Blurring Boundaries of Market Transformation activities: Linkages among Awards, Procurement, and Incentives

Debbie Karpay Weyl, CLASP

Stephane de la Rue du Can, LBNL

Chad Gallinat, US Department of Energy

Michael McNeil, LBNL

Jenny Corry Smith, CLASP

Anand Gopal, LBNL

Greg Leventis, LBNL

Nicole Kearney, CLASP

Abstract

Market transformation programs are critical to expanding the availability of top efficiency appliances, lighting and equipment. The Super-efficient Equipment and Appliance Deployment (SEAD) Initiative, a voluntary multinational government collaboration of the Clean Energy Ministerial, undertakes work in three areas of the early stages of market transformation: awards, procurement, and incentives. Each of these areas stimulates the market for energy-efficient products by motivating sellers or purchasers of a product to make a more energy-efficient choice.

This paper will review how policies transform the market for energy-efficient technologies, and define the "market stimulation" early stages of market transformation. It will also examine how sequential integrated market stimulation policies can affect greater change than separate application of each type of policy.

Finally, this paper will take a closer look at three SEAD projects – one each in awards, procurement, and incentives – in order to investigate how these three types of programs can more successfully feed into each other to further enhance realized energy savings. The paper will explore these linkages and other potential connections among market stimulation program areas through these three projects. In addition, for each program area, the paper will describe the potential impacts of making those connections on stakeholders including governments (national or local), utilities, manufacturers, and consumers.

Introduction: Market Transformation for Energy Efficient Technologies

Market transformation is a term that describes the progression of a new technology or innovation from research and development through to mass adoption. The stages that comprise this progression are shown in Figure 1. A number of policy interventions, shown across the top of Figure 1, can accelerate the transition of new products to the next market stage.

In the early stages of market transformation, the main method for achieving this acceleration is through *market stimulation*.[1] Market stimulation creates economies of scale, which lower costs for consumers, by increasing demand for new products in one of three ways:

---

[1] The authors selected the term "market stimulation" to reflect the similarities to existing programs, such as programs within the US Department of Energy's Building Technologies Office (BTO). BTO's market

(1) Singling out new, best available technologies through awards,
(2) Artificially lowering prices for consumers through incentives, or
(3) Requiring the purchase of energy-efficient products through procurement programs.

As demand increases towards a critical mass, manufacturers' production costs fall which in turn lowers prices and increases cost effectiveness. Then, as products become cost-effective, they move towards mass adoption.

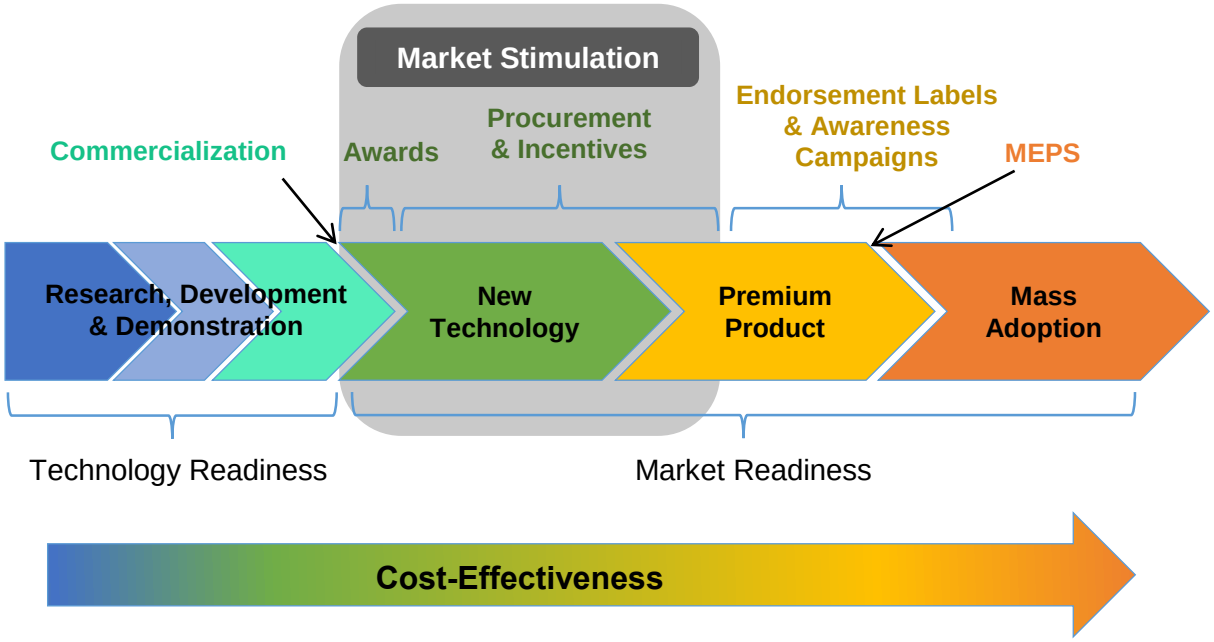


Figure 1: Market Transformation Stages and Target Policy Interventions

At every stage along the path of market transformation, consumer choice and behavior can have a significant impact on the net energy savings achieved from the uptake of energy-efficient technologies. For example, the rebound effect and free ridership both decrease overall energy savings, and program spillovers increase overall energy savings. [1] This paper examines the uptake of energy-efficient technologies themselves, rather than on the energy savings that result, and therefore will not focus on these effects.

