

Developing a Strategic Lighting Plan: Lessons from California’s Efforts to Transform the Lighting Market

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ABSTRACT

In December 2008, the California Public Utilities Commission (CPUC) launched a process to develop a Strategic Lighting Plan (SLP). The goal of the SLP was to assess technological opportunities and develop a guiding vision for a significant reduction in statewide lighting electricity consumption by 2020. As with California’s strategic planning efforts for other end-uses, the CPUC engaged representatives of local, regional, and national organizations including utilities, professional associations, and advocacy groups in public workshops to establish the culture of collaboration necessary to achieve long-term energy savings goals in the state. Through these workshops, the CPUC developed consensus around a vision for California’s lighting market along with a set of four goals, metrics for measuring progress toward each goal, and a roadmap to guide the state toward achieving efficient and sustainable lighting solutions throughout California.

Although these long-term strategic planning and market transformation efforts are still in progress, the CPUC’s experiences thus far can offer guidance to other states, regions, or even industry groups interested in developing similar plans. This paper concludes that several elements are necessary in developing such plans, including: (1) a foundation in best-practice technologies, systems, and design strategies that achieve substantial energy savings over standard practices; (2) a bold and inspiring vision for stakeholders; (3) active stakeholder engagement; (4) partnership with regulated entities; and (5) highly effective outreach.

Introduction

Strategic planning is defined as “the process by which the guiding members of an organization envision its future and develop the procedures and operations necessary to achieve that future” (Goodstein *et al.*, 1992). A successful strategic plan provides the criteria for making day-to-day organizational decisions and provides a template against which such decisions can be evaluated (*ibid*). To this end, when launching California’s effort to envision an energy efficient future, the California Public Utilities Commission (CPUC) worked with the other key state agencies (including the Energy Commission [CEC] and the Air Resources Board) as well as hundreds of stakeholders to create the California Long Term Energy Efficiency Strategic Plan (the Strategic Plan or The Plan). The resulting Plan focuses on four “vertical” market sectors — residential, commercial, industrial, and agricultural — and seven cross-cutting areas — Heating, Ventilation and Air Conditioning systems; Integrated Demand Side Management; Workforce Education and Training; Marketing Education and Outreach; Research and Technology; Codes and Standards; and Local Governments — and establishes a framework for eliminating persistent

barriers to significant energy savings through activities coordinated across each of these sectors and areas, ultimately achieving transformation of California's energy efficiency marketplace.

While the first iteration of the Plan was fairly comprehensive (as described in detail in Clinton and Fogel, 2008), energy efficient lighting was only included as a small component of both the residential and commercial chapters (CPUC, 2008). However, with lighting accounting for more than 20 percent of the state's electricity consumption and over 50 percent of investor-owned utility program savings in California, the need to develop a vision — and a plan — for a transformed lighting market was widely recognized (CEC, 2003; CPUC, 2010; California Lighting Technology Center, 2009). In addition, new legislation (such as California's AB 1109) and new Federal lighting standards codified increasingly stringent efficacy standards for many lighting products, dramatically changing the context for lighting strategies in California. Finally, with evidence of significant market transformation primarily in compact fluorescent light bulbs and high-bay fluorescent lighting — as well as recent lighting studies suggesting substantially lower savings from these measures than anticipated — the CPUC urgently needed to re-examine the role of lighting in its strategic planning efforts (KEMA, 2010; KEMA and Itron, 2010). These realizations ultimately lead to the SLP.

Below we describe the process of developing the SLP, including the preliminary background research and the stakeholder engagement process, and provide an overview of the key goals, strategies, and tactics included in the SLP. We then review the challenges encountered during the development process and conclude with a discussion of the keys to success for lighting strategic planning initiatives.

SLP Development Process

Preliminary Research

Before creating the SLP, the Energy Division and its consultants conducted preliminary research focused on two key objectives: (1) avoiding duplication of efforts; and (2) developing consensus regarding best practices in lighting and identifying the specific lighting technologies, systems, and design strategies necessary for inclusion in the SLP.

