LED Installations through Government Procurement Initiatives

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ABSTRACT

State and local government can be instrumental in transforming the LED high-efficiency lighting market. Public agencies' expertise in design, installation, maintenance and evaluation can determine what works, what products are available, and what service needs are not yet met. Government organizations are more disposed to transparency due to the need for accountability to taxpayers. Government facilities are often good lighting technology demonstration sites. Public and private sector players are influenced by both government specifications for particular LED products and other government building specifications that cover lighting decision criteria.

This paper will review a few examples of LED lighting installations in Wisconsin state and local government. These examples will reveal recent experience in product availability, performance, and cost. Examples will also illustrate remaining barriers to increased LED installation or saturation levels. Just as LED traffic signals captured the market in short order, LED lighting is beginning to be a major player in outdoor lighting applications. In particular, there has been a significant increase in LED street lighting installations through the American Recovery and Reinvestment Act of 2009 (ARRA) and its DOE Energy Efficiency Community Block Grant (EECBG) funding. The authors will present recommendations for further actions to increase adoption of energy-efficient LEDs, especially focused on state and local government organizations. Recommendations will include mechanisms to transfer successes from one organization to another.

Introduction

For years there has been general agreement that LED technology will be a dominant player in the lighting market, but that day has not yet arrived. However, research and development effort remains strong, the market is maturing quickly, the technology has gained traction in some applications, and for consumers there have been noticeable drops in price, and improvements in quality, just within the last few years. Buying LEDs is something most commercial building managers are considering if they have not already begun to do it.

The public sector has been particularly hard hit during the country's economic downturn, with contracted budgets and loss of jobs. Yet the public sector is so large that a great deal of public sector building, retrofitting, and purchasing continues to happen. How can we leverage this activity to promote energy efficiency, especially toward efficient lighting technologies like LEDs? Studying the actions of public agencies, as managers of commercial buildings, grounds, and roads, can illustrate the general dynamics of organizational decision making about LEDs. Furthermore, public agencies may have special abilities to influence the market transition to LED technology. This paper considers what role state and local government is currently playing in bringing this energy-efficient technology into broader use, and what role it *should* play.

First, the potential of state and local government in LED lighting will be reviewed. Next, examples from Wisconsin will be presented, and finally the authors will recommend what else could be done to expand the use of LEDs and to transfer successes to other government and non-government organizations.

Potential of Government in Adoption of LED Lighting

State and local governments have significant potential to influence the adoption of energy-efficient LED lighting. State and local governments manage a great deal of commercial real estate. State owned buildings were 5% of commercial floor space, and local government-owned buildings were 15%, in 2003 (DOE 2012). In Wisconsin, the state government is the largest landholder, owns more than 71 million gross square feet of commercial space, and spent $148 million on energy costs for its facilities in FY2010 (DOA 2011). State and local governments are also large purchasers of commodities and have a large combined purchasing power.

Governments have primary responsibility for special lighting-intensive functions such as roadway lighting, traffic signals, and airports. One of the three largest categories of building space owned by the state of Wisconsin is prisons, which have 24 hour lighting requirements both indoors and out. In addition, government institutions control certain categories of buildings with more moderate lighting needs including public schools, parks, public health care facilities, courthouses, libraries, public arts venues, public transit facilities, and police and fire stations. Furthermore, many private-sector activities function with heavy government support or oversight. Examples include railroad businesses, sports and entertainment facilities, hospitals, private schools, billboards, affordable multifamily housing, and private transit companies. This may provide opportunities for government to shape lighting policies in these activities, especially at the time of building new construction or major retrofit.

One outdoor lighting application, highway and roadway lighting, hints at the power to save energy with LEDs that is in the hands of state and local government. Highway and roadway lights represent a potential electricity savings of 20.2 TWh per year nationwide if completely changed to LEDs. This equates to a primary energy savings of approximately 0.22 quads per year, or the total annual electricity consumption of over one and a half million residential households (DOE 2011).

Wisconsin Examples of LED Lighting in the Public Sector

A few examples from Wisconsin illustrate how state and local government are adopting LEDs.