New Technology and related market interventions

In the New Technology market stage, manufacturers are selling a newly innovated product, but it is purchased mainly by trendsetters and early adopters who are demonstrating the utility and value of the new technology. At this stage, the technology is not necessarily cost-effective – manufacturers are still producing a small quantity, and so the forces that will bring prices down later – economies of scale and learning effects – have not yet taken place. For all of these reasons, technologies at this stage are not expected to capture a significant market share.

At the early part of this stage, Awards can be an effective policy intervention to identify products that are transitioning from demonstration to new technology. By bringing attention to the best available technologies, Awards can motivate manufacturers to increase the market share of products at a certain energy efficiency level, and can encourage trendsetters and early adopters to notice and purchase the products. A bit further along in the new technology phase, procurement and incentive programs can motivate the purchase of these new technologies by consumers and large institutions with an inclination

---

stimulation programs help grow new technologies, thus bridging the gap from research and development to building codes and appliance standards. More information is available online at: http://energy.gov/eere/buildings/key-activities-energy-efficiency

for using leading-edge, energy-saving technologies. These programs create niche markets for new technology and premium products, amplifying the energy-saving impacts that these products can have.

Taken together, these policy interventions – awards, procurement, and incentives – constitute *market stimulation*. Ideally, they increase the demand for (and therefore the production of) cutting-edge energy-efficient products, leading to accelerated reductions in costs, improved cost-effectiveness, and progression from research and development to mass adoption.

Towards Mass Adoption

As product costs continue to fall due to greater production and manufacturer learning, new technology products become premium products at the top end of the market within their product category. These better-than-average products often have a price premium due to high energy efficiency being bundled with other features that consumers want. These products are often cost effective, but not always. Endorsement labels and consumer awareness campaigns can help early and late majority consumers identify and purchase these products.

Finally, once products are cost-effective, mass adoption leads the efficient technology to become standard on the market or, if minimum energy performance standards (MEPS) are put in place, a requirement.

Figure 2 shows a technology diffusion curve [2] with the various categories of consumers that tend to purchase technologies in each market stage along with the types of policy interventions to which they are therefore likely to respond. The portion of the market that may be influenced by market stimulation policies – awards, procurement, and incentive programs – are those at the early stages of technology diffusion. Trendsetters and early adopters will be influenced by all three of these policy types, and some of the early and late majority will be influenced by procurement and incentive programs.

