L Prize

2014 Building Technologies Office Peer Review

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

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Project Summary

Timeline:

Start date: FY2008

Planned end date: FY2019

Key Milestones

1. First winner announced, FY2011
2. Second winner announced, est FY2015
3. Third winner announced, est FY2017

Budget:

Total DOE $ to date: $4.1 million

Total future DOE $: $4.0 million

Target Market/Audience:

SSL manufacturers, utilities & energy efficiency programs, retailers, end users

Key Partners:

Philips	Progress Energy
Other mfgrs	SCE
ComEd	DTE
Efficiency VT	National Grid
WECC	MEEA

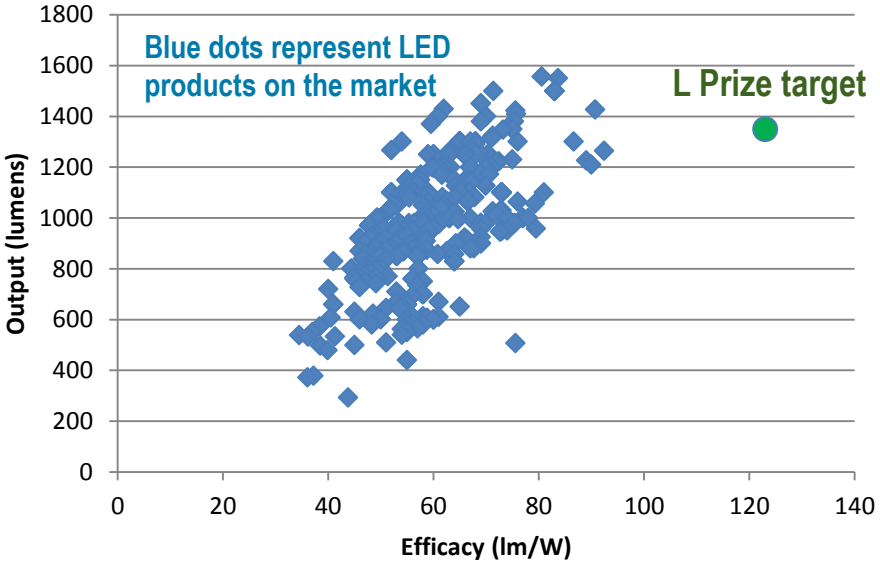
Project Goal:

Objective: to spur the development of new, ultra-efficient lighting products to replace common light sources including the 60-watt incandescent bulb and the PAR38 reflector bulb. **Goal:** to realize significant lighting energy savings through widespread adoption of the technological and product innovations developed in response to the competition.

Purpose and Objectives

Problem Statement:
SSL products have the potential to save significant energy, but many have lower lighting quality and performance compared to incumbent technologies. Cost pressures, performance trade-offs, and component availability currently discourage manufacturers from reaching L Prize performance targets.

Output and Efficacy of LED PAR38 Lamps Compared to L Prize Requirements



LED Lighting Facts-Listed PAR38 Lamps
As of March 2014

Purpose and Objectives

Target Market and Audience:

- Key target is lighting manufacturers – challenge them to produce advanced, high efficiency SSL products
- Secondary target is utilities and energy efficiency programs that promote efficient lighting technologies
- Secondary target is end-users, especially large volume buyers
  - Estimated energy use for general service A-type and reflector lamps targeted by the L Prize is 166 TWh per year (LMC 2010)

Purpose and Objectives

Impact of Project (Intended): Potential to transform the market for targeted product categories commonly used in residential and commercial buildings.

- If every socket in the U.S. converted their 60W incandescent lamps to the 10W L Prize winner, the country would save approximately 35 TWh per year, and avoid 20 million metric tons of carbon emissions.
- If all 90 million installed PAR38 lamps in the U.S. converted overnight to an L Prize-equivalent PAR38, the country would save 11 TWh per year and avoid roughly 7 million metric tons of carbon emissions.

