conference, in which ALA member manufacturers, designers and showrooms brainstormed ideas for residential lighting fixture designs incorporating energy-efficient light sources. Early in 2002, PNNL sought input from CEE on development of the portable lamp program. The two organizations decided to join forces on a broader effort to encourage decorative, energy-efficient residential light fixtures, and drew on CEE's growing relationship with ALA to form a three-way partnership to implement the design competition.

Sponsors

The organizing sponsors of Lighting for Tomorrow were the ALA, CEE, and DOE, represented by PNNL. ALA is the largest lighting trade association in the United States, representing lighting showrooms, and manufacturers of lighting fixtures and components. CEE is a membership organization representing energy efficiency program administrators throughout the United States and Canada, including electric and gas utilities, as well as state and regional efficiency programs. CEE's participation was supported by direct financial contributions from 20 of its members. DOE promotes energy-efficient technologies through its Appliances and Emerging Technologies program, administered by PNNL, a multi-program research laboratory.

Structure and rules

Lighting for Tomorrow was open to lighting fixture manufacturers, independent lighting designers, and students. Students could participate if they were affiliated with or sponsored by a manufacturer. Fixture designs had to use pin-based (not screw-based) lamps meeting the efficacy requirements of the Energy Star residential light fixture specification at the time. The efficacy requirements at that time were as follows in Table 1.

Table 1. Luminous efficacy requirements for participation in Lighting for Tomorrow

Lamp size and wattage	Minimum system efficacy in lumens per watt (lpw) per lamp ballast combination
All lamp types less than 30 total listed lamp watts	46
All lamp types that are ≤ 24 inches (61 cm) and ≥ 30 total listed lamp watts	60
All lamp types that are > 24 inches (61 cm) and ≥ 30 total listed lamp watts	70

A special category within the Lighting for Tomorrow competition allowed for designs incorporating light emitting diodes (LEDs). Fixtures using LEDs had to meet a minimum efficacy level of 35 lumens per watt, calculated by dividing total rated light output of all light sources in the fixture (in lumens) by total rated watts of all light sources in the fixture. Due to the comparatively low efficacy of white LEDs available then (around 20 lpw), this required use of a high-efficacy primary light source, supplemented

or accented by LEDs. Several designs incorporating LEDs were received in Phase I of the competition, but none of the designs has been produced to date.

Designs were invited for seven indoor fixture types: chandeliers, pendants, portables (including table and floor lamps), sconces, surface-mounted fixtures (including ceiling, wall, and ceiling fan light kits), task, and track lighting. Each type was further divided into lower and higher price groupings, resulting in a total of 14 categories of fixtures in the competition. The competition did not include outdoor fixtures.

In the first phase of the competition, manufacturers, designers, and student were invited to submit paper designs, which could include photographs, hand drawings, or computer renderings. Potential entrants were identified and contacted through several means: the membership list of the American Lighting Association, industry partners of the Energy Star lighting program, members of the International Association of Lighting Designers (IALD) and members of the Illuminating Engineering Society of North America (IESNA). A press release was issued to the lighting trade press in December 2002.

Timeline

Discussions with the lighting showroom and manufacturing sectors began in early 2002. Planning of the competition rules and materials took place during mid-2002. The other key milestones are listed below:

December 2002 – Competition announced

March 15, 2003 – Paper designs due

April 2003 – Finalists selected

May 1-4, 2003 – Finalists announced at ALA Annual Conference

January 31, 2004 – Prototypes due

March 2004 – Winners selected

May 15-18, 2004 – Winners announced and exhibited at ALA Annual Conference.

Prizes

In the first phase of the competition, US$2,500 was awarded for the best design in each fixture and price category. In addition, the entry selected as the overall “Best Design of 2003” received US$7,500. In Phase II, the Grand Prize Winner was awarded US$10,000, while the three second-place winners each received US$4,500.

Selection criteria

The criteria for judging entries at both the paper design and prototype stages were as follows:

1) Potential market impact, consisting of the judges’ assessment of the fixture’s
    a. attractiveness,
    b. value, and
    c. marketability;
2) Innovation in design and use of materials and components; and
3) Functionality: providing high-quality illumination for the intended application.