Avoiding duplication of efforts. The Energy Division and its consultants conducted a review of readily-available lighting-related strategic plans to avoid duplication of other strategic planning efforts. The review process identified three strategic plans developed by other organizations related to lighting: the American Lighting Association's (ALA) 2009 Action Agenda (ALA, 2009); the Illuminating Engineering Society of North America's (IESNA) Statement of Brand Values and Purpose & 2006-2010 Strategic Plan (IESNA, 2007); and the United States Department of Energy's (DOE) Multi-Year Plan for Solid-State Lighting (SSL) Research and Development (Navigant Consulting et al., 2009). Although each of these was not described as a "strategic plan" per se, each establishes a vision for the future and identifies the necessary steps toward achieving that future.

This review identified that while a number of other groups developed variations on plans for lighting, no other effort sought to address the structural, cultural and philosophical paradigms necessary to transform a statewide lighting market as California's SLP was intended to do. As noted in the Strategic Plan, "California's very ambitious energy efficiency and greenhouse gas reductions goals require long-term strategic planning to eliminate persistent market barriers and

effect lasting transformation in the market” (CPUC, 2008). Because the SLP would require coordinated activities among a wide range of stakeholders – and not just the entities over which California regulators have providence – the SLP process needed to create a compelling and inspirational vision to help spur voluntary action to address the SLP’s goals.

Developing consensus regarding best practices. Strategic plans for energy efficiency must have a foundation in technologies and their energy saving potential — not just the measures at hand, but also in the most promising emerging technologies (Clinton and Fogel, 2008). The CPUC avoided a prescriptive approach to identifying the technologies necessary to transform California’s lighting market and instead began with a discussion of broader systems and design strategies that yield substantial lighting energy savings. The CPUC and its consultants convened a group of lighting stakeholders in December 2008 to discuss these issues and this group developed a definition of “best practices” for the SLP: “a set of coordinated technologies, systems and design approaches which (through research and experience) demonstrate the ability to consistently achieve energy savings at least 25 percent greater than standard practices while avoiding negative environmental impacts” (CPUC, 2010).

At this initial “tech” meeting, stakeholders from utilities, industry, research institutions and state agencies reviewed and discussed energy efficiency opportunities for residential, commercial, exterior and industrial lighting applications. Importantly, this group was challenged to shake off any attachment to CFLs and T-8 fluorescent lamps and instead focus on the lighting technologies and design strategies identified by utility emerging technologies programs and by programs such as Public Interest Energy Research (PIER). In addition to technologies, the group also considered systems and design strategies which, if widely adopted, could help reduce lighting power consumption and power density while maintaining high-quality lighting.

Stakeholders ultimately identified a list of fourteen high-priority solutions – including technologies, systems, and design strategies – for which market transformation would be required to achieve the goals of the Strategic Plan. Based on this list, the CPUC and its consultants developed a Lighting Technology Overview (LTO) in 2009 and updated it in early 2010. The LTO provides descriptions of these lighting solutions; explores their applications in commercial, residential and exterior spaces; reviews barriers currently facing their widespread adoption; and analyzes the technical potential for energy savings associated with each. (See Table 1 for a list of the lighting solutions in the LTO along with their applications and estimated technical potential.) The technologies and strategies identified in the LTO served as a reference for best-practice solutions to be included in California’s SLP.

Table 1: LTO Solutions, Applications, and Estimated Savings

Example Solution	Application	Technical Potential (Percent Savings Over Standard Practice)
Task-Ambient Office Lighting	Commercial	40-50%
Integrated Classroom Lighting System (ICLS)	Commercial	30-50%
Multi-level Switching with Occupancy Sensors	Commercial	34-52%
HID Electronic / Dimmable Ballasts	Commercial	25%
LED Downlights	Commercial	75%
Dimmable/Controllable Fluorescent Ballasts	Commercial	10-35%
Daylight Strategies and Technologies	Commercial	50%
CFLs	Residential	75%
Halogen IR	Residential	30%
LED Fixtures and Systems	Residential	50-60%
Residential Occupancy Controls	Residential	50%
Super Lamps ¹	Residential	TBD
Smart Exterior Lighting Systems	Exterior	30-50%
Street Light Replacement	Exterior	20-40%

Source: CLTC, 2010.

