EXECUTIVE SUMMARY

It has been two years since the city of Los Angeles launched a major public works project to retrofit the city's street lighting with energy-efficient LED (light-emitting diode) fixtures, making this a good opportunity to assess progress. The project is still the largest LED street lighting retrofit ever undertaken globally; its implementation is ahead of schedule and the energy cost savings are surpassing original projections, largely due to continued improvements in the energy efficiency of LED technology. The project is a collaboration between the Los Angeles Bureau of Street Lighting; the Los Angeles Mayor's Office; the Department of Water & Power; and the Clinton Climate Initiative (CCI) Cities Program, which is now a fully integrated partner with the C40 Cities Climate Leadership Group (C40).

Targeting 140,000 of the city's more than 209,000 street lights, the objectives of the retrofit project are to enhance the quality of municipal street lighting, reduce light pollution, improve street safety, and save both energy and money. The city budgeted $57 million for the project, to be carried out over a five-year period. Upon full implementation, the project is expected to return an estimated $10 million in energy and maintenance cost savings to the city while avoiding at least 40,500 tons of CO_2e emissions each year.

As of July 2011, the city has installed 51,035 LED street lights, achieving energy savings of 59 percent, reducing CO_2e emissions by 12,560 metric tons annually, and cutting utility costs by $1.9 million annually. Feedback from the community, including residents, politicians, and law enforcement officials, has also been positive. This new data strengthens the business case for the project and provides a roadmap for other cities to develop similar projects around the world.

SUMMARY TABLE: ORIGINAL PROJECT PROFILE

NUMBER OF STREET LIGHTS BEING REPLACED	140,000
TECHNOLOGY	Converting old HPS cobrahead style fixtures to new LED cobra-head style fixtures; implementing a remote monitoring system
PHASE-IN PERIOD	5 years
TOTAL PROJECTED PROJECT COST	$57 million
PROJECTED PAYBACK	7 years
ENERGY & MAINTENANCE COST SAVINGS (TOTAL)	$10 million / year
ENERGY USE SAVINGS	68,640,000 kWh / year
CO_2E EMISSIONS SAVINGS	40,500 tons / year
FINANCING	7-year, $40MM loan at a rate of 5.25% repaid through energy and maintenance savings; loans provided by City Utility (LADWP) and City Funds; Bureau of Street Lighting to contribute $3.5MM directly from the Street Lighting Maintenance Assessment Fund; LADWP to provide a rebate based on the kWh reduced by the project, totaling $16.39MM

PROJECT UPDATE

As of July 2011, the Bureau of Street Lighting has used city labor to install 51,035 LED street lights on residential streets throughout the city. Results from this initial phase of the retrofit project show higher energy and maintenance cost savings and faster installation than had been expected, as well as positive feedback from residents. In addition, the project has resulted in the creation of 11 new jobs at the Bureau of Street Lighting and has created an estimated 300 jobs for the manufacturers of LED street lighting products, according to information provided by the manufacturers.

PROJECT IMPLEMENTATION AT 2 YEARS
PROJECT INSTALLATION FIGURES JULY 2011

TOTAL UNITS INSTALLED	51,035
ENERGY COST SAVINGS	$1.9 million / year
ENERGY USE SAVINGS	21,241 MWh / year
CO_2 EMISSIONS SAVINGS	12,560 metric tons CO_2e / year

The installation of 51,035 LEDs in the first two years of the project has produced energy savings of 59 percent in the retrofitted fixtures, yielding annual energy savings of 21,241 MWh and annual cost savings of $1.8 million. These figures are higher than originally expected and are largely the result of continued improvements in LED fixture efficacy over the period of project implementation. The additional energy savings, combined with the continued fall in the price of LED fixtures in the U.S. market and the ability of the city to auction removed street lighting units (as opposed to simply recycling them), means that, upon completion, the project payback will be notably less than the seven years originally anticipated.

The installation of the LED street lighting fixtures has also been faster than expected; this is in part due to the fact that the installation crews were able to improve the installation process as they gained experience with the LED fixtures and became more familiar with the technology.