Judges

The Lighting for Tomorrow organizers assembled a diverse panel of judges to evaluate entries in the two phases of the competition. In each phase, the panel consisted of eight judges, with five serving during both phases. The panels included one lighting showroom manager, one electrical distributor and showroom representative/manager, one custom homebuilder, one interior designer, two professional lighting designers, one builder magazine editor, two home décor magazine editors, one lighting testing laboratory representative, and a representative of the Energy Star Residential Light Fixtures program.

A three-person technical panel first examined the designs and prototypes to ensure they met the minimum requirements of the competition.

In Phase I, the judging panel intended to select one finalist from each of the 14 fixture/price categories. In two categories no entries were received, however, and in two other categories the judges did not make an award. A total of 11 finalists were identified, including an overall Best Design of 2003. The panel awarded special "judges' awards" to five additional designs. The organizers awarded honourable mentions to eight other designs that had scored within the top ten percent of their category. In total, 24 designs were recognized in Phase I. The owners of these 24 designs were invited to submit working prototypes in Phase II.

In the second phase of the competition, 18 prototypes were received and installed in a conference room where they could be viewed in operation. After a technical panel examined the prototypes, the judges proceeded to evaluate them with the initial intention to select first, second, and third prize winners. However, one fixture emerged as the clear winner, while the next three were very close in total points. Therefore, the judges decided to award one Grand Prize and three Second Place winners. In addition, the judges awarded one Technical Innovation Award to recognize the development of an electronic, dimmable ballast capable of simultaneous operation of up to six CFLs.

Design innovations

Several innovative lighting fixture designs were recognized in Lighting for Tomorrow. The top five winners are described below, including their unique design features.

Grand Prize Winner

The Grand Prize Winner in Phase II of the competition was the "Salem" chandelier by American Fluorescent Corporation, based in the Chicago, Illinois area. The fixture was designed by Stephen Blackman, Director of Design and Product Development for American Fluorescent. Salem was one of four American Fluorescent designs designated as finalists in Phase I of the competition. All four were developed as prototypes and competed in Phase II. The Salem was the clear winner in terms of total points assigned by the judging panel during scoring. Key features of the Salem included the following:

- The fixture uses real wax diffusers for the 13-watt CFLs. This material takes advantage of the lower operating lamp temperature of CFLs as compared to incandescent light sources, while producing a warm, amber-toned light to counter the typically "cooler" appearance of fluorescent sources.
- The Salem's traditional styling is consistent with the prevailing trend in residential lighting in the United States.
- Use of new, smaller, replaceable electronic ballast addressed concerns about ballast replacement.
- The fixture was submitted in the "Chandeliers under $200" category, indicating a retail price level that would make it accessible to many consumers.

Figure 1 Salem fixture by American Fluorescent

As a result of the recognition associated with the competition, American Fluorescent made significant changes at a corporate level. Stephen Blackman has described the changes during several public

forums. According to Blackman, his company has transitioned from being a “fast follower” to an innovator in decorative fluorescent fixture design. Blackman attributes this transition to the competition and stated that the recognition he and his company earned have enabled them to put additional research and development funds into decorative fixtures that they would not otherwise have committed.

In addition to their grand prize winner, three other American Fluorescent designs were designated as finalists in the competition. Three of these are currently in production, qualified under the Energy Star labelling program, and available at retail outlets. In addition, consistent with their corporate shift toward producing more decorative fluorescent products, American Fluorescent introduced the new “Studio A” collection, which includes 10 new fixture families, at the January 2005 Dallas International Lighting and Accessories Market.

Second Place Winners

The “Soli” fixture by Lightolier was awarded a Second Place prize during Phase II of the competition. This fixture is available in several versions and incorporates the following design features:

- Available in four different sizes (fixture lengths):
    - 14 inch (36 cm) with 26-, 32- or 42-watt CFL
    - 2-foot (61 cm) with 14-watt T5 lamp
    - 3-foot (91 cm) with 21-watt T5 lamp
    - 4-foot (122 cm) with 28-watt T5 or 54-watt high-output T5 lamp
- Available with acrylic or etched glass diffuser, or no diffuser.
- The 4-foot version of the fixture is available with emergency lighting and digital addressable lighting interface (DALI) capability.
- The fixture protrudes no more than 4 inches (10 cm) from the wall, consistent with requirements of the Americans with Disabilities Act (ADA), which applies to multi-family housing, hotels, and assisted living facilities.
- Companion ceiling fixtures are also available.