Stakeholder Engagement

After confirming that it was not duplicating other efforts and after developing consensus regarding lighting best practices, the CPUC sought to further engage with a broad range of stakeholders throughout the state to ultimately develop and implement the SLP. These efforts were grounded in the perception that while regulation and other command-and-control measures may be able to advance market transformation to a point, it is unlikely that these efforts could transform the state’s lighting market on their own. The CPUC thus wanted to create a process to engage stakeholders beyond regulated entities like the state’s investor-owned utilities (IOUs) and include a range of market actors such as manufacturers, contractors, local governments representatives, and others representing representatives of local, regional, and national organizations. Thus, California’s regulatory agencies formed the driving force behind the SLP but focused on engaging more than a hundred stakeholders representing nearly 60 different organizations. Table 1 provides an overview of the types of organizations involved in creating the SLP.

**Table 1
Stakeholder Groups Engaged in California Strategic Lighting Planning Process**

Architectural Firms	Media Organizations
Construction Companies	Municipal Governments
Consulting and Engineering Firms	Municipal Utilities
Environmental Organizations	National Electrical Manufacturers Association
Investor-Owned Utilities	National Labor Organizations
Labor Organizations	Other California State Agencies
Lighting Technology Research Organizations	Regional Energy Efficiency Bodies
Manufacturers of Lighting Products and Components	State and Private Colleges and Universities

Source: CPUC, 2010.

¹ Note the Super Lamp technology is still in development. For more information, visit California’s Emerging Technologies Coordinating Council website at http://www.etcc-ca.com/index.php?option=com_content&task=view&id=2830.

Stakeholder Workshops

The CPUC launched a series of workshops to engage the stakeholders described above in the process of developing the SLP. Between April and December of 2009, the CPUC held 5 public workshops specifically focused on SLP efforts. The CPUC also held a number of additional public workshops focused on related lighting issues (e.g. a June 2009 workshop on the status of California's compact fluorescent lamp market). Each of the SLP workshops had a different host organization, and these included the CPUC, two of the IOUs, a lighting research organization, and a lighting manufacturing firm. Workshop organizers felt that sharing hosting responsibilities among the stakeholder organizations provided another important opportunity to engage the various groups and enable them to take ownership of some of the planning activities.

In an effort to keep stakeholders interested and engaged, the CPUC established two rules for the 2009 workshops: (1) brainstorming and dialogue would be the central focus of each workshop; and (2) presentations would be minimal. Instead of presentations, the workshops focused on group discussions, consensus-building exercises, and interactive tasks such as ranking and ordering ideas generated via group discussion.

Topics naturally arose that required more focused, detailed discussion than was possible in a large public meeting, so several "breakout groups" were thus established to focus on specific topics. During several of the workshops, organizers allocated time for breakout group discussions and for sharing the ideas generated by these discussions with the larger group. The breakout groups were each initially centered on a particular market sector (such as residential or commercial), but they evolved to address key lighting market transformation issues that eventually became the four central goals of the SLP.

This approach to stakeholder engagement encouraged lively meetings and yielded enthusiasm for the process. The majority of attendees not only participated in group discussions but also made substantial contributions toward achieving each meeting's objectives. This strategy also helped the CPUC create a committed group of participants while at the same time incorporating the pulse of the marketplace into the SLP.

The Strategic Lighting Plan

Vision and Goals

Through the collaborative efforts put forth in the workshops, the CPUC and stakeholders ultimately crafted a vision for the future: "By 2020, advanced products and best practices will transform the California lighting market to deliver improved lighting systems, zero net energy (ZNE) buildings and a 60-80 percent reduction in statewide electrical lighting energy consumption" (CPUC, 2010). This vision served as the "guiding principle" around which the goals and strategies in the remainder of the SLP were formed. Through the workshops and related activities, the CPUC and its stakeholders developed four goals designed to achieve the vision. These goals are described in Table along with the expected outcome associated with attainment of each goal.