1. Current project endpoint is awards in all 3 categories authorized in EISA 2007
   a. 60W incandescent replacement lamp
   b. PAR 38 halogen replacement lamp
   c. "21st Century Lamp"; category still undefined
2. How achievements towards goal are measured:
   a. Near-term: Products introduced to market
   b. Intermediate-term: Estimated sales
   c. Long-term: Estimated energy savings

Approach

Approach:

- Set aggressive performance targets for select products, ensuring that winning products will save energy and meet user expectations for lighting quality
- Form partnerships with utilities and energy efficiency programs representing tens of millions of consumers and support with incentives and promotion
- Launch competition; solicit entries
- Perform extensive performance evaluation of entries before award; not only assures product meets requirements, but also reduces risks for buyers
- Technical Review Comm. of non-DOE experts determines if requirements met
- Make award if requirements met
- Engage in substantial publicity, recognition, and external communications

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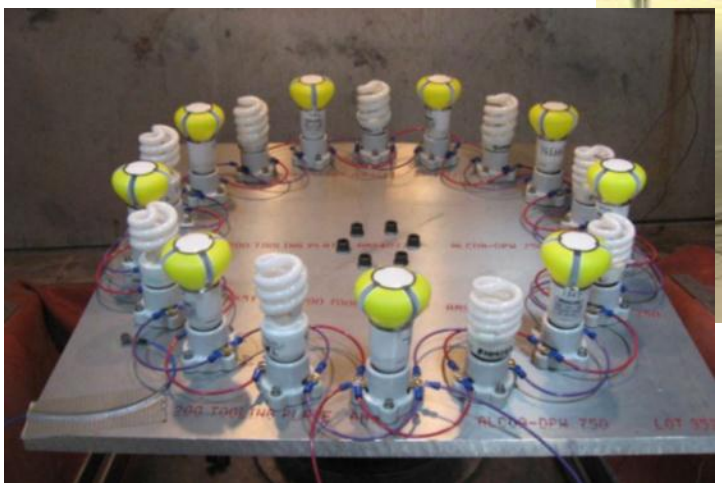
Approach

Key Issues:

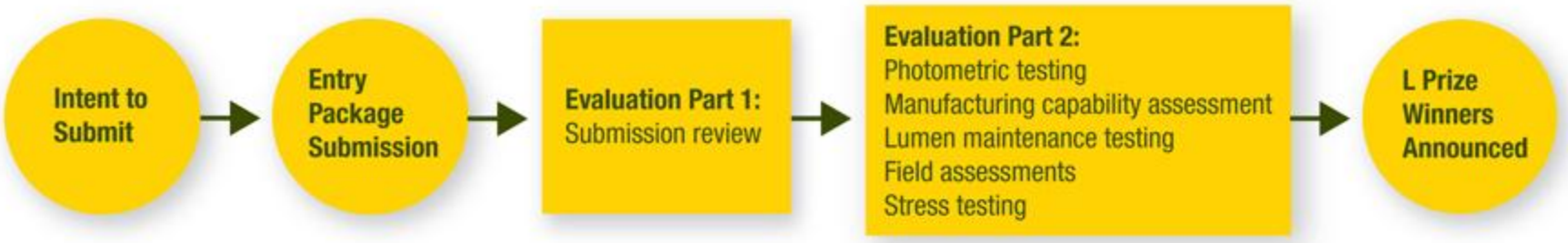
- After 25,000 hours of continuous testing, the L Prize winning bulb still had average lumen maintenance of 100% of their initial output and no visually noticeable color shift
- Stress testing (extreme max /min temperatures, vibration, high and low voltage, high humidity, electric waveform distortions) caused all benchmark CFLs to fail, while the L Prize lamps continued to operate.
- Field assessments identified dimming problems that were addressed by Philips in the production version



Approach

Distinctive Characteristics:

- Technology race with monetary prizes authorized in EISA 2007
- Very challenging technical performance requirements
  - Key specs established in EISA
  - Additional requirements developed by DOE
    - CA utilities helped with 60W replacement specs
- Rigorous evaluation process
  - Short-term photometric testing
  - Stress testing
  - Long-term lumen and chromaticity maintenance testing
  - Field assessments with energy efficiency partners and host sites