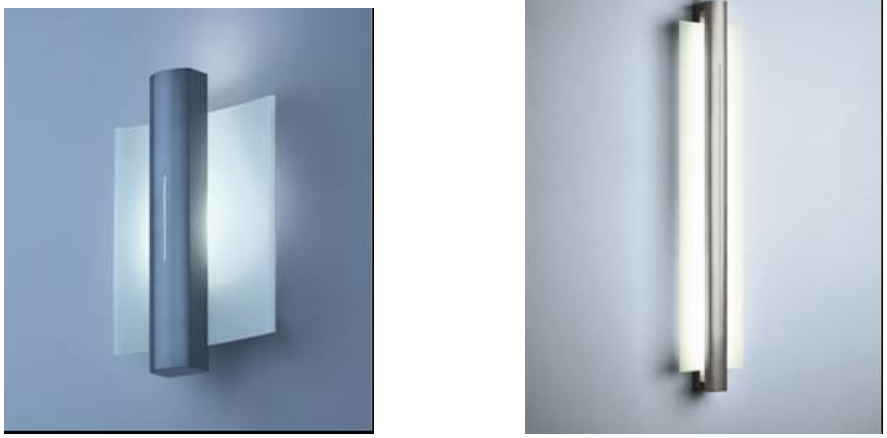

Figure 2 Soli fixture by Lightolier

The “Torch” fixture by Forecast was also a Second Place winner in Lighting for Tomorrow. This fixture has traditional, classic styling and is able to fit in with many styles of décor. Features of the Torch include:

- Uses a 13-watt CFL.
- Available in satin nickel or warm bronze finish, both with etched white opal glass shade.
- The electronic ballast is housed within the diffuser shade.

- ADA compliant.

Figure 3 Torch fixture by Forecast

The “Between2Shapes” pendant by Danish designer Soren Momsen also took a Second Place prize in the competition. This unique design was recognized by the judges for its sculptural qualities, use of materials, versatility, and beauty. This design had previously been recognized as a winner of the European Lights of the Future competition in 2002. Innovative features include:

- The fixture can be lamped with a 26-, 32-, or 42-watt CFL.
- It is fully dimmable at the touch of a button, down to 1% of maximum light output.
- The fixture rotates 360 degrees in both the horizontal and vertical planes. Therefore it can be used for downlighting, task lighting, wall washing, or uplighting.
- The porcelain material creates a glowing effect to complement the direct light coming through the diffuser.