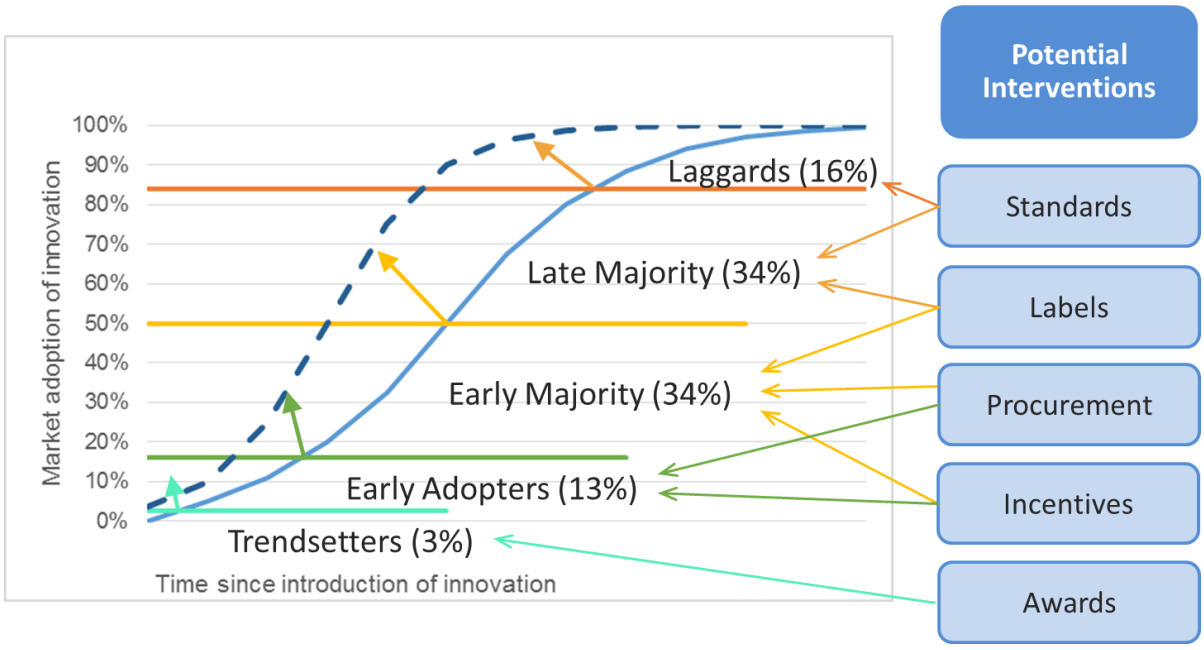


Figure 2: Technology Diffusion Curve and Target Policy Interventions [2]

The technology diffusion curve in Figure 2 is shown with time on the x-axis. Over time, manufacturers learn how to improve their processes and take advantage of economies of scale, and this technological learning leads to cost reduction. [3] Policy interventions for market stimulation at the early stages of market transformation reduce costs, improve cost-effectiveness, and accelerate progression along the technology diffusion curve. In Figure 2, the market stimulation policy interventions accelerate market adoption from the slower solid blue diffusion curve to the faster dotted blue diffusion curve. Ultimately, therefore, market stimulation leads to accelerated market transformation and earlier implementation of standards and labeling policies.

A Cyclical Process

Once new standards and labeling policies are in place, manufacturers will create new innovations to again push the envelope for energy efficiency. Ultimately these collective policies create continuous cycle of improvement for energy efficient technologies. [4]

As a product with new energy efficiency innovations comes to market, it will go through a cycle of increasing demand, lowering costs, and improving cost-effectiveness. Market stimulation programs therefore are useful each time new innovations provide a product with significant energy efficiency improvements. Major innovations will initially increase manufacturing costs anew and therefore require market stimulation programs to catalyze the lower prices that drive market demand. It is important to note that this cycle will happen many times for any product, as research and development lead to new innovations and efficiency gains.

For example, a number of innovations have led to major energy efficiency improvements for residential refrigerators. In the US, the Super-Efficient Refrigerator Program used an Awards program in the mid-1990s to motivate manufacturers to sell super-efficient refrigerators. With a US$ 30 million prize, manufacturers supplied refrigerators that were 25 to 50 percent more efficient than existing products on the market and did not use CFCs. [5] [1]

Since then, utilities across the US have provided fiscal incentives for the purchase of energy-efficient refrigerators. The efficiency levels that qualify refrigerators for these market stimulation programs continues to rise as the product mix continues to become more and more efficient. Incentives and other market stimulation policies paved the way for new standards implemented in 1993, 2001, and 2014, and prices of refrigerators have continued to fall despite the increases in efficiency. [6]

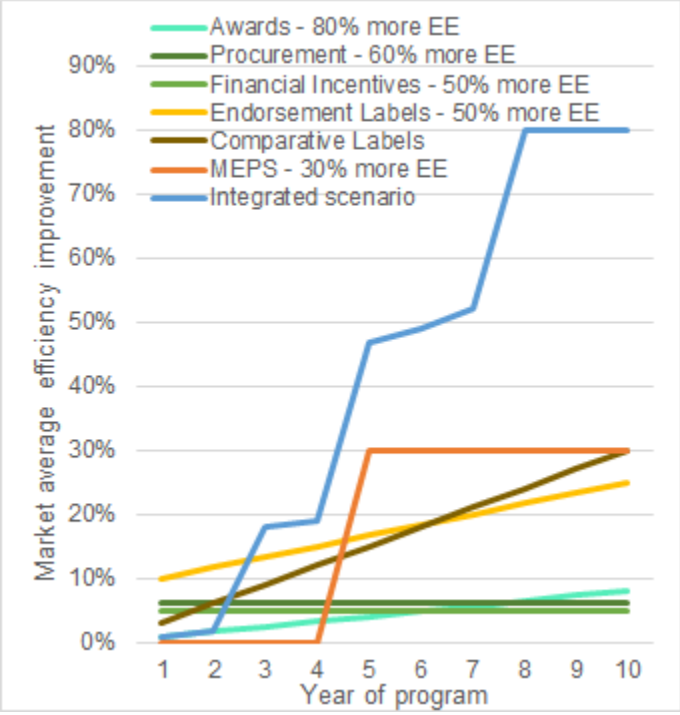
The Sum is Greater than the Parts: Integrating Market Transformation Activities

While each policy intervention causes some transformation of the market, it is even more effective for market transformation policies to be implemented in a coordinated way to shepherd products through the pathway of adoption. Figure 3 illustrates this point by showing each potential policy intervention on its own, and then showing an integrated scenario that combines these policy interventions. In this case, the integrated scenario uses the assumptions laid out in the sample policy implementation timeline. All percentage improvements outlined in this scenario are hypothetical.

