

**Response to correspondence sent by Pacific Northwest National Laboratory to the
National Product Information Program
regarding *Specifier Reports: Streetlights for Collector Roads***

October 13, 2010

In September 2010, the National Lighting Product Information Program (NLPIP), which is administered by the Lighting Research Center (LRC) at Rensselaer Polytechnic Institute, published *Specifier Reports: Streetlights for Collector Roads*.¹ The purpose of the report was to compare incumbent and emerging streetlight technologies in a collector road application using a methodology that is not biased toward any of the types of streetlights examined. The introduction of this *Specifier Reports* includes the passage:

Recently, there have been many LED street lighting demonstrations (for example, see the U.S. Department of Energy GATEWAY program). Some of these demonstrations present incomplete and potentially misleading comparisons with incumbent technologies. A complete comparison should demonstrate the system's performance compared to alternative technologies that meet all of the required performance criteria. Evaluations should be measured or simulated excluding ambient light and should include consideration of the full system costs.

NLPIP included this text to acknowledge the work that has been done under the GATEWAY program, but also to caution lighting specifiers to read reports carefully, with an eye toward factors that could make them unbalanced comparisons between technologies.

After *Specifier Reports: Streetlights for Collector Roads* was published, NLPIP received the following e-mail on October 6, 2010, from Pacific Northwest National Laboratory, which administers the GATEWAY program for the U.S. Department of Energy:

We noticed two sentences in the Introduction to last month's NLPIP report, Streetlights for Collector Roads, which appear to accuse our GATEWAY Demonstrations program of publishing misleading information:

"Recently, there have been many LED street lighting demonstrations (for example, see the U.S. Department of Energy GATEWAY program.) Some of these demonstrations present incomplete and potentially misleading comparisons with incumbent technologies."

Regardless of whether or not this was the intent of the text, we request that the LRC will consider revising the text to either remove the apparent accusation, or to clarify the real issues. If the LRC takes issue with particular aspects of particular GATEWAY reports, we would welcome your professional input in the form of direct correspondence.

Please note that while the Energy Policy Act of 2005 mandates the DOE to accelerate SSL technology, we do advise end users to consider another technology when it is immediately clear that LED is not a good fit for a given application. (You don't see GATEWAY reports for these projects because once a decision is made to use another technology in lieu of SSL, our team is removed from the project.)

We request that in the interest of continued good relations between your program and ours, the LRC will consider revising this text appropriately. Please respond by next week to let us know if and when you will be making any changes.

¹ Available at <http://www.lrc.rpi.edu/nlPIP/publicationDetails.asp?id=927&type=1>

We believe that as specifiers gather information to make decisions on which lighting technology is most appropriate for a particular installation, a neutral comparison of those products is an important resource. For twenty years, NLPIP has evaluated lighting products as an independent third-party to provide such comparisons. The GATEWAY program makes a similar claim: “The DOE GATEWAY Demonstration program focuses on providing a source of independent, third-party data for use in decision-making by lighting users and professionals; this data should be considered in combination with other information relevant to the particular plaza and application under examination.”² However, NLPIP believes that the GATEWAY program has not provided neutral comparisons between streetlights with LED and other light sources. The first reason is that it is structured to report on only cases that favor LEDs. This is indicated both in the email from PNNL quoted above and on the GATEWAY FAQ Web page under the question, “What’s involved in the selection process?”³ While it is useful for specifiers to learn about positive examples of a technology, they should be aware that these examples might not have been selected randomly and may not be compared to other technologies that could deliver better performance or cost.

The second reason that the GATEWAY program studies are not neutral is that their methods are sometimes biased to favor LEDs. NLPIP reviewed GATEWAY reports⁴ on outdoor lighting installations published in 2009 and 2010 and found instances of:

- *Not comparing light sources using the same system performance specifications, such as illumination levels.* In some installations,⁵ the average illuminance provided by the new LED system was about half that provided by the high-pressure sodium (HPS) system it replaced. This results in artificially short payback periods because the operating costs of a high-illuminance-level system are compared with those of a low-illuminance-level system. Also, if a lower illuminance level is acceptable in a particular area, then this could also be achieved by re-ballasting and re-lamping the existing luminaires to a lower power level, but these cases are not examined for energy and economic effects.
- *Not including all relevant light sources for comparison.* While the reports offer a comparison with at least one other technology, one report⁶ did not compare LED luminaires against HPS sources, which are the most commonly installed outdoor area luminaires and which NLPIP found to be the most cost effective for collector roads from the models tested.
- *Not accounting for ambient or stray light.* The studies fail to separately measure or adjust for ambient light levels.⁷ Outdoor lighting standards such as RP-8 and RP-20 do not have provisions for ambient light, so it should not be incorporated into the lighting system evaluations, particularly when conclusions are based upon field measurements where stray light is not controlled.
- *Not designing the maximum pole spacing for each technology.* NLPIP found that for collector roads, the LED luminaires studied required a narrower pole spacing to meet RP-8 than other lighting