SELECTED TWO-YEAR GOALS VS. ACTUAL

	FIRST 2 YEARS PROGRAM GOALS	ACTUAL (AS OF JULY 2011)
TOTAL UNITS INSTALLED	50,000	51,035
ENERGY SAVINGS	40%	59%
CREW PERFORMANCE	20 units / day / crew	30 units / day / crew
REMOVED UNITS	Recycle old units	Auction units to generate revenue

The retrofit project is focusing on the city's cobrahead style fixtures—the most abundant type of streetlight fixture—located on residential streets. The LED fixtures primarily replace high-pressure sodium vapor cobrahead fixtures, although metal halide, mercury vapor, and incandescent cobrahead fixtures will also be replaced as part of the project. High-pressure sodium vapor fixtures are some of the most prevalent outdoor lighting technologies used around the world; almost 62 percent of all outdoor lighting is provided by high- and low-pressure sodium vapor lights. The city is also focusing on cobrahead fixtures because current LED technology is highly compatible with these fixtures; LED technology for decorative post-top fixtures is less ready for implementation at a large scale. The LED fixtures meet or exceed current illumination levels and comply

with all relevant lighting standards while providing white-light at 4,300 Kelvin color temperature in the process. All LED fixtures installed as part of the project are full cutoff, Dark Sky Friendly fixtures. These full cutoff fixtures reduce light pollution and sky glow (the unnecessary illumination of the night sky by artificial lighting) over the city.

The Bureau of Street Lighting has received favorable feedback from city residents on the initial phases of the project. Residents have reported improved visibility from the broad spectrum LED light source.

PROJECT BACKGROUND

The city of Los Angeles owns the second-largest municipal street lighting system in the United States with over 209,000 streetlights and more than 400 distinct fixture styles, including the cobrahead style, which is the most popular style of streetlight. Each year, these streetlights consume approximately 197,000,000 kWh of electricity. The system is operated and maintained by the Bureau of Street Lighting, which was established in 1925 and today employs 250 people.

FINANCIAL DRIVERS

Faced with increasing budget constraints, the Bureau of Street Lighting has looked for ways to reduce operating costs while preserving the quality of service delivered, and the retrofit project has played a key role in meeting this objective. The Bureau pays a variable rate per fixture to the municipal utility company, the Los Angeles Department of Water and Power, which calculates rates based on the real kWh usage of the fixture as determined through field tests. Prior to 2009, the Bureau's annual electricity bill totaled approximately $15 million — nearly 29 percent of its $52 million operating budget. The Bureau itself renders maintenance services to the system. Funding for the Bureau is provided primarily by the Street Lighting Maintenance Assessment Fund (SLMAF), a yearly assessment paid by city residents for the operation and maintenance of Los Angeles' street lighting system; the SLMAF generates $42 million per year for the Bureau operations. In 1996, the passage of Proposition 218 froze SLMAF revenues; rising inflation and operating costs led to the projection of a future deficit for the Bureau, stimulating the need to reduce operating costs.

TECHNOLOGY OPTIONS

CCI/C40 helped the Bureau of Street Lighting consider both LED and induction technologies for its street lighting retrofit project. Both had the potential to match the city's requirement for long-life, white light products that improve color rendering and reduce maintenance costs relative to high-pressure sodium vapor street lights, the prevailing technology used in Los Angeles. Through its New Technology Group, the Bureau had already accrued substantial experience piloting LED and induction technologies, and CCI/C40 helped the city to model and understand the economic implications of the technologies' performance.

LED LIGHTING

An LED is a semiconductor light source that generates light at a precise wavelength when a current is applied; multiple LEDs are networked together in a single fixture in combination to generate the appropriate light output for each particular application. LEDs were initially utilized as indicator lights — it was for this purpose that NASA developed the first LEDs in 1962. Market penetration first occurred for colored-light applications like traffic signals, which became popular in the late 1990s; LED traffic signals now comprise an estimated 52 percent of the U.S. traffic and pedestrian signal market. In recent years, LEDs have begun to penetrate the street lighting market, with early street lighting deployments in Ann Arbor, Michigan (1,000 LED fixtures installed in 2007); and Anchorage, Alaska (4,000 fixtures installed in 2008; plans to install 16,000 total). Rapid improvement in the luminous efficacy (lumens/watt) of white-light LEDs — the majority of which are created by applying a phosphor coating to a blue LED light — has partly facilitated this market penetration. Innovations in fixture design — particularly optical efficiency and thermal management — as well as improved fixture warranties have also contributed to market growth. The LED fixture market is still highly fragmented, however, and fixture quality can differ starkly from one manufacturer to the next. Even so, many of today's LED fixtures boast lifetimes