Figure 3 shows that the earliest interventions – awards, procurement, and financial incentives – have the largest energy efficiency improvements (50-80%). However, because these market stimulation interventions only reach innovators and early adopters – about 15% of the market at most – they each only improve the average market efficiency by 1-8%. On the other extreme, MEPS improve the energy efficiency of the product by only 30%, but because they are mandatory, that results in a 30% improvement in the average market efficiency.

When these policy interventions are implemented in the sequence outlined in the sample policy implementation timeline, the cumulative effects (integrated scenario) are significantly more than any individual policy. Furthermore, the total timeline is accelerated, as the early market transformation policies began the process of bringing down costs, enabling the later policies such as MEPS to be politically palatable.

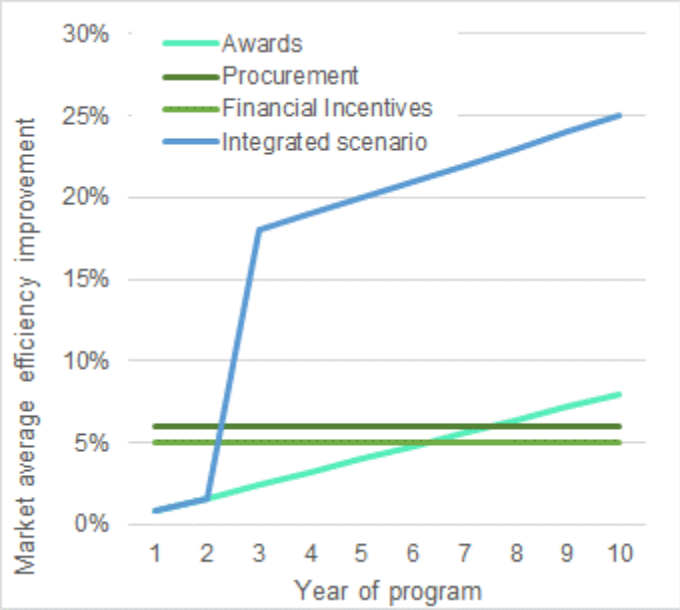
Figure 4 shows the same information as Figure 3 but focuses on the market stimulation interventions. Each policy intervention on its own might achieve less than 10% improvement on the market average efficiency because of low market adoption. An integrated market stimulation policy approach could improve the market average efficiency by 20-25% by (1) adding the effects of each intervention on its own, and (2) reaching more of the early majority (in addition to innovators and early adopters) as the cost-effectiveness of the product improves with increased production.



Sample Policy Implementation Timeline:

- **Year 1:**
  Announce **awards** to identify best available technology (BAT)
- **Years 3 & 4:**
  Target BAT through **financial incentives** and **procurement**
- **Years 5, 6, & 7:**
  Increase market share through **comparative** and **endorsement labels**; technological learning reduces prices
- **Year 8:**
  Introduce **MEPS** at initial BAT level

Figure 3: Example Integrated Energy Efficiency Policies for Market Transformation: All Policies



Sample Policy Implementation Timeline:

- **Year 1:**
  Announce **awards** to identify best available technology (BAT)
- **Years 3 & 4:**
  Target BAT through **financial incentives** and **procurement**

Figure 4: Example Integrated Market Stimulation Policies

Integrated Market Stimulation Policies: A Hypothetical Example

As an increasing number of countries turn to appliance energy efficiency as an element of actions against power crises and climate change, there are ever more opportunities to design integrated policy

portfolios of market stimulation activities. Though an integrated approach could take many forms, one potential example timeline is outlined below.

1. A national (or regional) government prioritizes product categories for which improvements in energy efficiency would have high impacts on electricity demand or peak load demand.
2. For a selected product category, a national awards program identifies the most efficient products on the market. If desired, one criterion could be local production or assembly of those products.
3. The national government provides financial incentives to manufacturers or consumers to increase the purchase of award-winning products. If local production is a criterion, the government provides upstream incentives to manufacturers of award-winning products to subsidize their production. Otherwise, the government provides incentives to purchasers/consumers.
4. Simultaneously, if relevant for the selected product category, government agency procurement programs specify preferred purchase of award-winning products, or set energy efficiency criteria at a level consistent with the energy consumption of award-winning products.

This kind of comprehensive program is an exciting goal, but does face several potential barriers. For such a program to be successful, selected products must have significant potential energy savings or peak load abatement as well as significant potential demand in order to transform the market.

