

**Voices for SSL Efficiency:
Opportunities to Partner and Participate
April 23-24, 2007 ■ Pasadena, CA**

DETAILED CASE STUDY FOR BREAKOUT SESSIONS

LED Outdoor Walkway and Streetscape Light

A core activity of the DOE SSL Market Introduction Workshop will explore case studies based on five hypothetical SSL products intended for various market applications. Workshop attendees will participate in one of the five case study breakout sessions.

This exercise is a vehicle for determining how DOE commercialization plan elements will best support the market introduction needs of new SSL products. It will serve to identify major stakeholders and the elements of the DOE programs where their participation will be most valuable. And it will provide valuable feedback to improve the design of DOE programs.

The Assignment

Each breakout group will consider one case study, working together to:

- Outline a general strategy to sell their target product, identifying issues that are particularly important for that product, such as barriers to overcome, critical information needs, involvement of critical trade allies, etc.
- Consider which elements of the DOE commercialization programs can best support their strategy and how. Could there be improvements?

The case studies include a lot of questions, provided to help you think about the issues. Some may apply, and some may not. The group doesn't need to address all the questions, but should address the questions and issues that are most important for this case study.

Case Study Structure

Each case study includes:

- An Introduction that identifies the product and places it within its intended market segment, outlining competitive advantages and disadvantages.
- The Product Description offers additional detail on performance.
- Pricing further defines the market served.
- Other Considerations are things the group may want to think about specific to this product.

Please note: The case study products are *hypothetical* products with *plausible* performance parameters (or that's the intention). In many cases, they would be technically challenging to produce today, but that doesn't matter for this exercise. Don't worry too much about the performance or market numbers, or spend time re-designing the product. This information is provided in the case studies only to help you understand the issues related to this product.

LED Outdoor Walkway and Streetscape Light

Introduction: Outside area lighting is a difficult challenge for SSL. High Pressure Sodium (HPS) lights are quite energy efficient, have reasonably long lifetimes, and deliver a lot of light. LEDs nonetheless offer two potential advantages in this situation. First, LED source technology today is capable of an efficiency approaching those of HPS and soon will likely surpass it, and the directionality of the LEDs should also allow luminaire efficiency to be higher than for HPS. Second, the LED color quality is much better than HPS. In many applications, this last “advantage” is not terribly important. However, in some areas, particularly historic districts, pedestrian areas in shopping areas or in some park or residential situations, better color may be a selling point. The target product is positioned as better than the HPS in terms of efficiency, having a longer life, and much better in terms of color quality. The price is somewhat higher than a comparable HPS fixture, but because the fixtures themselves are somewhat expensive in this market, it is not a large factor. The extra energy savings, while not as great as some applications, is nonetheless thought to be important in this application and should appeal to municipalities and utilities.



Product Description: The target product is a full cutoff LED outdoor walkway luminaire for illuminating pedestrian walkways, downtown streetscapes, residential neighborhoods, and public parks. This product is intended to be mounted at heights in the range of 10 to 16 feet. Light output delivered from the fixture is 3200 lumens while consuming 40W (a *luminaire* efficacy, including the LED driver, of 80 LPW). A 50W HPS *lamp* generates about 3600 lumens at an efficacy of 72 LPW. But the fixture efficiency for a full cutoff design is about 80%, so the luminaire delivers only about 2880 lumens resulting in a luminaire efficacy about 58 LPW. The directional nature of the LED sources makes them particularly attractive sources when dark-sky or other light-pollution considerations are important because it provides some “built-in” cutoff characteristics, simplifying fixture design. Additionally, with a color rendition index (CRI) of 80 easily achievable, the quality of the LED light exceeds HPS lamps, which typically have a pronounced yellowish color leading to a nominal CRI of approximately 21. This feature should make the product particularly attractive for historic areas or downtown areas where improved light quality will be appreciated. While halogen lamps are sometimes used in installations when color is important, their efficacy is extremely poor. The LED product offers a compromise of “good” color rendition while maintaining high energy efficiency. Since outdoor lighting installations are usually quite long-lived and also operate for extended times, both the light source and the driver can be separately replaced with design-specific modules. This also allows for upgrades as the SSL product technology advances. The design target for lifetime for both LED source and driver modules is 50,000 operating hours, which is over twice that for the best competing conventional lamps, even with anticipated improvements. The luminaire cannot be retro-fitted with a conventional light source, assuring that neither energy savings nor dark-sky advantages can be compromised.

Pricing: The LED street light is priced at \$1800, complete. Comparable products using conventional technology sell in the range of \$1200-\$1600 wholesale, including a halogen or sodium lamp. (Higher prices may apply for more intricate or decorative designs.) The manufacturer expects that the energy savings and long lifetime, especially, but also the better color quality and the attractive design all combine to fully justify this cost premium. The differential cost between the LED lamps and conventional lamps is higher, but is a fairly small fraction of the total. The driver is an important additional cost factor for the manufacturer, as it uses high-reliability technology for harsh outdoor environments.

