

Best Practice: LED Streetlight Retrofit

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Description of Project:

Those flying at night across the United States have probably started to notice that cities have begun to change in color from a yellow hue to daylight blue. This change in color is occurring due to the massive streetlight retrofits that are occurring in large and mid-size cities.

Over a dozen large to mid-size cities have retrofitted or are in the process of retrofitting the standard, high energy consuming streetlights, typically high pressure sodium, with new, high-efficiency LED streetlights. The result of these retrofits will be the replacement of over 600,000 streetlights, resulting in over 198 million kWh reduction and a reduction of greenhouse gases of approximately 126,000 tons of CO2 equivalent. Some of the cities that have taken on large scale retrofits include Los Angeles, Houston, Atlanta, Austin, Baltimore, Boise, Chicago, Washington, DC, Dallas and Seattle.

Texas cities have been very active in this space, with most of the large cities taking some steps to retrofit their streetlights. For example, the City of Houston was the latest city to announce a program and will soon begin replacing all of its 164,000 streetlights in the next five years. The expected savings once completed is about 54 million kWh per year resulting in \$2.7 million in savings per year.

The City of El Paso began a large scale energy efficiency retrofit project in 2008. In those five years, it has worked through eight project phases conducting retrofits of traffic lights, municipal buildings and streetlights. To date, the city has replaced 8,200 streetlights and is in the process of launching a third streetlight project where it will replace an additional 10,600 streetlights. This third phase will begin in August 2014 and will largely upgrade those streetlights that are owned by the city.

The city has replaced both their standard streetlights and decorative streetlights. The decorative lights, located in downtown El Paso, are an antique style, green cast aluminum fixtures. The city worked with the downtown improvement district and the tax increment reinvestment zone (TIRZ) to fund the upgrade. The TIRZ provided \$1.4 million to the project and the remaining financing came from the State Energy Conservation Office (SECO) LoanSTAR lending program.

For all of the street lighting projects, the city is realizing additional savings by taking over the maintenance of these streetlights from El Paso Electric Company. The city believes it can maintain

LED Standards

With the growth of the LED market comes a large number of market entrants claiming high quality and long lamp-life. There are a variety of ways to verify these claims. When purchasing LED street lamps it is important to verify the lamps meet industry standard test method, [IES LM-79-2008](#). Another great resource to determine lighting quality and to learn more about financing and strategies for installing LED streetlights is the [DOE Municipal Solid-State Lighting Consortium](#).

the lights at a lower cost than the utility and anticipates savings from the Utility standard fixed monthly fee.

Motivation for Implementing LED Streetlight Retrofit:

The primary motivation to begin its city wide energy efficiency project was largely driven by the desire to reduce operating and maintenance costs. Further, through an assessment of its utility bills and expenses the city realized that of its \$700,000 per month electricity bill, over 45% of the bill was exclusively to power the streetlights. With the advancement in LED technology and the rapid reduction in LED purchase prices, the city saw the street lighting retrofit as a great opportunity to quickly lower its power costs.

The second motivator was [Texas Senate Bill 898](#) (SB 898) which mandates that all political subdivisions located in the 41 National Ambient Air Quality Standards (NAAQS) non-attainment or near non-attainment counties must reduce electricity use by 5% over the next ten years starting in 2011. SB 898 is a continuation of [SB 12](#), passed in 2007 and [SB 5](#) passed in 2001. Both of these earlier bills set emission reduction standards and requirements for the state’s political jurisdictions.

Benefits of Retrofit:

The City of El Paso anticipates significant savings in both energy consumption and dollars saved when all planned phases are complete. The city anticipates it will see an energy savings of 21 million kWh per year with a dollar savings of \$2.4 million per year. The average lifespan of these lights is approximately 15 years which will significantly reduce maintenance costs for the city, as well. The table below provides the cost and savings for each project, including the city’s 6,600 traffic light retrofits.

	Cost	kWh saved	Dollars Saved	Simple Payback
Traffic Light Project 6,600 traffic light retrofits from incandescent to LEDs	\$2.979 million	9,888,132 kWh per year	\$642,192 a year in savings	4.6 years
Streetlight Project Phase One 7,300 streetlight conversion	\$7.8 million	5,553,177 kWh per year	\$830,225 a year in savings	9.4 years
Downtown Light Retrofit 920 Decorative Antique Style	\$1.5 million	410,710 kWh per year	\$107,118 a year in savings	14 years
Streetlight Project Phase 2 Two 10,600 streetlight conversion	\$7.5 million	5,428,670 kWh per year	\$838,795 per year in savings	8.9 years

Challenges Faced and Addressed:

One of the primary challenges was the city did not have a complete inventory of the number or type of streetlights in its portfolio. Without this inventory, the city did not know who owned what lamps, making it difficult to conduct a lighting assessment¹. Further, without a valid inventory, the utility was billing based on an estimated number of streetlights. To overcome this issue the city hired a contractor to map and classify the inventory. This inventory included the height, wattage and ownership of each streetlight. Through the inventory process they found that the city had 28,000 streetlights which were 3,000 more than what the utility had estimated.

The second challenge was negotiating a new streetlight tariff to reflect the savings of the LED lamps. Streetlights in the City of El Paso, as in many cities, are not metered so the city is charged a flat rate based on the wattage of the streetlight. A retrofit from a 200 watt high pressure sodium or metal halide lamp to a 100 watt LED is a significant reduction in watts per lamp². The process to establish a new rate to reflect this shift in lamp watt size and the publication of this new rate has taken considerable time. Due to the long process, the new rate was not in place when lights were installed³. The city had to continue to pay the old rate until El Paso Electric determined a new rate and had that rate schedule approved, through a rate case filing with the Public Utility Commission.