In addition, an integrated program would require political will to enable multi-year planning and coordination among multiple government ministries. An awards program would likely be managed from an energy-related ministry, an upstream incentive might be administered by an industry ministry, and procurement programs are often run by an administrative or competition-related agency. For an effective integrated market stimulation policy portfolio, the sequence of each phase would have to be agreed in advance and implemented by each agency in turn, with some flexibility for unforeseen delays and transparent communication throughout.

A significant benefit of this type of program structure is the potential to strengthen local industries' production of energy-efficient products. Industry ministries are often seeking ways to invest in local industries. Moreover, local industries in developing countries can struggle to keep pace with global manufacturers on the development of energy efficient products, and this type of policy portfolio can improve local industry competitiveness ahead of potential minimum energy performance regulations.

Potential linkages among existing SEAD activities

Existing activities within the SEAD Initiative seek to transform the market for energy-efficient products, but so far have done so within individual policy areas rather than in a coordinated fashion across market stimulation policy streams. This section will take a closer look at three SEAD projects – one each in awards, procurement, and incentives – in order to investigate how these three types of programs can more successfully feed into each other to further enhance energy savings. For each activity, this section will describe the potential impacts of making these connections on stakeholders including governments (national or local), utilities, manufacturers, and consumers.

Awards: The SEAD Global Efficiency Medal for lighting products

Background about the SEAD Global Efficiency Medal competitions

The SEAD Global Efficiency Medal competition is a global competition that encourages the production and sale of super-efficient equipment, appliances, and electronics by identifying the most efficient product in each category in four regions, as well as an overall global winner. The first awards were given in 2012 to manufacturers of energy-efficient flat-panel televisions, followed by 2013 awards for

displays and 2014 awards for line-start electric induction motors. Most recently, awards were given in May 2015 for lighting products with the highest efficacy in selected categories.[2]

This winner-takes-all competition seeks to advance efficiency improvements by:

- Recognizing products with the best energy efficiency;
- Guiding early adopters who want to purchase the most energy-efficient products; and
- Demonstrating the levels of efficiency that are achievable with existing and new technologies.

The benefits of winning an award in the competition include:

- Exposure and global recognition for products, providing external confirmation of energy efficiency credentials;
- Strengthened reputation as an award winning manufacturer of super-efficient products;
- Use of a Global Efficiency Medal award logo on packaging and marketing materials; and
- Attendance at an awards ceremony to showcase the victory.

The SEAD awards complement existing national and multinational labeling programs, such as ENERGY STAR, that set performance thresholds for energy-efficient products.

Manufacturers self-nominate products for consideration for the Global Efficiency Medal in any number of categories and regions. SEAD then analyzes the nominations for presumed winners, procures samples through random sampling from the manufacturer or purchasing products from the market, and performs testing to verify the manufacturer energy performance claims.

The Lighting Awards

On 12 May 2014, the SEAD Initiative launched its fourth Global Efficiency Medal competition, which recognized and awarded highly energy-efficient lighting products. Lighting products were selected as an award category because of the large impact lighting has on overall electricity consumption. Grid-based lighting accounts for about 15% of electricity consumption globally. [7] In 2006, the cost of providing lighting service globally was USD 360 billion, or roughly 1% of global GDP. [8]

Regional Awards	GLS Lamps					Directional Lamps		Planar Luminaires	Downlight Luminaires	
	Commercially Available			New Technology		Commercially Available		Commercially Available	Commercially Available	
	≥800 lumens 2700-3000K CCT	≥800 lumens 4000-5500K CCT	≥700 lumens 5500-6500K CCT	≥1500 lumens 4000-5500K CCT	≥1300 lumens 5500-6500K CCT	Low-voltage ≥600 lumens 2700-3000K CCT	Mains-voltage ≥600 lumens 2700-3000K CCT	600mm x 600mm (2ft x 2ft); ≥2000 lumens	≤51mm (2 in) ≥700 lumens 3000K CCT	≥102mm (4 in) ≥1500 lumens 4000K CCT
AUSTRALIA	• 230V	• 230V		• 230V		• 12V	• 230V	•	•	•
EUROPE	• 230V	• 230V		• 230V		• 12V	• 230V	•	•	•
INDIA	• 230V	• 230V	• 230V	• 230V	• 230V	• 12V	• 230V	•	•	•
NORTH AMERICA	• 120V	• 120V		• 120V		• 12V	• 120V	•	•	•
GLOBAL AWARDS	• 230V	• 230V		• 230V		• 12V	• 230V	•	•	•

Figure 5: Categories for the 2015 SEAD Global Efficiency Medal for lighting products

Categories for the lighting awards were determined through a consultation process with policymakers and technical experts in the months leading up to the awards launch. These categories, shown in Figure 5, represent common lighting products found in participating regions for which a transition to energy-efficient lighting would have a significant energy savings impact.