Traffic Signals

By 2000, some local governments in Wisconsin were gradually transitioning to LED traffic signals, but the state declined to participate. It was a watershed moment in 2002 when the state announced it was buying $1 million in LED traffic signals. Accumulated interest in LEDs and the availability of funding at Wisconsin's Department of Transportation (WisDOT) combined to produce this breakthrough. Procurement specialists managed a competitive bid process and wrote a state contract for LED traffic signal lamps. Over a period of two to three

years, all state-controlled reds, greens, and some ambers were replaced at a total cost of about $1.7 million. WisDOT electricians from seven regional offices installed the LEDs. Local government used the state contract to get better pricing than they had obtained through their own direct purchases. For example, Wisconsin's second largest city, Madison, had begun to install some LED traffic signals by 1999. When the WisDOT contract became available, Madison used the state contract to leverage price decreases with their supplier although they did not buy directly from the state contract because they preferred some characteristics of the LED lamps they were buying over the ones WisDOT specified. All local governments had the option of purchasing from the state contract.

The transition to LEDs proceeded much more quickly after the state got involved. This story shows the power of state government in galvanizing permanent change. LED traffic signal lamps were one of the earlier LED products available, and purchased only by governments. These purchasers were attuned to quality, performance, and longevity. As with any new product, there were some failures. However, this product type probably helped the industry develop and improve its core components that are used in different applications today. As a large class of early purchasers, government played a strong role in nurturing the LED industry.

The most recent rebid of the WisDOT LED traffic signal lamp contract was in the first quarter of 2012. WisDOT found it straightforward to update the old specification because there are better industry standards available today. During the process of renewing the contract, WisDOT recognized the disadvantages of waiting the full contract period (five years) before re-examining pricing for a quickly-changing technology such as LEDs. WisDOT found the market for the product had changed considerably, and wattage and prices had dropped. This time, Madison found the state pricing so advantageous they switched to buying directly from the state contract.

WisDOT saw significant energy and maintenance savings after the switch to LEDs. Initially, WisDOT tasked technicians with testing luminance every year and got good results. WisDOT dropped this tracking two years ago. In a cold climate, LEDs' tendency not to melt snow is a concern. WisDOT changed visor designs, removed snow in response to complaints, and found the problem manageable. Maintenance costs dropped dramatically since the same lamps lasted for a decade. Previously, the red and green lamps had been changed every year, and ambers every other year. Some failures have occurred. Previously installed lamps typically had 30-40 LEDs on two strings. Sometimes an entire string would fail. New LED lamps have a different design with only 5 or 6 LEDs total.

One problem is that the longer replacement cycle makes the traffic signal relamping funding potentially more vulnerable to raids. Prior to 2002, funds of around $200,000 were required annually for relamping. Since this function lapsed, the funding was redirected to other programs. Political concerns and the competition for funding tend to make unused funds in a budget line item unavailable for carry over. Different programs or agencies pursue that funding. Now that ten years have passed and it is time to replace the first round of LED traffic signal lamps, the project requires a large capital appropriation, on the order of one million dollars. Decision makers can find these large funding requests more problematic than regular, smaller requests. To make sure this problem does not come up again, WisDOT officials are looking ahead to the next large funding round needed in ten years and will urge decision makers to set aside some funding each year for this future need.

While studying energy usage of these projects, WisDOT found another way to save money. In the densely populated southeast portion of the state, many intersections were not on

the Time of Use (TOU) rate, although this rate was an option. WisDOT switched to the TOU rate, and reaped significant savings from being billed at the lower off-peak rates.

Signage, Holiday Lights

Other early examples of LED use in government came from LED signage and holiday lights. In 2003, state procurement agents were doing a sealed bid for "Lottery" signs to provide to retail outlets all over the state, when the state energy office contacted them about LEDs. The procurement agents found out there was cost savings in the LED signs. Although there was a technical problem with the original bids, requiring the bidding to be repeated, the benefit was that this gave the procurement office an opportunity to restate the criteria and require LEDs. The state contract came in at lower cost than expected, and the LED signs performed well.

In 2004, facilities managers in the Wisconsin State Capitol building switched to LED lights for the holiday tree, which is forty feet tall and installed inside the Rotunda. Benefits of the LEDs included lower energy use, durability and longevity of the strings, cooler operation, and lower weight, as well as fewer problems with overloading electric circuits in the building. This was a permanent transition, and a placard explaining the environmental benefits of the 2400 LEDs is displayed now each holiday season with the tree. By 2006, the public benefits program Focus on Energy offered a consumer rebate for the purchase of LED holiday lights, assisting citizens in following the state's example.