² DOE GATEWAY report on host site T.J. Maxx, Manchester, NH, page iii

³ http://www1.eere.energy.gov/buildings/ssl/gatewaydemos_faq.html#6

⁴ http://www1.eere.energy.gov/buildings/ssl/gatewaydemos_results.html

⁵ For example, DOE GATEWAY report on host site Lija Loop, Portland, OR

⁶ DOE GATEWAY report on host site Raley’s Supermarket, West Sacramento, CA

⁷ For example, DOE GATEWAY report on host site T.J. Maxx, Manchester, NH

One problem with not accounting for ambient light is that in an analysis this will tend to favor luminaires that produce less light over those that produce more light, which, in these case studies, means favoring LEDs over other light sources. Also, if an outdoor lighting system is documented to meet a certain standard at one time and at one location with ambient lighting present, that system might not meet the standard at another time (such as if exterior lights on a business are shut off late at night or are removed at a future time) or in another location with less ambient light.

technologies, and this significantly affected their cost-effectiveness. Economic analyses in GATEWAY reports assume the same pole spacing, even for new construction.⁸

- *Not including the same costs in economic comparisons.* One report⁹ bases the maintenance costs of a high intensity discharge (HID) luminaire on the costs to maintain a previously installed system, which presumably includes re-ballasting and cleaning, but assumes that there will be no maintenance costs for an LED luminaire, even though there is no evidence that LED drivers outlast HID ballasts.
- *Not including time-of-use energy savings for all technologies.* One report¹⁰ compared the energy use of an LED installation with a motion sensor that dims the lights during periods of vacancy with the energy use of a metal halide system without a motion sensor,¹¹ even though it is possible to dim HID sources.¹²
- *Not describing the selection methodology for the luminaires that are compared.* It is unclear how alternative luminaires were selected for installation in the case studies. For example, in some cases¹³ the selected luminaires overlit or they underlit the sites relative to the performance criteria. One paper did not identify the models of the luminaires used in the study.¹⁴
- *Not applying a consistent mathematical analysis.*
 - a. One report¹⁵ showed a maximum-to-minimum illuminance ratio for the LED luminaire that is not consistent with the data presented. The ratio based on the data would not meet the performance criterion mentioned in the report.
 - b. In the same report, the purchase price described in the text is different than the one used in the payback analysis, leading to a very different economic result for the non-LED system.
 - c. In another report, the presented average illuminance is not consistent with the average of the measured illuminance levels presented in the appendix.¹⁶

NLPIP believes that LED systems will play an important role in the future of lighting, but NLPIP's sole purpose is to objectively investigate the current state of the technology and then to report the findings to specifiers and end users who want to know how technologies perform. By comparing products and technologies on a neutral basis, over time NLPIP has served to:

- help prevent backlash and permanent barriers for new technologies;
- identify shortcomings of products, which has led to an industry response resulting in new and better products;
- debunk non-performing products (e.g., power reducers, polarizer panels, and specular reflectors), which has resulted in their decreased market share;

⁸ DOE GATEWAY report on host site Raley's Supermarket, West Sacramento, CA

⁹ DOE GATEWAY report on host site Raley's Supermarket, West Sacramento, CA

¹⁰ DOE GATEWAY report on host site Raley's Supermarket, West Sacramento, CA

¹¹ <http://www.lrc.rpi.edu/programs/nlpip/lightingAnswers/dynamicOutdoor/04-ItSources.asp>

¹² <http://www.lrc.rpi.edu/nlpip/publicationDetails.asp?id=125&type=2>

¹³ DOE GATEWAY report on host site T.J. Maxx, Manchester, NH

¹⁴ DOE GATEWAY report on host site Raley's Supermarket, West Sacramento, CA

¹⁵ DOE GATEWAY report on host site T.J. Maxx, Manchester, NH

¹⁶ DOE GATEWAY report on host site Lija Loop, Portland, OR

- support adoption of high-performing products (e.g., occupancy sensors and electronic ballasts) with data.

NLPIP follows specific procedures to make sure that the information it publishes is the best available from an independent third party. For example, NLPIP ensures that there is no bias in the selection of the products to be tested, the methodologies are clearly explained, the measurement instruments are calibrated, the methodologies and reports are reviewed by outside experts before publication, the reports are written using precise language, the reports are formally checked using prescribed risk management procedures to make sure that all statements are supported, and the limitations of the study are clearly stated. (For example, *Specifier Reports: Streetlights for Collector Roads* studied only a collector road application, tested luminaire models identified by manufacturer representatives, tested only one sample of each luminaire, and purchased luminaires from July through October 2009.)

NLPIP does not advocate for or against the utilization of any technology. Although NLPIP does not use case studies, they can be useful in helping lighting specifiers understand the benefits of a new technology. Case studies must, nevertheless, be carefully designed and executed using an unbiased and consistent methodology if they are to fairly compare products and technologies. NLPIP welcomes questions and comments on its reports and methodologies at lrc@rpi.edu.