Integrating the SEAD Lighting Awards with Incentive and Procurement Programs

While the SEAD lighting awards identified lighting products with extremely high efficacy, the opportunities to influence product purchasers have been limited. Awareness of the Global Efficiency

[2] To win the Global Efficiency Medal for lighting, products also had to meet a number of other minimum quality criteria that ensured that the winning products did not sacrifice quality for efficiency.

Medal is low, so inclusion of that logo on marketing or packaging materials has limited ability to stimulate the market for these super-efficient products.

To increase the impact of the SEAD lighting awards, linkages could be made with utilities, many of which have incentive programs for lighting products. For tiered incentive programs, a new top tier of consumer or retailer cash rebates might be possible with a specification inspired by the efficacy (and quality) of award-winning lighting products. Although the winning products were required to meet a cost threshold, these cash incentives would improve the cost-effectiveness of these high efficacy technologies, which could help move them along the diffusion curve from early adopters to the early majority which is more sensitive to first costs. By increasing the production volume, manufacturers would then be able to bring down costs further, making the products (with or without subsidies) more palatable to the late majority consumers.

In addition, linkages could be made with some procurement programs. Some procurement programs, such as the federal procurement program in the US, have a small fraction of their portfolio for which purchasers can purchase best-in-class technologies that go beyond the least lifecycle cost level. In addition, for some niche procurement instances with very high energy prices (such as national parks, islands, or call boxes), best-in-class technology would be more cost effective. In each of these instances, procurement of award-winning products could also increase the overall demand for these energy-efficient technologies.

Linking the awards with incentive and procurement programs would impact utilities, manufacturers, and consumers. For utilities, reduced electricity loads from lighting can help ease the strain on peak loads. In addition, for utilities that are required to meet certain electricity reduction goals, the proliferation of efficient lighting can be a large step towards meeting those goals.

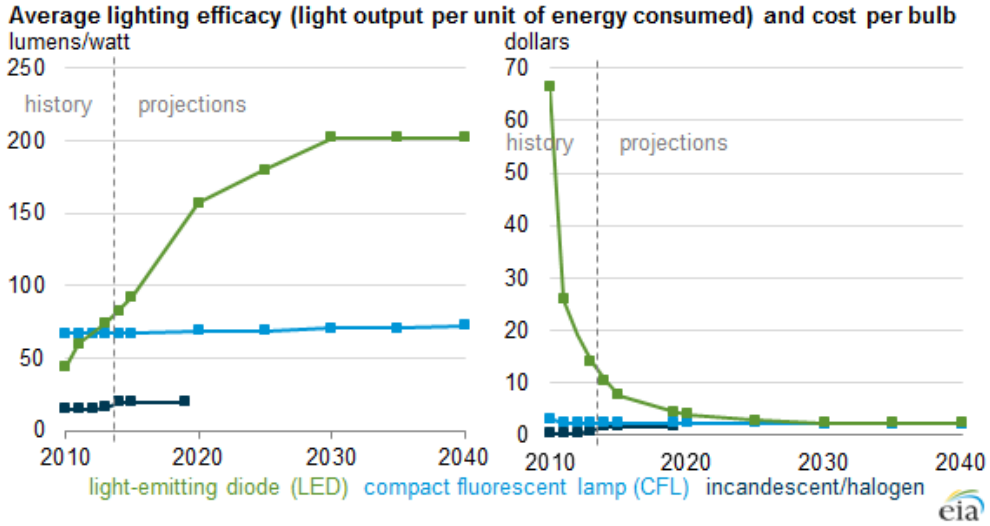


Figure 6: Average lighting efficacy and cost per bulb [9]

Manufacturers would be greatly impacted – as shown in Figure 6, even as the efficacy of LED lamps and luminaires have skyrocketed in recent years, the first cost of these products have come down dramatically. However, these products still usually have higher costs than other lighting technologies. Therefore, further reducing the costs of the highest efficacy lighting products will increase production volume for manufacturers of these products. Finally, more consumers will be likely to purchase super-efficient lighting products with lower first costs that increase the overall cost-effectiveness of the products.

Procurement: The SEAD Street Lighting Evaluation Tool

Background about the SEAD Street Lighting Evaluation Tool

Street lighting is typically one of the largest sources of energy consumption under a municipality's direct control. A rapidly changing product market, including the introduction of LED fixtures and other advanced technologies, allow for significant energy savings, but also make proper lighting design and

careful evaluation of fixture choices all the more important. The SEAD Street Lighting Tool provides a quick, easy way for government procurement officials and lighting specialists to evaluate the light quality, energy consumption, and life cycle cost of efficient street lighting options.

