

Case Study

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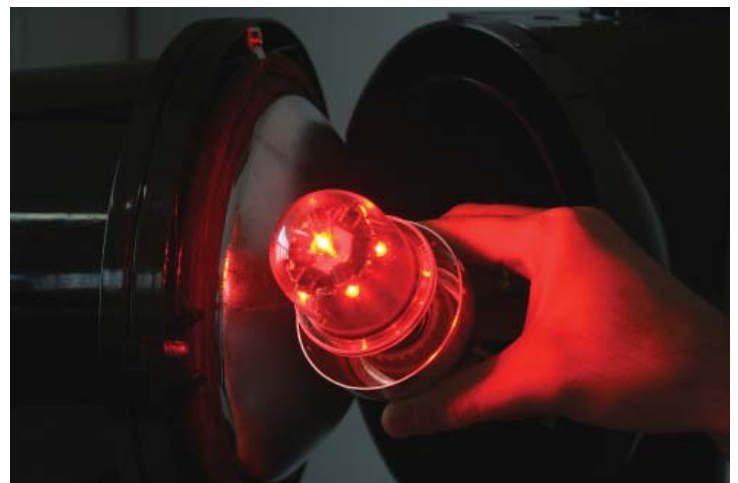
Case Study: Brazil Traffic Lights

Brazilian City's LUXEON-Based Signals Slash Energy Costs 90%

Cities throughout the U.S. and Europe have been replacing incandescent-based traffic lights with LEDs since the 1990s, drawn by the dramatic cost savings of a light source that consumes roughly 10% of the power required by incandescent lamps. Developing countries have been slower to switch to LED traffic signals in part because of limited capital budgets, but a project in a large suburb of Sao Paulo, Brazil, may light the way.

Instead of completely replacing each traffic fixture with the standard dome-shaped LED traffic signal ball integrating an LED array, optical lenses and color filter in a single housing, the Brazilian city of Guarulhos retrofitted 5,370 incandescent lamps in 1252 vehicular and 807 pedestrian traffic signals with custom light bulbs illuminated by high-power LUXEON® I LEDs from Philips Lumileds (www.philipslumileds.com).

Spearheaded and funded by electric power distributor Bandeirante Energia S.A (www.bandeirante.com.br/energia) with approval from the Brazilian federal government, the project has slashed signal-related energy usage in Guarulhos by nearly 90%. The savings of 1340 megawatt hours per year is enough to power about 558 Brazilian households. It has also chopped approximately USD\$240,000 (R\$434,200) per year off the city's electricity expenditures, freeing funds to add over 300 new traffic lights to improve safety and traffic management.



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The initiative cost approximately USD\$750,000 (R\$1.35 million) and paid for itself in 12 months through a combination of energy savings and maintenance reductions made possible by long LED life. “We’re not only saving money but we’re saving energy as well. It’s good for the city budget, and it’s good for the environment too,” said Paulo de Tarso Carvalhaes, Illumination and Energy Director, City of Guarulhos, São Paulo State.

Combating Energy Waste

The Guarulhos LED retrofit project was inspired by Federal law #9991, passed July 24, 2000. Under that law, Brazil’s energy companies are required to invest 1% of their total revenues on initiatives aimed at reducing energy use. In 2005

Wagner Silvestre, energy efficiency

consultant for Bandeirante Energia, began investigating the use of LED traffic lights to help fulfill the requirement.

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Silvestre submitted a proposal to the Agência Nacional de Energia Elétrica (Electric Energy National Agency, or ANEEL)—part of the Mines and Energy Ministry of Brazil, and the government agency that enforces the energy conservation law—to replace all existing green, yellow and red traffic lights, arrows and pedestrian signals in Guarulhos with the new LED bulbs. The plan got the green light in November 2005.



With a population of nearly 1.3 million and one of Brazil’s main airports, Guarulhos is the largest city served by Bandeirante Energia, the second largest city in São Paulo state and the 12th largest incorporated city in Brazil. That made it an ideal showcase for the new LED bulb, which until that point had been used only in a few tiny Brazilian towns as a proof of concept.