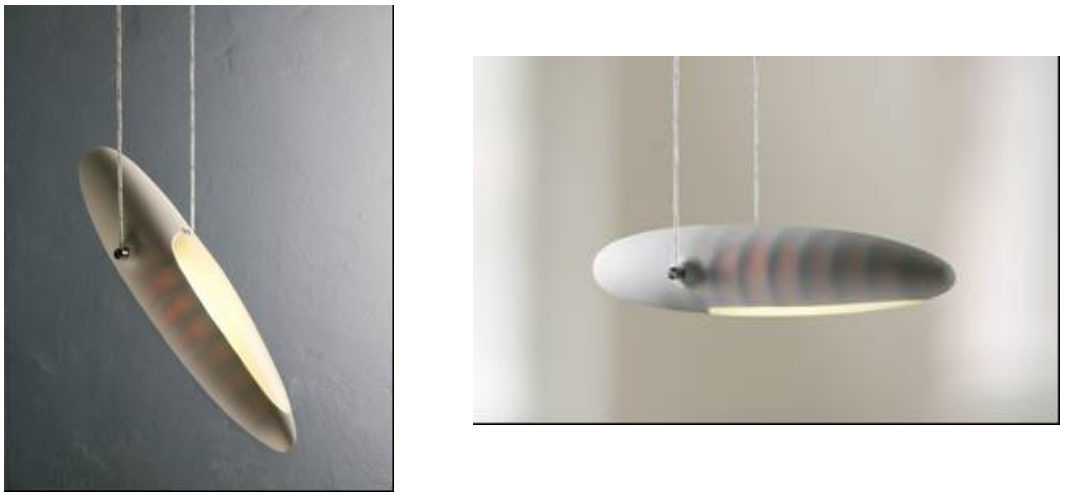

Figure 4 BetweeN2ShapeS fixture designed by Soren Momsen

Best Design of 2003

The “Aliante” pendant by Ivalo Lighting was selected as the Best Design of 2003 in Phase I of the competition. Designed by Stefano Casciani for Ivalo, the fixture was selected by the judges for its elegant design and engineering, exceptional energy efficiency, and modern aesthetic appeal. Features of the Aliante include the following:

- Comes in 4-foot (122 cm) or 5-foot (152 cm) lengths
- Available in four different colors/finishes and with or without acrylic diffusers

- Uses either a 28-watt T5 or a 54-watt high-output T5 lamp and electronic ballast with optional dimming capability.
- A companion fixture, the Aliante sconce (see below) was also designated as a finalist in Phase I.

Figure 5 Aliante pendant by Ivalo Lighting

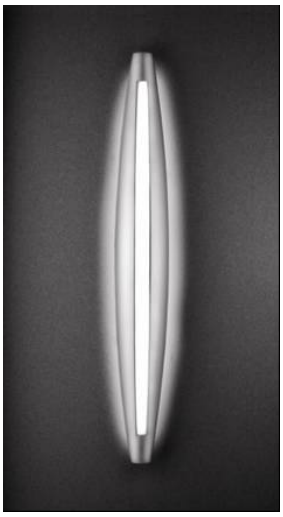

Figure 6 Aliante sconce

Impacts of the first competition

Industry education impact

As part of the industry outreach associated with the design competition, LFT organizers presented information on the competition and on efficiency at several major meetings and conferences:

- International Lighting and Accessories Market, Dallas TX, January 2003
- Energy Star Lighting Partner Meeting, Tempe AZ, March 2003
- ALA Annual Conference, New Orleans LA, May 2003
- LightFair, New York NY, May 2003
- International Lighting and Accessories Market, Dallas TX, June 2003
- ALA Engineering Committee Meeting, Cleveland OH, September 2003
- International Lighting and Accessories Market, Dallas TX, January 2004
- Energy Star Lighting Partner Meeting, Austin TX, April 2004
- ALA Annual Conference, Tucson, AZ, May 2004
- ACEEE Summer Study on Energy Efficiency in Buildings, Asilomar, CA, August 2004
- CEE Industry Partner Meeting, Dallas, TX, September 2004.

Attendees of these meetings were primarily lighting fixture manufacturers, some of whom already produced efficient fixtures and some did not. Others included lighting fixture designers, lighting showroom managers, and manufacturer's representatives. At these meetings, attendees heard about the design competition's aims, the state of efficient lighting technology, the growing market for efficient fixtures, and the opportunity to participate in utility energy efficiency programs. LFT organizers encouraged attendees to participate in the design competition and in the Energy Star program for efficient fixtures. Information about the competition and efficient fixtures was also mailed and faxed to all ALA members, including manufacturers and showrooms, to educate them about efficient lighting.

These mailings and meetings generated a significant amount of interest in the competition and in efficient lighting in general, as evidenced by the number of submissions to the competition. LFT received 272 indications of interest and 156 actual design entries in Phase I. Of the entries received, 117 designs were from 34 different fixture manufacturers, while 39 were from lighting designers. 35 percent of the fixture manufacturer entries had qualified under Energy Star in the past, while 65 percent had not. Through its outreach efforts, LFT was successful in bringing new manufacturers to the table.

While the majority of the designs came from U.S.-based entrants, the competition was not limited to the United States, and entries were received from other countries including Australia, Canada, Denmark, Slovenia, Spain, Switzerland, and Thailand.