of 50,000 hours, or almost 11.5 years when operated 12 hours per night. In addition, unlike all other street lighting technologies, LED fixtures contain no mercury.

INDUCTION LIGHTING

An induction light is an electrodeless light source in which gas contained within a glass tube is excited by electromagnetic induction. Because of the absence of an electrode, a principal failure point for a gas discharge light source, these white-light sources can theoretically last up to 100,000 hours before replacement is necessary. High-pressure sodium, mercury vapor, metal halide, and fluorescent technologies are all examples of gas-discharge light sources.

REMOTE MONITORING SYSTEMS

As part of the retrofit project, the Bureau of Street Lighting is deploying a remote monitoring system that collects and centrally reports real-time performance data for each street light fixture; data is sent to the Bureau's GIS system, which was developed in-house. Equipment failures are tracked, logged, and synchronized with the Bureau's maintenance work orders. As part of the fixture performance data, the monitoring system will return the measured kilowatt-hour usage for each fixture, creating a hi-resolution picture of actual electricity consumption and verifying energy savings for the project.

PROJECT DEVELOPMENT

In surveying the potential for a retrofit project, the Bureau of Street Lighting had to tackle the following tasks:

- Confirm the efficacy of LED and induction technologies
- Quantify the potential cost and savings of the project
- Assess alternative financing mechanisms with a specific focus on energy and maintenance savings due to its already-burdened balance sheet
- Coordinate with other city agencies — the Los Angeles Department of Water & Power and the Los Angeles Mayor's Office — to organize the project
- Vet its internal projections of retrofit project economics
- Continue its rollout of a remote monitoring system to measure and verify fixture energy consumption and performance

The Bureau of Street Lighting requested CCI/C40's assistance in analyzing the potential for a retrofit project and in March 2008 the organizations began collaborating on this project.

CCI/C40 ROLE: ECONOMIC AND FINANCIAL ANALYSIS

CCI/C40 assisted the Bureau of Street Lighting in developing the street lighting retrofit project in two primary ways: 1) by developing a detailed economic cost analysis examining the street light retrofit opportunity for both LED or induction technologies, and 2) by assisting the Bureau in exploring the financing options available for the project. The analysis prepared by the CCI/C40 ultimately supported the city's decision to move forward on the LED retrofit project.

Using data provided by the Bureau of Street Lighting, CCI/C40 generated a detailed economic analysis of the retrofit project for LED and induction lighting systems that could be shared with municipal officers as well as potential financiers. (Select model inputs and model output can be found in Appendix A.). Key data inputs that CCI/C40 used to create the detailed economic analysis included: total street light fixtures to be replaced, cost per fixture for new equipment, cost per fixture for operation and maintenance, and useful life of old and new equipment.

The results of the analysis and economic modeling were then synthesized with project information and packaged into a "pitch book" which CCI/C40 used to solicit informal proposals from financial institutions for financing the retrofit project.

Key details included in the analysis were:

- Total project size
- "Cash Flows" produced from energy and maintenance savings

- Current flow of funds within existing system — How are payments allocated for street lighting between the customers, the city and the utility?
- Primary structural financing objectives for the city
- Preferred financing structure(s) focused on energy savings
- Required financing term in years
- Timeline and deadline for financing proposals

From these key details, as well as from the economic analysis and financing proposals that were generated from a number of different financial institutions, the Bureau was equipped to develop two alternative scenarios for the project based on 140,000 LED or induction fixtures. In both, the CCI/C40 model projected a seven-year payback period.