Table 2: California Strategic Lighting Plan Goals and Expected Goal Outcomes

Goal	Expected Outcome
1. Design and advance best practices for design, installation and operation and maintenance of integrated systems to achieve sustainable lighting solutions for all spaces.	By 2020, 100 percent of new installations will meet best practice standards and will be optimally maintained throughout their useful lives.
2. Develop research, development and demonstration (RD&D) networks to create, test, and deliver the lighting solutions needed to transform the California market and achieve zero net energy goals.	Create a broad RD&D portfolio of solutions that will support a 60-80 percent statewide reduction in electrical lighting energy consumption by 2020.
3. Create widespread end user desire for, purchase of, and use of energy efficient, responsive and environmentally sound lighting systems.	By 2020, consumers' preferences will have transformed, demonstrated by an 80% decrease in perceived barriers and a 50% decrease in inefficient lighting market share in key market segments (over 2010 baselines).
4. Develop coordinated policies and procedures that accelerate lighting market transformation in California and provide incentives for best practice lighting technologies and systems.	By 2020, existing policies and procedures in California will enable lighting technologies to contribute to zero net energy consumption and negligible negative impacts on the environment.

Source: CPUC, 2010.

Strategies and Tactics

Each of the four goals shown above has elements relevant to the residential, nonresidential and exterior lighting market sectors. The SLP provides guidance for achieving these goals “through a set of synergistic strategies with specific, time-bound objectives” (CPUC, 2010). The SLP includes three to four strategies to advance each goal, and each strategy is tied to up to seven near-term, mid-term, and long-term targets for the periods covering 2010 through 2012, 2013 through 2015, and 2016 through 2020, respectively. These time periods align with the California IOUs’ energy efficiency program cycles so that the utility programs can be leveraged in support of these strategies.

The process of crafting the strategies and tactics associated with each goal encouraged synergies among them. For example, Goal 3 (End-User Demand) includes a strategy related to educating decision-makers about financial mechanisms available to help them purchase the most efficient lighting systems available (*Ibid.*). Because policy support is necessary to establish and fund such mechanisms, the CPUC created a strategy to develop these mechanisms as part of the Goal 4 (policy). In this way, the SLP’s goals, strategies, and tactics were designed to support one another.

Table 3: SLP Goals, Strategies, and Sample Tactics

Goal	Strategies	Sample Tactics
<p>1. Best Practices Design and advance best practices for design, installation and operation and maintenance of integrated systems to achieve sustainable lighting solutions for all spaces.</p>	1-1. Identify best practices to ensure use of high-performance lighting systems	Identify top best practices for major space types; Develop pilot projects that support best practices; Establish protocols integrating lighting systems with other building systems
	1-2. Elevate the level of professional practice and performance for lighting professionals	Develop specifications for best practices; Train lighting professionals on evolving best practices; Require Lighting Certification for designers and contractors
	1-3. Continuously promote lighting system design improvements to codes and standards	Enhance process for integrating best practices into codes; Create a standard lifecycle evaluation for lighting impacts
<p>2. RD&D Develop RD&D networks to create, test, and deliver the lighting solutions needed to transform the California market and achieve zero net energy goals.</p>	2-1. Establish and maintain a research-based collaborative, multi-institutional statewide lighting RD&D infrastructure	Establish a lighting RD&D advisory group; Publish lighting RD&D roadmap; Establish online portal to disseminate solutions
	2-2. Develop smart lighting technologies, systems, and solutions	Assess best practices; Develop research plan to address non-energy benefits of lighting; Create solutions to reduce lighting power density
	2-3. Design creative, high-profile demonstrations of advanced lighting technologies.	Establish consistent process to collect/ analyze demonstration data; Design demonstration programs; Share results
<p>3. End-User Demand Create widespread end user desire for, purchase of, and use of energy efficient, responsive and environmentally sound lighting systems.</p>	3-1. Educate Californians to equate quality of light with quality of life.	Initiate lighting literacy education; Create campaigns and messages for each market segment; Launch marketing campaign
	3-2. Leverage key market stakeholders to promote advanced lighting technologies, systems and best practices	Coordinate promotion of advanced technologies; Elevate role of lighting in green building system requirements
	3-3. Educate decision-makers about financial mechanisms that enable purchase of advanced lighting systems	Create and publicize financing guides; Create education/outreach partnerships; Facilitate bulk purchases for large institutions
	3-4. Introduce advanced lighting technologies, systems, and best practices into the marketplace	Study lighting transition/ intervention points; Use results to accelerate best practice adoption; Propose business case for best-practice lighting
<p>4. Policy Develop coordinated policies and procedures that accelerate lighting market transformation in California and provide incentives for best practice lighting technologies and systems.</p>	4-1. Match public policy and utility energy efficiency program priorities with statewide ZNE goals	Consider revisions to current cost/benefit methodologies and shareholder incentive mechanisms; Design/test innovative programs
	4-2. Build a common vision for advancing lighting market transformation among key state agencies	Engage state agencies to agree on steps toward lighting market transformation; Encourage deep energy savings retrofits in public buildings
	4-3. Create financial incentives and policies to make best-practice lighting solutions affordable	Identify and eliminate barriers to on-bill financing; Increasingly integrate funding for demand response, energy efficiency and renewable energy projects
	4-4. Minimize environmental impacts of each lighting technology throughout its lifecycle (production, use and disposal).	Expand/establish recycling programs; Develop hazardous materials content specifications; Develop voluntary product labeling standards