The SEAD Street Lighting Tool is a free, easy-to-use calculator that can help purchasers make more informed choices regarding street lighting fixtures to help achieve up to 50 percent in energy savings. Supported by Mexico's National Commission for Energy Efficiency, India's Bureau of Energy Efficiency, Natural Resources Canada, Swedish Energy Agency and U.S. Department of Energy, the tool is designed to make the fixture evaluation process easier by assisting street light purchasers with evaluating light quality, energy use and costs for the most common road layouts.

This Excel-based tool calculates the expected energy use, light performance, and lifecycle cost of street lighting upgrades for the most common road configurations. It evaluates the luminance and illuminance, energy consumption, and life cycle cost for both LED and conventional fixtures on many common road layouts, and provides several unique benefits to users:

- **Small Municipality or First-Time User:** The tool intentionally simplifies the photometric analysis to enable first-time users to perform a first-level assessment of lighting options using common road configurations.
- **Experienced Lighting Designer:** The SEAD tool is designed to make prescreening fixture choices faster and easier, and can assist lighting designers with analyzing tens or hundreds of fixture choices in a single batch for a particular road and pole configuration.
- **Manufacturer:** Manufacturers often receive requests to recommend the best fixture of those they sell for a particular road configuration, and can use the SEAD tool to optimize this selection process and provide consistent recommendations across their organization.

Integrating the SEAD Street Lighting Tool with Awards

For additional impacts, the SEAD Street Lighting Evaluation Tool could be informed by a street lighting award program recognizing the most energy-efficient, high quality fixtures for various road layouts. Award-winning fixtures could be included in the tool as sample fixtures, or anonymized fixtures with data that reflects the energy use of the winning products. This would then provide these super-efficient options to tool users. Because these fixtures would still be subject to the tool methodology and analysis, those award-winning fixtures that were suited to the users' specific road configuration would be shown to be a good fit (along with any other fixtures the user enters).

Linking the SEAD Street Lighting Tool with awards could impact local governments, utilities, and manufacturers. Municipal governments are responsible for managing street lighting, and are one of the main audiences for the tool. Policymakers who use the tool to evaluate street lighting options may see the award-winning fixtures proposed as potential low life-cycle cost options, and may then consider installing those fixtures in their municipality. These fixtures could also be marked as award winners, which would indicate that SEAD had tested them and verified their performance. Selection of these fixtures could ultimately save local government resources in future electricity payments.

For utilities, especially those that are required to meet certain electricity reduction goals, the proliferation of more efficient street lighting can be a large step towards meeting those goals.

Manufacturers with award-winning products could gain free, international advertising of their energy-efficient street lighting products directly to municipal policymakers responsible for purchasing those products.

Integrating the SEAD Street Lighting Tool with Incentives

The SEAD Street Lighting Tool allows users to enter fixture-specific information before analyzing products. This allows for more accurate light quality and life cycle cost outputs. If subsidies or rebates are offered, users can enter this information into the tool and life-cycle costs will be adjusted accordingly. This can help users make the business case for more efficient fixtures when incentives are offered. The tool also streamlines the procurement process because a separate tool or calculation is not needed to determine the impact on payback time.

Incentives: The LBNL Energy Efficiency Revenue Analysis (LEERA) model

Background about the LEERA model

Many countries around the world subsidize electricity consumption, which promotes increased and inefficient energy consumption. Countries that subsidize electricity, including a number of emerging economies, have limited options to improve end-use efficiency without raising consumer costs. Reducing subsidies may not be politically feasible or desirable, as doing so would directly raise consumers' electricity costs. Strengthening appliance and building efficiency standards also often imposes a new cost on consumers. In addition, financing appliance efficiency incentive programs is a challenge for many governments.

Faced with these obstacles, many countries are turning to appliance efficiency incentive programs as a viable way to reduce energy use without altering subsidies or increasing energy performance standards. The LEERA model is a tool to help governments with electricity subsidies design revenue-neutral appliance efficiency incentive programs.

The LEERA model helps policymakers design incentive programs that can be financed entirely by revenue generated from end-use efficiency improvements, such as avoided subsidies. [10] The model provides key data for decision makers on:

- Energy savings that can be realized through efficiency improvements;
- Financial savings from avoided subsidies; and
- Targeted incentive levels (i.e., the percentage efficiency improvement for a given appliance).

The model calculates the financial and energy savings that governments will accrue from the deployment of more efficient models of appliances. It then draws on SEAD's techno-economic analyses to calculate the efficiency improvements that can be achieved for specific appliances. The model also suggests incentive levels for more efficient models of each product.

For example, in Mexico, policymakers are planning to give away 14 million LED LCD televisions as part of their transition to all digital terrestrial TV signals. If the government replaces analog CRT TVs with super-efficient LED-LCD TVs, it can reduce TV energy consumption by 3.5 TWh/yr (roughly equivalent to the electricity generated by a 500 MW power plant). Further, the government could save up to US$877 million (MX$11.5 billion) in subsidies from such a replacement program even if these superefficient TVs are given away for free.