New Breed of Bulb

The sample bulb that impressed Silvestre was developed by Meng Engenharia Ltda (www.meng.com.br), a Brazilian company specializing in highway, urban and industrial signaling projects. The lamp was based on a prototype created by engineers at Philips Lumileds in California, who nicknamed it the “bulbeon” because of its resemblance to a conventional light bulb and its use of the company’s LUXEON brand of power LEDs.

Project Wins National Award

The LED retrofit traffic light project in Guarulhos, Brazil, earned a first-place Rational Use and Energy Conservation National Award from the Mines and Energy Ministry of Brazil in 2007. The annual award recognizes initiatives that reduce the use of electric energy and/or oil or natural gas derivatives in favor of renewable sources.

The award was given to Bandeirante Energia S.A., the electric power distributor that initiated the project. Bandeirante Energia provides electric energy to 1.4 million customers in 28 cities in the State of São Paulo. Guarulhos is the largest city served by the utility.



Meng Engenharia adapted the prototype to traffic light applications in a version containing seven LUXEON I LEDs per bulb, a built-in power supply, and the standard E-27 screw-in base used in South America. The distribution of the LEDs across the bulb was designed to replicate the basic radiation pattern of an incandescent bulb filament. The LEDs were positioned to work with the existing reflector inside the traffic light head to avoid the expense of reflector replacement.

Municipalities using this approach can convert their traffic lights by simply unscrewing the old incandescent lamp and screwing the new LED bulb into place. This eliminates the time involved in dismantling the entire traffic head as required with LED traffic signal balls. It also eliminates the need to employ specially trained work teams to perform the upgrade.

LUXEON-Enabled Energy Savings

The payoff comes in lowered energy consumption and related savings in electric bills. Thanks to LED technology in general and LUXEON efficiencies in particular, the bulb designed by Meng Engenharia has a 10-watt maximum rating—one-tenth of the 100 watts required to run the conventional traffic lights used in Guarulhos and one-sixth of the 60 watts that drive the city's pedestrian signals.

The bulb's actual energy usage in Guarulhos has been measured at even lower than 10 watts since the installation was completed in late 2006. The upshot: the power consumed for the city's vehicular and pedestrian traffic lights on a yearly basis has plummeted from 1520 megawatt hours before the LED retrofit project to just 180 today.

One of the reasons is that LEDs produce far more light and far less heat per watt than incandescent bulbs because of the inherent characteristics of solid-state technology. Another is that no wattage is wasted on generating unneeded colors and then having to

filter them out to produce red, yellow or green signals, since LEDs can produce those colors directly. The LUXEON LEDs used in the Guarulhos bulbs maximize these advantages with industry-leading energy efficiency achieved through advanced engineering.

Benefits at a Glance

- Reduced traffic light energy consumption 90%
- Slashed USD\$240,000 off annual electric bill
- Easy field replacement with regular work crews
- Bulbs last 5-10 times longer than incandescents
- Reduced maintenance costs
- Helped utility comply with energy-saving law
- Paid for itself in 12 months
- Freed funds to install additional traffic lights





Model for Other Municipalities

Equally important is the longevity of the bulb. In contrast to incandescent traffic lights that must be replaced every one or two years, LUXEON-based luminaires can run non-stop for 10 years. This offsets the higher costs of the LED fixtures, reduces bulb replacement costs over the long term and lowers manpower expenses for manually changing light bulbs, adding to the savings in energy bills.

With its relatively low capital cost, maintenance advantages and ability to provide a fast LED retrofit without replacing the entire traffic light enclosure, the strategy used

in Guarulhos offers promise for developing countries dealing with limited resources and less stringent traffic signal standards than those in North America and Europe.

“This same bulb model can be used anywhere in Brazil, elsewhere in South America or in other developing countries to retrofit incandescent traffic lights. It’s relatively inexpensive, it’s reliable, and it doesn’t require expert technicians to make the switch from incandescent to LED fixtures,” said Alberto Montoro, CEO, Meng Engenharia. “With this strategy, even cities and countries with limited resources can migrate to LED signaling.”

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CEO, Meng Engenharia

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