In 2006, the downtown merchants association in Madison made a wholesale conversion of their outdoor holiday light display to LEDs. The city and the merchants association were pleased with the performance of the new LEDs, which are lit about half of every 24 hour period for three months each year. The energy savings was supplemented by reduced replacement costs due to longer lifetime of the lamps. One motivation for the change was that the city had insisted that the merchants association assume responsibility for the electric costs for the first time.

Building Projects in State Government

Unlike some other states, Wisconsin has one office with centralized review of state building projects. The Department of Administration (DOA), Division of State Facilities (DSF) oversees all building projects for state agencies and the University of Wisconsin System. DSF also manages a number of state buildings for other state agencies, and leases commercial space from the private sector. DSF has many ongoing building and retrofit projects where energy efficiency can be incorporated.

Statutes direct the State Building Commission to establish life-cycle costing as a decision tool for new building and major remodeling projects. This life-cycle costing includes "all relevant costs" including maintenance, discounting, and the bond rate. Project managers can choose more expensive, better quality products if life-cycle costs are lower. State projects are generally also governed by state *Master Specifications and Design Guidelines*. Furthermore, in recent years DSF has established a *Sustainable Facilities Standard*, based on the LEED program. This standard has been approved by the State Building Commission and was last updated in February 2010. These documents are available on the DSF website, http://www.doa.state.wi.us/index.asp?locid=4

In practice, DSF projects are constructed by private contractors in the building industry. DSF uses in-house engineers in its Electrical Section to review lighting for each new project. After DSF has completed detailed designs for a project, the project announcement is placed in DSF's project bidding system, to request competitive bids from private companies. Bid announcements and details can be viewed on-line. The project is awarded to the lowest bidder. Although the state has input on the type of lighting included in the project as expressed in the detailed building plans, the lighting is not purchased directly by the state. Lighting decisions are made by architects and engineers as part of a whole building project. Private sector contractors purchase and install the lighting, and bill the state for all the costs.

Energy Performance Contracting in State Government

Under the larger umbrella of building and managing state buildings, DSF has a special project to implement energy efficiency retrofits using Energy Service Performance Contracts (ESPCs). The latest round began around 2008. The state has an Energy Bond Fund begun in the state budget for the 2007-2009 Biennium. So far, $180 million has been authorized for that fund. ESPCs account for most of the Energy Bond Fund activity. In January 2011, the state reported that $80 million in projects have been completed under guaranteed cost savings performance contracting and these projects will save the state over $9 million per year in energy costs.

Through ESPCs, significant LED projects are being installed at UW-Madison and at least six branch campuses, as well as at least two correctional institutions. Most installations are outdoor lighting. UW Madison, the flagship campus, is planning a wholesale change to LEDs for outdoor lighting in summer 2012. The campus has historic buildings and aesthetic concerns that make piecemeal change undesirable, so the campus is expected to standardize on one fixture type and brand as it has in the past. This will be a multi-million dollar project. As this case illustrates, institutional standards and guidelines can be a double-edged sword for new technologies. For example, LEDs proposed for small parking lot and area light upgrades at UW-Madison have had difficulty obtaining approval in the past, because they violate the all-campus lighting standard for parking lot lighting, a certain brand and model of non-LED luminaire. However, these rogue installations will lose their outlaw status this summer during the wholesale update to LEDs at UW Madison. The campus lighting standard that was a barrier in the past has now become a major enabler of new LED technology, and will theoretically prevent backsliding in the future.

UW campuses, in particular, have expressed interest in LEDs for various projects planned as ESPCs. One explanation may be that higher education institutions have greater awareness of new technology, and a greater need to promote an image of sophistication, status, and environmental responsibility. A few LED projects proposed on campuses have also been in showcase buildings where higher costs were acceptable.

DSF administers the ESPCs. State agencies and UW campuses propose general ideas for energy-saving projects at their facilities. The host organization (agency or campus) also can specify an interest in LEDs for certain applications. Engineers develop specific proposals for these projects, sometimes with several lighting technology options to compare for a given application. Cost effectiveness and guaranteed savings estimates are provided for each measure, and these dictate the financial terms of the project. The host organization makes decisions on which lighting measures to accept based on economics and technology characteristics. For example, one branch campus asked for indoor LED box fixtures for a project, but ultimately rejected the measure because they were not willing to accept the estimated 25 year payback.