Progress and Accomplishments

Lessons Learned:

From 1st category (60 watt replacement):

- Product was over-specified (900 lumens required by legislation) and over-priced for the market at the time of competition
  - *Response: Target PAR38 contest to commercial/retail market*
- Utilities did not reward the higher performance of the winning product with financial incentives beyond those available for all Energy Star qualified products
  - *Response: Reduce dependence on utility incentives*
- Mass adoption by federal agencies was hindered by efficiency policies that had already caused most incandescents to be replaced with CFLs
  - *Response: Reduce dependence on federal purchasing*
- Long evaluation period delayed market intro while competitors caught up
  - *Response: Shorten overall evaluation period from 18 months to no more than 12 months*

Progress and Accomplishments

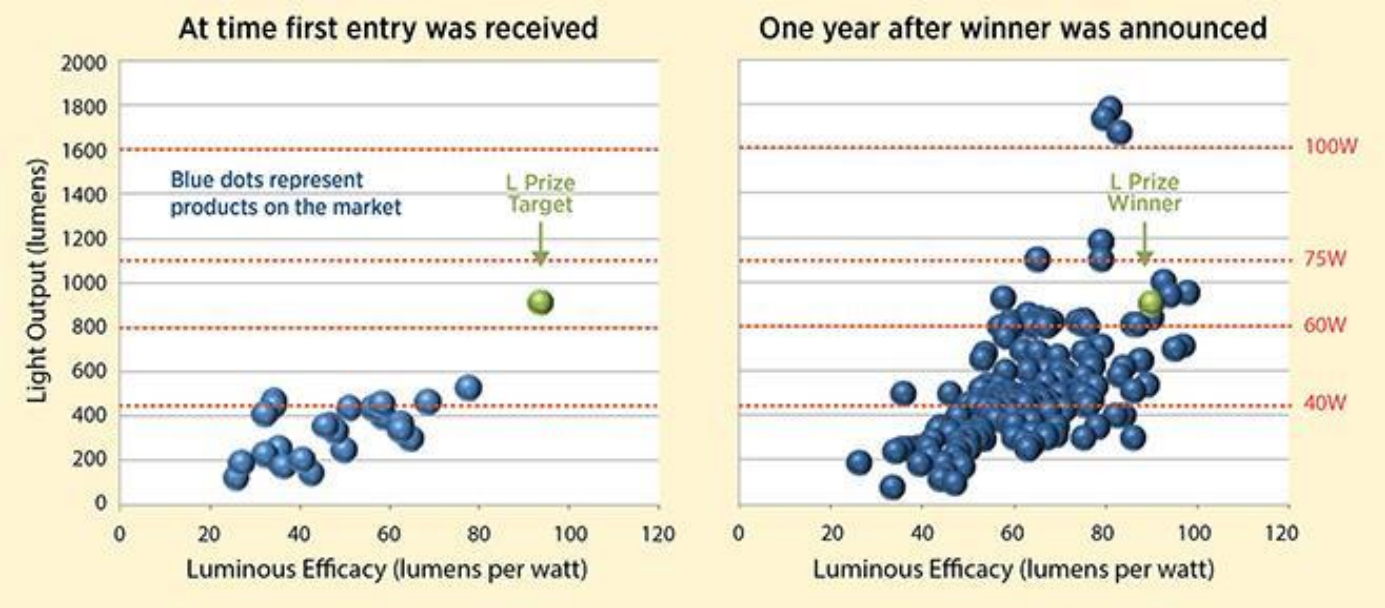
Accomplishments:

- The Philips product line using L Prize technology had saved more than $13 million in consumer energy costs by early 2013
  - more than pays back the $10 million prize awarded in late 2011
- Technical innovations in L Prize lamp enabled multiple products in Philips' LED light bulb line, including 60-, 75-, and 100-watt replacement bulbs, and the Hue color changing bulb, controlled by iPhone interface.
- Established L Prize brand in market as meaning ultra-high performer; U.S. government prize winner