Upon approval of the new rate, El Paso Electric began converting the old rate charged to the new LED rate. The utility is still in the process of converting 2,300 of the original 7,300 over to the new rate. However, there has been a delay in this conversion because they had to confirm ownership of the poles. That issue has now been settled and new lights continue to be converted to the new, lower rate.

Description of Retrofit Process:

Motivated by the desire to reduce operating costs, as well as to comply with SB 898, the City of El Paso started the process of implementing a comprehensive energy efficiency program. To manage the energy efficiency program, the city determined it was best to work through a contract with an energy service company (ESCO). The ESCO would be responsible for providing turn-key retrofit of the street lighting, as well as energy efficiency upgrades for city buildings and traffic lights.

Upon selection of the ESCO, and with approval of City Council, the city went forward with the ESCO to identify projects. Their strategy was to identify the projects that provided the greatest benefit early on, so that the savings would motivate additional efforts in the future. This strategy was termed "*the firstest with the mostest.*" The outcome of this

Negotiating a streetlight tariff:

When installing new LED streetlights and replacing high pressure sodium or metal halide streetlights, it is important to ensure that a new street lighting service rate is negotiated that reflects the lower electricity consumption of the streetlights.

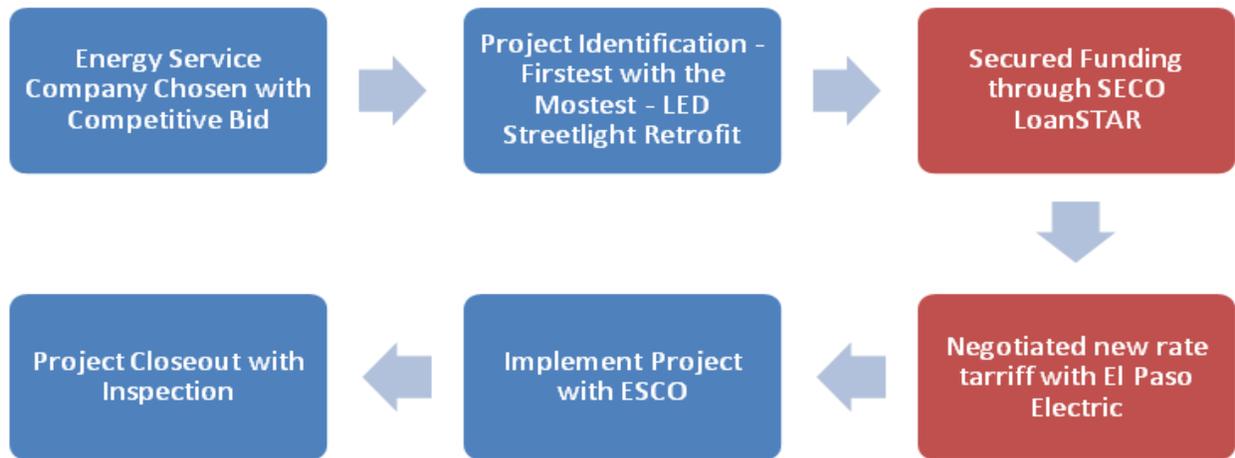
Streetlights are typically not metered. Therefore, the amount paid for electricity consumed by a streetlight is largely calculated based on the wattage of the lamp. This is a flat monthly fee that is charged per lamp, based on the wattage of the lamp.

EL Paso's new LED service rate can be found [here](#).

¹ In El Paso the utility or the City own the streetlights, not all are owned by one entity.

² Less consumption by the new lamps means less power to be generated for and used per streetlight. This should be reflected in a lower rate charged on a per lamp basis.

³ The earlier rate was flat rate by size/watt. The new rate averaged 15% to 20% less than the old rate.



assessment was a phased approach that included both streetlight and building retrofits.

After identifying the project plan for Phase 1, the city applied for and secured funding from [SECO's LoanSTAR](#) program. The funding is a low interest loan from SECO that is paid back through the energy savings from the retrofit project.

In parallel with securing the funding for the project, the city negotiated a lower street lighting tariff with El Paso Electric. The new rate resulted in a 15% to 30% reduction in the rate charged per lamp, for LEDs versus the mercury vapor and high pressure sodium lamps. The city was able to further lower their costs by taking on the operation and maintenance of the lamps. The savings from operation and maintenance of the LED street lights is approximately \$30,000 per month.

Upon securing the loan from SECO, the city took the proposal to City Council for approval. With City Council approval, the General Services Department provided a purchase order to the ESCO, held a pre-construction conference and began the project. The city has been able to develop an additional revenue stream with the old fixtures. The fixtures are sold at auction, four fixtures per pallet at \$100 to \$180 per pallet. The auction is done through [GovDeals](#).

Phase one of the project, took about 270 days to complete through close out. Subsequent phases followed a similar procedure excluding the selection of the ESCO and the tariff negotiation. The same ESCO will be used for all phases of the energy efficiency projects. The newly negotiated rate with El Paso Electric applies to all streetlight retrofits for each additional phase, and will be adjusted as these lights are replaced with LED.

Continuing Efforts:

In early June 2014, the city passed an ordinance to spend \$7.5M to replace another 10,600 streetlights. This project will begin in August of 2014. The project is expected to take 12 to 14 months to complete. Upon completion, a total of 18,000 of the City's 28,000 streetlights will have been retrofitted.