Although maintenance savings are not formally included in ESPC calculations, in practice the host organization does benefit when maintenance savings result from an installation. Maintenance savings are expected to outstrip energy savings in many LED projects. Often DSF installs a test LED installation to verify acceptance, prior to implementing the full-scale lighting change. For the ESPC projects, DSF is using established tools to evaluate LED lighting products, including the DOE web site www.lightingfacts.com. DSF is also working closely with the public benefits program, Focus on Energy. For its commercial sector customers, Focus on Energy has recently updated its incentive guidelines to cover many more LED applications. On its web site, Focus on Energy's business incentives page says LED products must appear on one of the following lists to qualify for an incentive: ENERGY STAR® LED light bulbs, ENERGY STAR Commercial LED lighting, DesignLights Consortium SSL Qualified Products List, Lighting for Tomorrow winners 2011, or Next Generation Luminaires winners.

Local Government LED Street Light Projects

The U.S. DOE Energy Efficiency Community Block Grant (EECGB) funding of the 2009 federal ARRA stimulus program appears to have helped increase the installation of LED street lights recently. In Wisconsin, 31 larger cities and counties ("entitlement" communities) and 40 smaller ("non-entitlement") communities implemented energy upgrades with ARRA EECBG funding over the last few years. While some of the larger "entitlement" communities used part of the money to fund LED street light upgrades, a full accounting of this is not available. However, it is known that LED street light projects were popular among the smaller EECBG communities. Of the 40 smaller "non-entitlement" communities, 15 installed a total of over 2,800 street lights, mostly LEDs. Virtually all of the street lights replaced by these small communities were high pressure sodium (HPS) but a few were mercury vapor. Typical local match funding for these EECBG grants was about 50%.

For these ARRA-funded LED Street Light projects, communities wrote their own specifications, but had to follow federal procurement rules that forbid geographical preference, except for the "Buy America" provision, satisfied by having the product assembled in the U.S. The DOE Municipal SSL Lighting Consortium model specification was not available at the time these projects were bid. A major LED street lamp manufacturer is in state and played a role in many of these projects, although a variety of different manufacturers' LED models were installed in different communities through the program.

Some communities used EECGB funding to install other types of LED exterior lighting. At least one community used an ESCO performance contractor to plan and implement relatively diverse lighting upgrades, including non-street light LED applications. For these projects, small communities often got assistance with technical support, procurement, and incentives from energy consultants; the municipal utility association; and the public benefits program, Focus on Energy.

Columbus. One small community, Columbus, Wisconsin, used all of its EECBG funding on LED street lights, installing 600 street lights in total, about 95% of the street lights in town. Sixty percent of the funding came from ARRA and the rest came from city funds. An official at the municipal electric company indicated that he had been a champion of LED street lights for years before the ARRA funding made a large scale relamping possible. He carried around sample LEDs and showed them at civic clubs and the city council. Several waves of pilot installations

began in Columbus in 2008. Citizens and city alders were surveyed on their perception of the pilot installations. On the other hand, a former Supervisor at the Water & Light Commission, which oversees the municipal utility, felt that there was too much risk and influenced decision makers to hesitate for a time. The municipal utility's internal champion did research and contacted many manufacturers. Early on, there was instability in the market and manufacturers' representatives could come and go quickly. The champion learned from LED installations in Alaska. When Los Angeles announced a project to install 140,000 LED streetlights in February 2009, this helped Columbus decision makers feel more confident. Participation in pilot installations by a local LED streetlight manufacturer was helpful. After all city approvals, installation of the LED street lights in Columbus began in January 2011. The city committed to converting all their street lights to LEDs over a two or three year period. Labor was supplied by city line workers in between their other duties. Installation was expected to take six months, but most was done in three months. There were no problems with installation and a mild winter helped. Some residents reported particular satisfaction: they had disliked yellow or orange light shining in their bedroom window.

One challenge was to decide who owned the street lights: the city or the municipal utility. This would also dictate who was responsible for maintenance. An ad hoc committee studied the question and decided the utility should own the lights and charge the costs to the city. In this community, utility rates for street lights include a relatively flat per-pole charge based on the capital expense of the street lights. With LEDs, this charge did go up, but the increase was manageable and did not eliminate the cost savings of the project. The municipal utility valued not only the energy and maintenance savings but also the better lighting quality and public relations benefits.