CCI/C40 successfully solicited proposals on behalf of the city from a series of financial institutions that were attracted by the measurable cost savings, the long equipment life, and the awareness that this could be the first of many future opportunities. Collectively, the proposals received outlined a range of ideas, from basic tax-exempt leasing to non-recourse debt/equity structures focused solely on energy and maintenance savings.

FINANCING OUTCOME

As the Bureau moved further along in the financing process, validating its business plan and demonstrating the potential upside of the investment for the city, the City Utility (LADWP) and the city itself saw the value of getting more directly involved in project funding to ensure rapid execution. As a result, even though external funding sources remained available, the city ultimately decided that it would fund the project internally, with a structure based on energy savings and utility rebates.

The city secured a seven-year, $40 million loan at a rate of 5.25 percent that is being repaid through energy and maintenance savings over the loan term. The loan is a combination of utility and city funds. Additionally, the Bureau of Street Lighting is contributing $3.5 million directly from the Street Lighting Maintenance Assessment Fund over the five-year implementation period. The Department of Water & Power is providing a rebate based on the kWh reduced by the project, totaling $16.39 million. A chart describing this structure is attached as Appendix B.

TECHNOLOGY OUTCOME

After considering the competing fixture technologies, the Bureau of Street Lighting selected LED technology for its retrofit project. This choice was driven by multiple factors. First, the rapidly declining cost of LED technology in 2008 — and the anticipated continuing decline in cost over the next five years — had made the LED fixtures more appealing from a cost perspective than high quality induction fixtures. Second, LED technology provided superior optical control to induction fixtures. LEDs are directional light sources that can, when properly oriented in a fixture, create precise and uniform patterns of light. Third, based on pilot tests managed by its New Technology Group, the Bureau affirmed that LED technology was both ready for deployment at scale and superior to induction for the purposes of retrofitting its cobrahead fixtures. Finally, the city of Los Angeles determined that LED technology represented a new paradigm in lighting that reflected its ambitions as a global leader on climate change.

In November 2008, the city apprised prospective LED street light fixture manufacturers of a three-month final product evaluation, to occur between November 2008 and January 2009, during which it would verify its previous four years of pilot testing and identify the LED products to be used in the initial phases of installation. These manufacturers were each invited to send four fixtures for testing to the Bureau of Street Lighting at no cost or at a significantly reduced cost to the city. The city released an RFI seeking fixtures in January 2009 and received strong interest from technology providers. (This RFI is included as Appendix C).

Testing occurred on residential streets in Los Angeles over a three-month period, ending in the first quarter of 2009. In addition to measuring light levels and evaluating fixture performance, the Bureau sent surveys to area residents to solicit feedback on the new LED fixtures. Based on all test results, the city selected

manufacturers and drafted product specifications for its year one installation of over 20,000 fixtures. This method provided the city with enviable flexibility in product selection — a critical attribute given the rapid evolution of LED fixture technology that will occur during the 5-year implementation of the project.

Every six months, the Bureau reevaluates the LED fixture market, drafts specifications based on best-available technology, and purchases equipment, thus staying on the leading edge of fixture innovation. To date, the Bureau has conducted five phases of testing and evaluation of LED products. More information on the testing and evaluation of LEDs can be found on the Bureau's website at: www.ci.la.ca.us/bsl/.

FINAL PROJECT PROPOSAL

The final proposal outlined by the Bureau of Street Lighting for mayoral approval was for a $57 million capital project lasting from 2009 to 2013, to be executed in five discrete yearlong phases:

- Year one began in July 2009 and 20,074 fixtures were installed; the original goal was to install 20,000 fixtures.
- Years two through five will each encompass 30,000 fixtures, totaling 140,000 fixtures; in year two 30,961 fixtures were installed.

In October 2008, Mayor Villaraigosa approved the five-year, 140,000 fixture retrofit project, allowing the Bureau of Street Lighting to commence formal rollout by means of internal funding. The project was originally projected to deliver $35 million in energy savings and $13 million in maintenance savings from 2009 to 2015; preliminary results show that the energy savings figures will potentially be higher than original projections. The Bureau of Street Lighting is carrying out all planning and installation work for the project. This project requires 14 municipal employees, including 8 personnel to install fixtures in year one and an additional 4 personnel to install fixtures in years two through five. This represents $7.4 million in labor costs. The city is leasing six aerial lift trucks for five years to complete the project, costing a total of $630,000. In the process, the Bureau will avoid the risk of future budget shortfalls due to frozen SLMAF revenues and rising energy costs. Charts depicting originally projected energy savings and avoided CO_2e emissions are included in Appendix D.