Integrating the LEERA model with Procurement Programs

To realize additional energy savings, the LEERA model could include national-level procurement programs for products that are applicable to federal procurement as well as being relevant to consumers. This would increase the aggregated demand for the selected product, which could result in lower purchase prices. In addition, the federal government pays 100% of the electricity used by federally-procured products. Therefore, the cost savings from federally-used products could increase the revenue available to incentivize consumer purchases of efficient products.

Linking the LEERA model with procurement programs could impact national and local governments, utilities, manufacturers, and consumers. National and local governments would save on electricity costs following the procurement of energy-efficient products. In addition, the national government would have more self-financed revenue for consumer-facing incentive programs. As a result, either more consumers would benefit from the same level incentive, or the same number of consumers would benefit from a greater incentive, to purchase energy-efficient products.

For utilities, depending on the selected product, reduced electricity loads could help ease the strain on peak loads. In addition, for utilities that are required to meet certain electricity reduction goals, the proliferation of efficient lighting can be a large step towards meeting those goals.

Manufacturers would see even larger demand for energy-efficient products through the aggregation of federal procurement and consumer-facing incentive programs. This could incentivize manufacturers to prioritize the production of the selected energy-efficient products, leading to reduced costs for any consumers who were not eligible for the incentive or who wanted to purchase the same type of product at a later time.

Conclusion

In the early stages of market transformation, the main method for achieving this acceleration is through *market stimulation*, or increasing demand for new products in one of three ways:

(1) Singling out new, best available technologies through awards,
(2) Artificially lowering prices for consumers through incentives, or
(3) Requiring the purchase of energy-efficient products through procurement programs.

As demand increases towards a critical mass, production costs fall which in turn increases cost effectiveness. Then, as products become cost-effective, they move towards mass adoption.

While each policy intervention causes some transformation of the market, it is even more effective for market transformation policies to be implemented in a coordinated way to shepherd products through the pathway of adoption.

When these policy interventions are implemented in the sequence outlined in the sample policy implementation timeline, the cumulative effects (integrated scenario) are significantly more than any individual policy. Furthermore, the total timeline is accelerated, as the early market transformation policies began the process of bringing down costs, enabling the later policies such as MEPS to be politically palatable.

Existing activities within the SEAD Initiative seek to transform the market for energy-efficient products, but so far have done so within individual policy areas rather than in a coordinated fashion across market stimulation policy streams. SEAD projects that focus on awards, procurement, and incentives can more successfully feed into each other to further enhance energy savings and to have greater impacts on governments (national or local), utilities, manufacturers, and consumers.

References

[1] Stephane de la Rue du Can, Greg Leventis, Nihar Shah, Michael McNeil, 2015. *Lessons learned from incentive programs for efficient air-conditioners: A review*. July 2015.

[2] Everett Rogers, 1962. *Diffusion of Innovations*.

[3] For example, see: Louis E. Yelle, 1979. *The Learning Curve: Historical Review and Comprehensive Survey*. Decision Sciences, vol. 10, no. 2 (1979), pp. 302–328.

[4] Stephane de la Rue du Can, Greg Leventis, Amol Phadke, Anand Gopal, 2014. *Design of incentive programs for accelerating penetration of energy-efficient appliances*. Energy Policy, May 2014. Issue 72, pp 56-66. Can be downloaded at: http://www.sciencedirect.com/science/article/pii/S0301421514002705

[5] Consortium for Energy Efficiency. Golden Carrots: The Beginning. http://www.cee1.org/content/golden-carrots-beginning

[6] Joanna Mauer, Andrew deLaski, Steven Nadel, Anthony Fryer, Rachel Young, 2013. *Better Appliances: An Analysis of Performance, Features, and Price as Efficiency Has Improved.* May 2013. Can be downloaded at: http://www.appliance-standards.org/sites/default/files/Better_Appliances_Report.pdf

[7] http://enlighten-initiative.org/

[8] IEA 2006. *Light's Labour's Lost: Policies for Energy-efficient Lighting*. Can be downloaded at: http://www.iea.org/publications/freepublications/publication/light2006.pdf

[9] U.S. Energy Information Administration, Annual Energy Outlook 2014 Early Release. Available online at: http://www.eia.gov/todayinenergy/detail.cfm?id=15471

[10] Anand R. Gopal, Greg Leventis, Amol Phadke, Stephane de la Rue du Can, 2014. *Self-financed efficiency incentives: case study of Mexico*. Energy Efficiency, October 2014. Volume 7, Issue 5, pp 865-877. Can be downloaded at: http://link.springer.com/article/10.1007%2Fs12053-014-9263-9