Madison. As a larger "entitlement" community that received EECBG funding, the City of Madison used some of this funding to install 500 LED street lights in 2010 to replace 150w and 250w high pressure sodium (HPS) street lights. The main benefits the city sought included an expected 40% energy savings, longer life and reduced maintenance expense, whiter light, and better lighting control. The city is expecting the LED lights to last 10-15 years, rather than the 4-5 years of the HPS lights. The city is still operating in a cautious mode and is aiming to install enough LEDs to see if there will be perceived problems with color or appearance. The first installations were on major roads, but more recently the city installed a large number of LEDs in neighborhoods.

As with all street lighting, the city is responding to citizens' sometimes contradictory perceptions of the light. The reduction in light trespass has generally been seen as an improvement. Also, most residents consider the whiter light to be preferable. However, early versions of LEDs had very high color temperatures, which did not appeal to some residents. The city aimed for lighting around 4000K for the most part. However, higher color temperatures were accepted in an early project in an area with a major roadway and few residences bordering the street. While dimming is not used here or in other communities contacted, the city continues its practice of turning off every other street light mid-block after a certain late hour of the night in order to reduce energy costs.

After the exhaustion of ARRA funding, the city is continuing to install LED street lighting as funding allows. LED street lights are being incorporated into some of the city's road and intersection projects as major overhauls are implemented. Often, federal or county funding is

involved in these projects. Perhaps it is easier to consider higher-priced LEDs when local tax payers are not responsible for the full cost.

The price of the fixture is still a major impediment to expanding installations. Although LEDs have the advantage of controllability, to obtain the best lighting control often requires purchasing the premium priced components. Of course LED and other efficiency projects are more feasible in the high energy cost areas of the state. Madison pays over 6.5 cents per kWh plus $2.85 distribution service charge per lamp for street lighting, while some public organizations in other parts of the state pay around 3 cents per kWh.

For Madison's projects, the average LED fixture price was $513. The actual energy reduction of the project so far has been 39%. For Madison, $100,000 of EECBG funding underwrote about 40% of the cost of the project. No Focus on Energy incentives were used. The city had already intended to install LED street lighting, and just expanded the original project with the availability of EECGB funding. Prior to making a large purchase, the city tested products from nine manufacturers. The city received 15 different bids from distributors. Some distributors submitted multiple bids, each for a different manufacturer's product. This demonstrates that the industry is immature and products for the same purpose are not always directly comparable. Madison liked products from three manufacturers, chose the top two, and negotiated the price further below the bid submittal. The first cost differential was smaller for decorative fixtures: upgrading to LEDs was an easier choice in those cases. It may be difficult for small towns to replicate this sophistication in purchasing. In general, larger quantity purchases will motivate bidders to offer better prices. Paradoxically, the rapidly dropping prices of LEDs can provide a perverse incentive for potential buyers to wait to implement large purchases.

Stevens Point. Stevens Point is a mid-sized central Wisconsin city that installed 360 LED street lights with EECGB funding. The city replaced more street lights than they originally intended to, because their bids came in at a lower cost than expected. Comparing five years of historical data to the last year of operation, the energy savings from the LEDs as measured at the fixture is 37%, but measured at the line, the savings drops down to 23% because of high line losses, a separate problem the city is studying. Other factors affecting savings include the higher lighting levels the city chose to install, and old inefficient ballasts on the existing 250w HPS fixtures that contributed to particularly high pre-project energy use levels. As part of this project, the city decided to install more powerful LEDs rather than the usual "equivalents" to the 250w HPS, to address the problem of dark spots in between widely spaced poles. The roadway light levels are now more uniform, and this may contribute to safety. The LED lights installed had a color temperature of 4300K. The ownership of the lights is mixed through the city, between the city and utility. The city has received positive feedback from residents and elected officials about the color and uniformity of the LED lights. As a measure of how fast the industry is evolving, Stevens Point says more efficient versions of the same model of LED lamps they installed are now available, only two years after they began their project.

Prior to installing the LEDs, the city did a pilot installation of lighting in a business park area for three months with products from several manufacturers: mostly LEDs but also some induction and fluorescent lights. Although energy savings were good for the samples, the performance dropped dramatically in the cold of January. The city recommends testing prior to making a large purchase. Stevens Point contributed 50% local match funding to its EECGB project. Focus on Energy incentives were not available. Stevens Point is planning to install LED

street lights in several additional road projects this year, and it appears LEDs have the support to expand further in this community.