ABOUT C40'S OUTDOOR LIGHTING PROGRAM

C40's Outdoor Lighting Program aims to help cities around the world improve the energy efficiency of street lighting systems and reduce the greenhouse gas emissions these systems produce. Services made available to cities include advising on project management, purchasing, financing, and technology as well as assisting cities to analyze the economics of a retrofit project and develop the business case. C40 works directly with cities to initiate new projects and to move existing projects forward more quickly and cost-effectively. Outdoor Lighting Program assistance to cities for street light projects will vary based on the city's technical expertise, staffing, and experience as well as the extent of the city's control over street lights.

Amongst C40 cities the opportunity to cut energy costs and greenhouse gas emissions by providing more energy efficient outdoor lighting is large. As outlined in the CCI lighting white paper, which can be downloaded at http://www.clintonfoundation.org/files/CCI_whitepaper_lighting_2010.pdf, existing street lighting can account for a significant portion of a city's electricity costs, while, at the same time, recent innovations in street lighting technologies enable cities to take action today to achieve near-term energy-efficiency, cost, and performance benefits. Furthermore, a report on C40 cities by Arup, found that, on average, C40 city mayors have strong powers over their street lights and that outdoor lighting is clearly a top priority for C40 Cities. Furthermore, the study found that 14 C40 cities currently have plans to expand projects to install energy efficient LED lighting and an additional 5 C40 Cities are looking to deploy LED lights for the first time. If you are a C40 city that would like to work with C40's Outdoor Lighting Program please contact: outdoorlighting@clintonfoundation.org.

APPENDIX A: CCI ECONOMIC MODEL

Included below are the core inputs and outputs from CCI's original economic model. This model, built using key data supplied by the Bureau of Street Lighting, was an assumptions model that focused on 143,172 city street light fixtures. Using the results from this model, the Bureau of Street Lighting honed its retrofit program to 140,000 fixtures and developed its business case. The included CCI cash flows still represent the original 143,172-fixture analysis.

INPUTS:

Fixtures — Assumed LED Equivalents

Mercury Vapor				**LED**	
Lamp Watts	Fixture Watts	$/fixture/mo	# of fixtures	Fixture Watts	$/fixture/mo
400	454	15.65	971	108	3.36
250	285	9.82	90	78	2.56
175	200	6.89	1,391	50	1.57
100	125	4.31	6	39	1.34

High-Pressure Sodium				**LED**	
Lamp Watts	Fixture Watts	$/fixture/mo	# of fixtures	Fixture Watts	$/fixture/mo
400	465	16.03	1,756	153	5.30
360	438	15.10	4	153	5.30
310	360	12.58	2,399	153	5.30
250	295	10.17	8,066	108	3.36
220	283	9.76	27	108	3.36
200	240	8.27	49,884	108	3.36
150	190	6.55	17,093	78	2.56
100	138	4.76	56,900	50	1.57
70	86	2.96	3,484	39	1.34
50	68	2.34	2	39	1.34

Metal Halide				**LED**	
Lamp Watts	Fixture Watts	$/fixture/mo	# of fixtures	Fixture Watts	$/fixture/mo
400	458	15.79	464	153	5.30
250	295	10.17	101	108	3.36
175	210	7.24	57	78	2.56
100	129	4.45	109	50	1.57
70	94	3.24	228	39	1.34

Incandescent				**LED**	
Lamp Watts	Fixture Watts	$/fixture/mo	# of fixtures	Fixture Watts	$/fixture/mo
860	844	29.09	2	108	3.36
620	599	20.65	1	108	3.36
405	371	12.79	122	108	3.36
295	263	9.07	7	78	2.56
189	189	6.51	7	50	1.57
103	102	3.52	1	39	1.34