Source: CPUC, 2010.

Challenges

Elevating the Conversation

At different points in the development of the Strategic Lighting Plan, stakeholders across the board had to be “pulled back up” from highly detailed conversations regarding technical specifications, program design details, and the like to focus on bigger-picture concerns. While the last workshop focused on tactical elements of the SLP, most of the workshops required higher-level discussion and planning. Workshop facilitators were thus vigilant in keeping conversations moving and focused on the level of detail appropriate to each workshop’s desired objectives.

Resource Constraints

The state of California is currently facing a budget deficit of nearly \$18 billion in the 2010-11 General Fund (Taylor, 2010). In May 2009, state agencies and departments issued more than 4,500 layoff notices to state employees as part of efforts to reduce state spending and in July of 2009, Governor Schwarzenegger issued an executive order calling for a furlough of some state employees for three Fridays per month (State of California Office of the Governor, 2009). As a result of these constraints, state agency staff were overburdened with responsibilities, and funding for travel and related expenses was limited. Although some of the SLP activities will be supported by California’s IOU programs, additional funding is needed. Ideally, private, public and nonprofit organizations will offer funding for some of these initiatives to further support the SLP goals.

Responsibility and Accountability

Given that participation in the SLP process is a voluntary process for most stakeholders, the CPUC faced the challenge of cultivating responsibility for tasks in the SLP among workshop participants without the ability to establish firm accountability beyond the regulated entities (e.g., the IOUs). This issue too has yet to be fully resolved, but given the level of enthusiasm among stakeholders at the present time as well as the action planning process through which responsibilities will be assigned, planners are hopeful that this issue can be overcome.

Synergistic Goals

Because part of the SLP process involved four breakout groups – one focused on each of the SLP’s four ultimate goals – there was a “truing-up” process necessary once all four goals were combined together. For example, several of the strategies in the SLP encourage public institutions to lead by example and retrofit specific space types and/or apply specific advanced lighting technologies, systems, and solutions. When the SLP’s goals were brought together, planners had to ensure that the tactics and metrics associated with each of these strategies were complimentary. In other words, it is more efficient to suggest a consistent measure for public sector leadership (e.g., retrofitted square footage) rather than several different metrics (such as number of buildings, percentage of space retrofit, or proportion of energy saved) within the same

public sector targets. This truing-up process ensured that the final SLP would avoid measurement and tracking headaches once the implementation process began.

Additionally, because planners designed the goals within the plan to complement and support one another, planners conducted an additional review process to ensure that related strategies – e.g., developing financial mechanisms under the Policy Goal, supporting these mechanisms through the Marketing goal – did not include redundant tactics. To avoid this outcome, planners conducted careful comparisons across all four goals at the strategic and tactical levels and eliminated any duplication.