Roadway Lighting and WisDOT

WisDOT acknowledges that local governments are ahead on LED roadway lighting, and says they are cautious because their directives must be appropriate for all regions of the state. State officials want to make sure there is not a problem with replacement luminaires and spare parts. WisDOT also needs to ensure competitive solicitation. They cannot have just one manufacturer approved. Unlike the traffic signal market, the LED street light market is not as mature, there is not an industry standard, and each manufacturer's products are different. There are many kinds of roadways, with different speed limits and illumination levels needed. All DOTs are wrestling with this challenge.

WisDOT engineers have been encouraged by their managers to pursue LEDs for roadway lighting applications, partly based on the positive experience of energy savings from traffic signal lamps. The energy savings from roadway lights are expected to be more modest, because the LEDs are replacing already efficient HPS. Engineers have cautioned managers that maintenance savings will be the main advantage of LEDs for this application. WisDOT will be using the DOE Municipal SSL Lighting Consortium model specification as a template to develop a WisDOT specification. As a supplement to the specification, WisDOT will develop examples of typical intersections, roundabouts, and other roadways. After these are finalized, WisDOT will be requesting that all manufacturers submit calculations and make their own recommendations on which of their products is suitable for which particular applications in these examples. WisDOT expects to find some of these recommendations are rough equivalents to other non-LED products currently approved for use on Wisconsin roadways. WisDOT will decide on which products are approved for use. These will appear on the final WisDOT qualified products list. For each roadway project, WisDOT will specify whether LED technology is appropriate in an application or not. At this point, contractors who implement all the roadwork will be responsible for doing the aggressive cost-based bids. WisDOT expects LEDs to be on the list of approved products for the 2013 construction season for 30 foot pole applications in roadway lighting. WisDOT will not approve LEDs for 40 foot applications yet.

Recommendations

Examples above and other experience suggest several actions that could encourage the adoption of LED lighting.

Expand Energy Efficiency Funds

Government programs dedicated to funding energy efficiency should be expanded to encourage adoption of energy-efficient LED technology. For example, the ARRA EECGB program had a large impact on the adoption of LED street lights. Although a main goal of the ARRA funding was to create jobs, the EECGB also pushed LED technology deep into small communities where it was unlikely to arrive so early without a helping hand. As a result of the EECBG, many lighting decision makers focused their attention on LEDs. If an additional round of such a program was launched, these same local governments could quickly apply what they

learned about LEDs through their street lighting projects to install more street lights, parking lot and area lighting, and other LED applications. Within the realm of state government, the ESPCs have allowed large energy-saving efforts to go forward even in a time of public budget contraction. Energy-saving projects did not need to compete for funding with non-energy projects. Other funding sources may be available as well. For example, legal judgments against polluters are sometimes settled by including reparation projects in addition to the punitive fines. Installation of LEDs in public thoroughfares would be a good way to compensate for environmental degradation.

Update Organizational Lighting Specifications

Now is the time for state and local governments to update organizational specifications to accept and encourage LEDs. The state of Wisconsin is revising its *Master Specifications and Design Guidelines* to state explicitly a preference for LEDs for all outdoor lighting applications, as long as life-cycle costing concerns are met. Because many private contractors implement state projects, this update may influence work in private sector buildings as well. Contractors may develop a comfort level with new installation practices and product performance. In the past, the state of Wisconsin has used its *Master Specifications* to promote early adoption of LED Exit Signs, ENERGY STAR transformers, energy-efficient motors, and compact fluorescent bulbs. WisDOT is now writing specifications for LED street lighting, based on national templates, and plans to have approved LED products available for the 2013 road construction cycle. New guidelines and initiatives to promote LEDs in state-leased spaces could also be helpful. Building codes can be updated to require more efficient lighting technology. LEDs are well suited to dimming, and specifications and codes should be revised to encourage use of lighting controls where appropriate to lower energy use.

An example illustrates how old specifications can preclude LEDs even where they may be appropriate. Currently, DOE's Weatherization Assistance Program (WAP) does not allow use of its funds on LEDs. The program is bound by federal guidelines in 10 CFR 440, and its "Appendix A—Standards for Weatherization Materials." This guideline allows only fluorescent or compact fluorescent lighting to be funded with DOE WAP money. The guideline was established for a good purpose, but has become outmoded by rapid technological developments in lighting. It has the unintended consequence of inhibiting LEDs, which might be particularly useful for exterior lighting on multifamily building projects. DOE is aware of the problem and working to find a more technology-neutral rule for the program.