The Market: Outdoor lighting consumes about 12% of the total lighting energy consumption in the U.S. It is also very public, so success in entering this market not only offers significant energy savings but also some educational aspects that may help promote solid-state lighting for other applications. This makes it an attractive target for the efforts of utilities, municipalities, and energy-efficiency organizations. The market strategy should take full advantage of these opportunities. However, this is not a high-volume market. Annual sales number in the thousands rather than the millions, as do some other segments. At the same time, the higher prices combine to make it a reasonably attractive market from the point of view of dollar sales volume. Also, as the installations have a long lifetime, there is, in this case a more significant potential for the module replacement market than may apply to other segments served by SSL.

Other Considerations: Several issues relating to the introduction of new technology provide market barriers to entry. These will need to be addressed in any marketing strategy for this product.

1. Maintenance. This is potentially a very important advantage because of the longer life. The manufacturer has addressed this issue from a practical perspective with the replaceable driver and source modules, but buyers may want some assurance of continued availability.
2. Lumen output. Although the fixture provides significantly *higher* delivered light to the walkway surface and surrounding area because no upward-directed light is generated by the LEDs, buyers may perceive this as a low-luminance fixture because of the advertised lumen output of the competing HPS *lamps*. What kind of educational efforts might help this situation? Is this an area that governments, energy efficiency organizations or utilities should emphasize, and if so what is the best way?
3. Color quality. This product is significantly better than HPS technology in this regard, but falls somewhat short as compared to a halogen alternative on CRI. So there is a compromise between color quality and operating cost. How can this best be sold? Educational efforts? Public demonstrations?

Assignment

Your Job: Your assignment is to design a marketing strategy for this product. Your company, a specialty manufacturer of outdoor lighting fixtures, has many years of experience with traditional lighting and many relationships along the value chain, but this is your first SSL product. Fortunately you are addressing a highly motivated market. Environmental factors have had some influence in this market for some time. Many municipalities are embarking on serious energy savings programs, and saving money for maintenance has always been an important consideration. DOE has developed a plan that will involve many public organizations such as government agencies, utility companies, state energy efficiency organizations, industry organizations, and others. They have begun important educational, technical support, and standardization activities intended to accelerate market development. Most of these activities, however, are not directed at any particular market segment or product type. The main purpose of this part of your market development process is to determine how you can most effectively use these programs to achieve your goals. What changes, if any, might improve these programs to better support the needs of your product and market?

The Task, Part I: Frame the general outlines of the marketing strategy.

- Where are the weaknesses in the incumbent products that can provide new opportunity? How can you exploit them? What are the key competitive barriers to success? What are the technological barriers to success?
- How can you best exploit the energy savings inherent in this product to foster market acceptance? Address some of the particular issues outlined for street lighting above.

- What has to happen for a successful market introduction of an LED outdoor area? What might be some useful unit sales goals for the first year or two? (We don't have a lot of specific market data. Either invent numbers for the total addressable market or compare as a percentage.)
- Maintenance cost savings drove the acceptance of LED stoplights in the U.S. There are, however, issues of availability of replacement parts for a new technology. An open standardized interface for the modules would ensure that multiple suppliers could provide compatible replacement products and help to alleviate this barrier. How could this be expedited?
- What behaviors will need to change in order to achieve success? What sort of educational efforts or demonstrations might help to show the advantages for this technology in these applications?

The Task, Part II: Identify the roles of the government and non-government agencies and organizations.

- In the table below are listed some potential market-assisting activities that many public and industry organizations may be willing to support. Which do you think would be most useful? How would you apply these activities to your overall plan?
- Which activities are not useful for this particular product? Why? Could they be improved?
- What other elements would you add to this list?
- You have heard about the commercialization activities at the DOE. What aspects of the DOE program will be most useful for this application and market?
- What other groups will be most important to engage to achieve success?

General Comments and Advice:

- Your team has limited time to put together a solution to this assignment. For best results (and most useful for this workshop) spend only a portion of the first day's breakout session on Part I and do some brainstorming on Part II. Use the second day breakout to complete your evaluation to tidy up your presentation.
- Don't spend a lot of time debating the numbers in the case study. The idea is to give you something concrete to work with, not to give you a review of the lighting market or for you to design a specific product.
- Give your product a name. Make it sell!

Campaign elements	Stakeholders and roles*	How could you use this element for this product?
<i>Buyer Guidance</i>		
a) ENERGY STAR® Criteria		
b) Design/Purchasing Guidance		
<i>Design Competitions</i>		
a) Lighting for Tomorrow (Residential Fixtures)		
b) Commercial Fixtures Competition		
c) Lighting Design Competition for Exterior & Interior Spaces		
d) State-of-the-Art LED Luminaire Showcase		
<i>Technology Demonstrations/Procurements</i>		
a) Demonstrations of Market Readiness		
b) Demonstrations to Test Field Performance		
<i>Commercial Product Testing</i>		
a) Commercial Product Testing Program		
<i>Technical Information</i>		
a) Information Development and Dissemination		
b) Technical Information Network		
<i>Standards and Test Procedures</i>		
a) Standards/Testing Procedure Development Support		
<i>Coordination/Leadership</i>		
a) Facilitating and Coordinating Local and Regional Efforts		
b) Federal Government Leadership		
<i>Other</i>		

* Stakeholders: Standards organizations, manufacturers, industry associations, commercial lighting distributors, residential lighting showrooms, retailers, ESCOs, EEPs, utilities, state energy efficiency programs, large purchasers, energy efficiency advocates, others...