Publicity

Lighting for Tomorrow placed considerable emphasis on publicizing the competition itself, the concept of decorative energy-efficient lighting in general, the finalist designs, and the ultimate winners. Intensive publicity campaigns were conducted at three points over the course of the two-year competition: 1) at competition launch, 2) following Phase I, and 3) following Phase II.

The competition launch was advertised through a news release and a dedicated website, www.lightingfortomorrow.com. The organizers developed a four-panel brochure describing the competition. The brochure was mailed to the ALA membership and all Energy Star lighting partners and distributed at conferences and industry meetings.

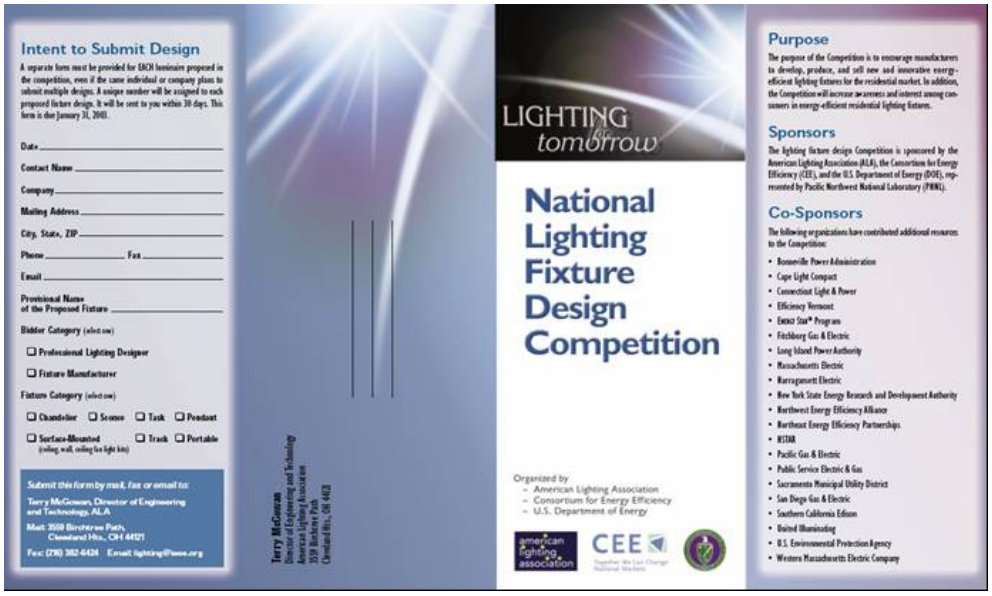

Figure 7 Brochure used to advertise the competition.

Following Phase I, the primary strategy for publicizing the finalists was to place articles in the lighting trade and consumer press. Articles appeared in about a dozen magazines, in addition to numerous web sites. The organizers also reached out to lighting fixture manufacturers to promote the finalist designs submitted by independent designers. A special section of the LFT website featured finalist designs that were seeking a manufacturer. A one-page information sheet was developed for each design.

Figure 8 Examples of the one-page information sheets describing available finalist designs.

Following Phase II and the selection of the overall winners of the competition, the organizers hired an exhibit design firm to custom design a display booth that could travel to industry shows and events.

Figure 9 Lighting for Tomorrow exhibit booth featuring winners

The booth was displayed at ALA's 2004 Annual Conference in Arizona; the ACEEE 2004 Summer Study in California; and CEE's September 2004 Industry Partners Meeting in Texas. In addition, several of the winning fixtures were integrated into long-term displays at educational facilities sponsored by electric utilities, including the Smart Living Centre in Connecticut, the Pacific Energy Centre in San Francisco, and Southern California Edison's Lighting Technology Centre in Irwindale.

The Lighting for Tomorrow organizers also developed a 35-page glossy booklet highlighting 14 of the finalists, including the four Phase II winners. The booklet was designed as an all-purpose handout for use at conferences, trade shows, and industry meetings, and for a broad range of people interested in Lighting for Tomorrow, including lighting fixture manufacturers, designers, utilities and energy efficiency programs, lighting showrooms, and government sponsors. The organizers printed 3000 booklets which were distributed from May 2004 through early 2005.