Key Success Factors

Foundation in Best-Practice Lighting Solutions

Because strategic plans for energy efficiency must have their foundations in technologies and their energy saving potential, planners felt that it was essential to establish a preliminary set of best-practice lighting solutions – technologies, systems, and design approaches – before delving into deeper discussions regarding market transformation strategies. The CPUC avoided a prescriptive approach to identifying these solutions and instead engaged stakeholders in a discussion regarding best-practice solutions. Planners believe that establishing consensus on this list of solutions up front was a good way to begin forming a cohesive stakeholder group and also avoided the potential for repeated conversational digressions toward this topic during the larger public workshops.

Bold and Inspirational Vision

The SLP's vision is to rapidly transform California's lighting market to achieve a 60-80 percent reduction in statewide lighting electricity consumption by 2020 (CPUC, 2010). Planners' intentions were that this vision would be a stretch and would require aggressive action to reach it. The vision was created as a real push for Californians and to be inspirational and bold to match the 2008 Strategic Plan. The CPUC believed that a bold vision would more be motivating and inspiring than a vision that seemed fairly achievable. Stakeholders generally feel that the bold vision will encourage innovation and drive the formation of unique partnerships among stakeholder groups to advance the goals identified in the SLP and ultimately achieve lighting market transformation in California. The SLP's bold vision is another way to ensure that participants in the process feel motivated and inspired to take action.

Active Stakeholder Engagement

When seeking new ideas necessary to transform the lighting marketplace, the authors believe it is vital to design dialogue-focused meetings that create opportunities for discussion and cross-pollination. As described above, strong facilitation was a key success factor. Moreover, given that the long-term success of the SLP requires commitment and engagement from the broadest array of stakeholders possible, engaging stakeholders in the beginning stages is crucial to securing champions and leaders within the group.

Partnership with Regulated Entities

California's electric IOUs – Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric Company (SDG&E) – are critical partners in the state's lighting strategic planning efforts. The IOUs' programs have had substantial impact on California's lighting market, and there is evidence that the IOUs' lighting programs have helped markedly reduce prices for CFLs in particular – and not only in California but throughout the United States (The Cadmus Group *et al.*, 2010). The IOUs have clearly exerted influence on the California's lighting market in the past, and they are positioned to do so in the future as well.

The IOUs are slated to receive more than \$167 million in funding during the 2010 through 2012 program period for their residential lighting programs alone (CPUC, 2009). Other stakeholders involved in the process are unlikely to have the level of capital – or the specific mandate – specifically to support lighting market transformation efforts in California. The SLP process has thus engaged the IOUs as key players in the SLP process and has found the knowledge and insights of IOU representatives to be critical to crafting the SLP.

Effective Outreach

To ensure the SLP's success, it is essential that many of the industry's leaders continue their involvement past the development of the SLP and help develop and implement the Action Plan over the next 10 years. The process must also engage new leaders and maintain a strong level of commitment from its stakeholders. To ensure the SLP's success, strategies to advance its objectives must be highly visible, results-oriented, and compelling, ultimately generating engaged partnerships within each of the SLP's key sectors and institutions. SLP outreach must thus be proactive, actively demonstrate statewide policy coordination, and provide consistent messages to the private sector regarding the state's commitment to supporting a marketplace designed to provide deep energy savings.

Conclusion

Ever-increasing energy prices and the threat of global climate change require long-term strategic planning to eliminate persistent market barriers and effect lasting transformation in our state economies and energy markets. Despite the massive opportunities that energy efficiency offers in both economic and environmental benefits, only a handful of entities have described a clear vision for state or regional energy efficiency futures and identified the technologies, stakeholder groups, and milestones necessary to achieve this vision.

Creating a strategic plan for lighting can be an effective tool to help achieve broad, long-term energy efficiency goals across multiple sectors. Achieving deep, long-term reductions in lighting energy usage requires an approach that addresses barriers in the lighting market (including gaps in RD&D infrastructure, lack of retailer awareness, cost constraints, and policy conflicts) while motivating the broader marketplace toward a big, bold energy savings goal. Based on the California's experience, a foundation in best-practice lighting solutions, a bold and inspirational vision, active stakeholder engagement, partnerships with regulated utilities, and effective outreach are all critical elements of success for any lighting strategic planning effort.

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