Billing

Annual change in Electricity Rate (%)	4%
Avg Night Only Operating Time (hrs/yr)	4,284
All Day Operating Time (hrs/yr)	8,736

Maintenance

Labor Rate ($/Hr)	130.00
Annual change in Labor Rate (%)	2%
Vehicle Rate ($/Hr)	30.00
Annual change in Vehicle Rate (%)	2%

Technology Information	MV	HPS	MH	INC	Induction	LED
Expected Lamp Life (Hours)	24000	20000	14000	8000	50000	50000
Expected Lamp Life (Years)	5.5	4.7	3.3	1.9	11.7	11.7
Installation requirements						
Luminaire Cost ($)	150	150	150	150	425	425
Annual change in Luminaire Cost (%)	0%	0%	0%	0%	-1%	-5%
Maintenance requirements[1]						
Repair Frequency (over lamp life)						
Lamp	100%	100%	100%	100%	0%	0%
Photocell	100%	100%	100%	100%	0%	0%
Starter	5%	5%	5%	5%	0%	0%
Ballast	5%	5%	5%	5%	0%	0%
Fixture	1.5%	1.5%	2%	3%	6%	6%

[1]*Sources for this table: CCI assumptions based on BSL data; PG&E Application Assessment Report #0714, January 2008.*

OUTPUTS:

Project NPV										
Years	1	2	3	4	5	6	7	8	9	10
Discounted cashflow										
LED										
Installation Cost										
Material	(9,243,750)	(12,876,698)	(11,650,346)	(10,540,789)	(9,755,200)	-	-	-	-	-
Labor	(866,667)	(1,296,239)	(1,259,203)	(1,223,226)	(1,215,476)	-	-	-	-	-
Vehicle	(200,000)	(299,132)	(290,585)	(282,283)	(280,494)	-	-	-	-	-
Recurring Cost										
Electricity	1,038,659	2,612,709	4,156,682	5,671,010	7,156,116	7,087,962	7,020,458	6,953,596	6,887,371	6,821,777
Material	91,350	220,950	338,001	443,402	537,999	512,380	487,981	464,744	442,613	421,536
Labor	384,326	948,167	1,479,474	1,979,647	2,450,030	2,380,030	2,312,029	2,245,971	2,181,800	2,119,463
Vehicle	86,010	212,195	331,100	443,036	548,306	532,640	517,422	502,638	488,277	474,326
DSM Funding	2,443,084	3,761,495	3,761,495	3,761,495	3,761,495	-	-	-	-	-
Total cashflow ($)	**(6,266,986)**	**(6,716,552)**	**(3,133,383)**	**252,291**	**3,202,775**	**10,513,011**	**10,337,889**	**10,166,949**	**10,000,062**	**9,837,103**
NPV ($)	**(6,266,986)**	**(12,983,538)**	**(16,116,922)**	**(15,864,630)**	**(12,661,856)**	**(2,148,844)**	**8,189,044**	**18,355,993**	**28,356,054**	**38,193,157**
Payback (Years)	**7**									
10 Year IRR	**23.4%**									

APPENDIX B: FUNDING OVERVIEW

The following funding overviews were developed by the Bureau of Street Lighting for its 140,000 fixture retrofit program.

		PROGRAM FUNDING				EXPENSES		
Year	LED Units To Install	Total Project Capital Cost	DWP Energy-Efficiency Rebate	SLMAF contribution	Funding Needed	Labor Cost	Material Cost	Equipment/ Vehicle Cost
1	20,000	$9,998,081	$0	$3,600,000	$6,398,081	$1,012,521	$8,754,180	$231,380
2	30,000	$14,320,000	$2,400,000	$0	$11,920,000	$1,529,152	$12,670,848	$120,000
3	30,000	$12,120,000	$3,600,000	$0	$8,520,000	$1,575,027	$10,424,973	$120,000
4	30,000	$10,120,000	$3,600,000	$0	$6,520,000	$1,622,278	$8,377,722	$120,000
5	30,000	$10,120,000	$3,600,000	$0	$6,520,000	$1,670,946	$8,329,054	$120,000
TOTAL	**140,000**	**$56,678,081**	**$13,200,000**	**$3,600,000**	**$39,878,081**	**$7,409,924**	**$48,556,777**	**$711,380**