Figure 10 Cover of Lighting for Tomorrow booklet

Retail placements

In addition to upstream efforts to increase the production of decorative, efficient fixtures by manufacturers, LFT also worked with the manufacturers to get the new products placed in retail stores. Efforts in this area included several educational mailings/faxes to lighting showrooms to inform them of the new products, as well as tracking manufacturer efforts and informing CEE members when the products reached their service territories.

The outreach to lighting showrooms yielded significant results. For example, at the beginning of the competition, Ivalo Lighting, winner of the Best Design prize in Phase I, had no retail placements for its

products. They were primarily sold directly from the manufacturer to architects and lighting specifiers. With the promotion provided by the competition, Ivalo was able to place its fixture in 11 showrooms by the end of the competition period.

Anecdotal evidence from other participants indicates that this phenomenon is not limited to Ivalo. Both Lightolier and Forecast Lighting, which were given Second Prize awards in 2004, have stated that their placements and sales have increased over the period of the competition, though they have released no specific sales data to competition organizers at this time.

Four American Fluorescent fixtures recognized in the competition were introduced to the market and placed at retail as a result of the competition. These were purchased by Lowes, a major home improvement chain, and are currently available at all of Lowes' stores on the U.S. west coast. The fixtures are also available at selected retail outlets nationwide such as Connecticut Lighting Centres. Lighting for Tomorrow has leveraged these placements by distributing the information to the relevant CEE members and encouraging them to develop targeted promotions around the fixtures.

Energy and environmental impacts

While tying these retail placements to kWh and carbon savings is difficult due to lack of future sales data, an estimate of potential impact can be made with some standard assumptions.

Table 2. Estimated potential energy and carbon savings from Lighting for Tomorrow fixtures

	kWh/yr consumed	Incandescent equivalent kWh/yr	Annual savings kWh per fixture*	National savings (MWh/year)**	Carbon savings (tonnes/yr)	Carbon savings over fixture life (tonnes)***
Salem	123	526	403	6044	3663	36629
Torch	20	88	67	756	458	4579
Soli	39	146	107	799	484	4844
B2S	64	292	228	512	311	3106

*Assumes 4 hours/day operation. **Based on hypothetical annual fixture sales. ***Assumes 10 year fixture life.

Lessons from the first competition

The first Lighting for Tomorrow competition was deemed a success by its sponsors and organizers. It attracted a high degree of industry participation, generated favourable publicity for the winning companies, and in general, raised awareness of energy-efficient residential lighting within the lighting fixture manufacturer and showroom industries. In building upon this initial success and developing future efforts, the organizers have identified several areas requiring increased attention or a modified strategy in the future. These areas are described below.

Fixture families. The first competition invited individual fixture designs. While some companies and designers submitted complete families of matching fixtures, the competition did not specifically invite families and treated each fixture individually. Judging was organized by specific fixture type (e.g., chandelier, sconce, portable, etc.), so families were split up across categories. This worked against the families in the judging process because the judges tired of seeing the same basic design in multiple categories. Because the competition was structured around individual fixture categories, the winners were recognized and promoted individually. Feedback from lighting showrooms and utility programs indicated a desire to have more complete families or sets of fixtures to promote. Organizers believe that fixture families, unlike single designs, will also be easier for builders to install in residential new construction.

In future competitions, the organizers plan to invite designs for complete fixture families.

Key role of manufacturers. The first competition was open to lighting fixture manufacturers and designers, as well as students sponsored by a manufacturer. The organizers wanted to invite a broad range of visions and possibilities about what energy-efficient lighting could look like, and therefore, wanted to be open to as much creativity as possible. In practice, however, it was difficult to move the interesting designs submitted by designers and students into prototyping and production. Several beautiful, innovative designs submitted by designers were selected as finalists in Phase I, but were unable to find manufacturing partners or even a way to construct a prototype in time for Phase II. Among the seven designer-submitted finalists that were able to submit a prototype, only one has secured a manufacturer to date.