Progress and Accomplishments

Market Impact:

- Enabled and accelerated new LED products (not just winning product)
  - In 2009, LED lamps were typically producing 200-400 lumens, at 30-60 lm/W
  - By early 2013, 17 products exceeded 900 lm, 3 exceeded 90 lm/W
  - >$13 million in consumer energy costs by early 2013 (Slide 10)
- L Prize has helped shift key market player expectations well above ENERGY STAR, which has lagged technology development
- Philips stated the L Prize moved technology ahead 3–5 years



60-watt replacement lamps

Progress and Accomplishments

Awards/Recognition:

- Philips L Prize lamp was listed by TIME Magazine as 3rd in "The 50 Best Inventions of 2009"
- L Prize was on the Philips Lighting home page for over a year
- Extensive media coverage of the award in both general and trade press

TIME

Project Integration and Collaboration

Project Integration:

- Promotion among NGLIA manufacturers; Philips was the first winner
- Utilities & energy efficiency programs are field assessment and market development partners

West

BC hydro powersmart
EWEB
EnergyTrust of Oregon, Inc.
NRDC
NVEnergy
Pacific Gas and Electric Company
PUGET SOUND ENERGY
SDGE Sempra Energy utility
Seattle City Light
SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT The Power To Do More.
SOUTHERN CALIFORNIA EDISON

Mountain/Central

Ameren ILLINOIS
ComEd An Exelon Company
DTE Energy
MEEA
PLATTE RIVER POWER AUTHORITY
SOUTHERN MINNESOTA MUNICIPAL POWER AGENCY
WECC wisconsin energy conservation corporation
Xcel Energy

East

Cape Light Compact
Efficiency Vermont
LIPA
nationalgrid THE POWER OF ACTION
nep
NYSERDA
NSTAR
Progress Energy
ui The United Illuminating Company
CONNECTICUT

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Project Integration and Collaboration

Partners, Subcontractors, and Collaborators:

- PNNL is lead technical contractor
  - Develop technical specifications and requirements
  - Perform and oversee evaluation testing
- Akoya is communications contractor
  - L Prize branding, messaging, news releases
  - Video development
  - Partner promotion and documentation of field assessments
- L Prize promotion with FEMP, GSA, other federal agencies/programs
  - Cross-fertilization with Challenge.gov and other technology contests

Project Integration and Collaboration

Communications:

- L Prize award ceremony Aug 2011 on Capitol Hill
- DOE SSL annual R&D and Market Introduction workshops
- Exhibit booth at Light Fair International
- Trade and general press, articles, video

Next Steps and Future Plans

1. To wrap up current project plans, need to make awards in PAR38 and 21st Century categories
    a. DOE revised PAR 38 eligibility requirements Jul 2013 to allow for more potential participants
    b. 21st Century competition still not announced; challenge to align EISA technical requirements with market-appropriate lighting applications
2. May consider additional product categories to be the focus of future L Prize awards after 21st Century competition

REFERENCE SLIDES

Project Budget

Project Budget: Peak spending to date was FY10 & FY11 during evaluation of the 60w replacement lamp entry.
Variances: Original FY09 budget was $100k. A mid-year addition of $400k supported development of the lumen maintenance test facility.
Cost to Date: Approximate total cost to date (through Mar 2014): $4,100k
Additional Funding:

- Investment by first winning manufacturer: ~$10,000k
- In-kind contribution of utilities participating in field assessments: ~$700k

Budget History

FY2008– FY2013 (past)		FY2014 (current)		FY2015 – FY2019 (planned)	
DOE	Cost-share	DOE	Cost-share	DOE	Cost-share
$4,000k	~$10,700k	$379k	$0	$4,000k	~$10,000k

Project Plan and Schedule

- 60-watt replacement winner announced Aug 2011
- 60w replacement winner entered the market Feb 2012 (commercial) and Apr 2012 (consumer)
- 25,000 hours testing of 60w replacement winner completed Apr 2013
- No PAR38 entries to date
- 21st Century category not opened to date