In states where there is no clear central coordination of building specifications, the legislature can adopt guidance and delegate responsibility for developing new voluntary or mandatory guidelines for building or purchasing energy-using products. Governors can issue Executive Orders. States can use the work of other organizations as a template.

Partner for Volume Purchasing

Bulk purchasing should be used more widely to obtain better prices for LED products. For the EECGB projects, some local communities attempted to do joint bids to save effort and boost quantity to attract better pricing from vendors. To do this on a larger scale, the state could step in and bid new contracts for the most popular LED applications. The state's professional procurement process can build in quality checks and warranty requirements. The state often

obtains more attractive pricing than smaller purchasers because of large quantity pricing. Through the state's commodity bidding process, vendors may increase their awareness of new products and technologies, bid prices down, increase supply and open new distribution channels. Local governments in Wisconsin should be reminded to check the recently renewed state contract for traffic signals. Local governments can purchase from virtually all state contracts.

State and local government are only part of the market, but can influence the whole market. State-run programs that influence purchasing but do not purchase directly are also important. For example, the DOA's Housing Division dictates standards for, and funds, Shelters, Group Homes, Halfway Houses, and other Community-Based Residential Facilities. The Wisconsin Housing and Economic Development Authority (WHEDA) requires proposals for Section 42 tax credits for Affordable Housing to incorporate high-efficiency lighting. Wisconsin's Weatherization Program has had a major influence on the purchase of high-efficiency furnaces, ENERGY STAR refrigerators, and CFLs. These programs could all be re-examined to see if additional encouragement of LEDs is possible.

Share Information

Information sharing could be increased in order to encourage LED adoption. An annual LED showcase by a lighting professional organization in Wisconsin has been very useful, but is held on only one day in one city. Expanding this effort to other regions could be helpful. University Extension Services can be better used to spread reliable technical information about LED performance. Credible figures, technology champions, and opinion leaders should be tasked with facilitating information sharing on LEDs. State and local governments are not yet aware of many of the tools available to assist them in their lighting decisions, including the DOE tools for parking lot and ramp lighting, and the Municipal SSL Consortium street lighting calculator. There is a need for additional forums for state and local governments to share specifics on quality, performance, and pricing of LED products. Like any consumer group, government agencies have common interests in pursuing the best quality and prices for their products. Too often, consumers get most of their product information from vendors, a biased source.

Leverage Ongoing Public Infrastructure Projects

State and local government continue to build even in a down economy, and LED lighting can be incorporated into these projects. Public agencies upgrade a building with the idea of stewarding the building and reaping the operational savings over the long term. State and local governments have bonding authority that allows them to access funding at lower interest rates. While private businesses may shy away from investments with payback cycles longer than a few years, public agencies can sometimes tolerate paybacks of ten years or longer. Public buildings and functions are always needed and are less often sold, and the split incentive owner/tenant problem may be less common. Many members of the public visit public facilities. Because of this transparency and accessibility to the public, government facilities are often ideal demonstration sites for LED technology.

Conclusion

State and local governments are playing a key role in deploying and diffusing LED technology, and can do more. Even in an era of austerity, government continues a significant level of retrofit and construction activity, and oversees many other programs where it has indirect influence on lighting. Leveraging this activity to promote energy-efficient LEDs for selected applications makes sense. Bidding and contracts are an opportunity for public agencies to concentrate purchasing power to obtain better prices on LEDs. Many public projects with LEDs are open laboratories for learning by consumers and lighting specifiers, for both the public and private sector. Information on performance and cost for these projects is available. State agencies can put in place specifications that other organizations can often use for free, and are available on line.

LED costs have changed dramatically in the last year, making the cost/risk balance more attractive, especially for outdoor lighting applications. LEDs have the potential to provide an array of benefits including better aesthetics and lighting control, and energy and maintenance savings. A fair amount of LED lighting, especially street lighting, has been installed over the past two years, and evaluating these installations could yield valuable information on real savings. Even an average state like Wisconsin has been able to move ahead with LED projects, with great credit due to federal assistance programs. Although many challenges remain, progress in realizing energy savings with LEDs is happening, and state and local governments have new opportunities to contribute to this progress.

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