In future competitions, the organizers plan to focus on fixture manufacturers. Designers will be invited to participate if they have secured a commitment from a manufacturer to prototype and produce the fixture design.

New versus existing fixture designs. The competition allowed fixtures that had already been introduced in the market, as well as new designs. The organizers decided to allow existing fixtures for several reasons. First, existing energy-efficient, dedicated fluorescent fixtures generally lacked recognition by consumers, lighting showrooms, and the decorative lighting market press. The competition organizers wanted to draw attention to the small number of existing high-quality, decorative, energy-efficient fixtures. Second, because LFT was the first competition of this type in the U.S., the organizers could not predict the response and wanted to increase the number and quality of submissions by allowing products that had already been developed by manufacturers. Third, in light of the ultimate goal of saving energy through use of more efficient residential lighting fixtures, the organizers wanted to increase the speed with which winning designs could be made available to consumers, lighting showrooms, and energy efficiency programs. Lastly, while bringing new designs and manufacturers into the program was important, organizers did not want to penalize the manufacturers that had already made an investment in efficient, decorative fixtures.

Of the 24 finalists identified in Phase I, 17 were developed specifically in response to the Lighting for Tomorrow competition, while the other 7 had been developed earlier. Five of those seven were already in production and available on the market. The Best Design of 2003, selected in Phase I of the competition, was a fixture that had been introduced earlier and was in production. In terms of the Phase II winners, the Grand Prize Winner was a new design developed specifically for the LFT competition, while the three 2nd Place winners had been developed earlier and/or already introduced in the market. Particularly at the paper design stage, it was arguably difficult for new designs to compete with finished product photography. However, some existing products submitted in Phase I were seen as "old news" by the judges, and therefore scored low on innovation.

In future competitions, the organizers intend to request new and recently introduced designs. Existing designs would be allowed only if introduced after a certain date, for example, within the same calendar year as the competition.

Indoor and outdoor fixtures. The first competition allowed only indoor fixtures. The perception of the organizers was that enough energy-efficient outdoor fixtures were available in the market and it was not a significant need. However, recent feedback from manufacturers and lighting showrooms indicates that outdoor lighting is a growing part of the residential lighting market, and one that could be aptly addressed by efficient fixtures. One showroom estimated outdoor fixtures represent 20 percent of their sales. From an energy efficiency perspective, outdoor lighting is an attractive application, given the long operating hours of outdoor lights. Recent trends in outdoor fixture styles, including use of milky, etched, patterned, or otherwise translucent diffusers, rather than clear glass, is better suited to CFLs.

In future competitions, the organizers intend to include an outdoor fixture category.

More direct links to the market. The first Lighting for Tomorrow competition ended with the announcement of the winners. Although the organizers continue to promote the winning fixtures through exhibits at industry events, presentations at conferences and meetings, magazine articles, and distribution of the full-colour booklet, the program did not include specific retail promotion activities. The organizers encouraged energy efficiency programs to promote the winning fixtures in their programs, but specific plans were not developed under the Lighting for Tomorrow program.

In future programs, the organizers intend to develop plans with administrators of energy efficiency programs with active residential lighting components, including cooperative promotion with lighting showrooms in their local areas.

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Acknowledgements

The authors would like to acknowledge the sponsors of Lighting for Tomorrow's Phase I and II activities: American Lighting Association, U.S. Department of Energy, Consortium for Energy Efficiency, Bonneville Power Administration, Cape Light Compact, The Connecticut Light & Power Company, Efficiency Vermont, ENERGY STAR® Program, Long Island Power Authority, Massachusetts Electric, Narragansett Electric, New York State Energy Research and Development Authority, Northeast Energy Efficiency Partnerships, Northwest Energy Efficiency Alliance, NSTAR Electric, Pacific Gas & Electric, Public Service Electric & Gas, Sacramento Municipal Utility District, San Diego Gas & Electric, Southern California Edison, United Illuminating, Unitil: The Fitchburg Gas & Electric Company, and the Western Massachusetts Electric Company.

Pacific Northwest National Laboratory is a multiprogram laboratory operated by Battelle for the U.S. Department of Energy.