Program funding overview. Courtesy of LA BSL

Year	1	2	3	4	5	6	7	Accumulative Payback at End of Loan	Projected Savings during Years 8-12	Accumulative Savings at Year 12
Street Lights To Retrofit	**20,000**	**30,000**	**30,000**	**30,000**	**30,000**	-	-			
Capital Cost ($)	**9,998,081**	**14,320,000**	**12,120,000**	**10,120,000**	**10,120,000**	-	-	**56,678,081**		
Capital Sources										
DWP Loan ($)	3,199,041	5,989,389	4,304,083	3,304,083	3,304,083	-	-	20,100,679		
MICLA ($)	3,199,041	5,989,389	4,304,083	3,304,083	3,304,083	-	-	20,100,679		
Energy Rebate ($)	-	2,341,222	3,511,834	3,511,834	3,511,834	3,511,834	-	16,388,557		
Rehab Contribution ($)	3,600,000	-	-	-	-	-	-	3,600,000		
Total ($)	**9,998,081**	**14,320,000**	**12,120,000**	**10,120,000**	**10,120,000**	-	-	**60,189,915**		
Loan Debt Service ($)	**1,102,590**	**3,451,039**	**5,418,944**	**7,813,144**	**10,207,344**	**10,207,344**	**7,813,144**	**46,013,549**		**46,013,549**
Program Savings										
Energy Savings ($)	924,669	2,436,781	3,994,257	5,598,457	7,250,783	7,468,307	7,692,356	35,365,610		77,430,564
($)	177,921	1,014,258	1,424,687	2,214,687	2,956,561	2,420,790	2,493,414	12,702,319		22,921,719
Total Program Savings ($)	**1,102,590**	**3,451,039**	**5,418,944**	**7,813,144**	**10,207,344**	**13,400,931**	**10,185,770**	**48,067,929**		**100,352,283**
Net Savings ($)	**0**	**0**	**0**	**0**	**0**	**3,193,587**	**2,372,626**	**2,054,380**	**10,000,000 to 12,000,000**	**54,338,734**

Program funding overview. Courtesy of LA BSL

APPENDIX C: PILOT TEST RFI

LED STREET LIGHTING ENERGY EFFICIENCY PROGRAM (REVISED 1/13/09)

The city of Los Angeles has over 209,000 streetlights that light two-thirds of the City with light sources including incandescent, mercury vapor, metal halide, to high pressure sodium. This variety of lamps is an example of the evolution of roadway lighting that provides greater efficiency in lighting output and energy savings. Based on preliminary analysis and evaluation of the development of the LED industry the Bureau is strongly considering a large scale project to replace existing roadway fixtures into LED or any other high energy efficient light source.

In coordination with the Mayor's leadership on advancing energy efficiency throughout the City, the Bureau strives to be conscious of the impact of excessive energy use, light pollution, glare, hazardous materials, and other environmental impacts to the City. Due to the development of new lighting technology that promises increased energy efficiency, reduced maintenance, longer life span and light control it is incumbent upon the Bureau to actively explore these new lighting sources.

DEMONSTRATION PROJECT

Currently, the Bureau is in the midst of preparing a demonstration project to evaluate LED luminiares by replacing existing 100W HPS (cobrahead) roadway luminaires on local, residential streets with various manufacturers. It is expected that the first phase of this demonstration project will occur from November 2008 to January 2009 and will greatly impact the City's direction for large scale deployment.

LED FIXTURES

The demonstration project will take four luminaires per manufacturer and install them side by side on consecutive residential city blocks. Manufacturers who wish to participate in this demonstration should strongly take into consideration the following suggested requirements:

- The fixtures should be controlled with a photoelectric control with standard socket per ANSI/NEMA C-136.10
- The fixture should connect like a standard cobra head into a typical pipe arm 2.5" in diameter
- The fixture should be designed to save 30% to 40% in energy
- The fixture should be designed to meet IESNA Standards for local/residential street with average roadway width of 36' and two sidewalks of 12' each. Pedestrian conflict area should be considered medium with pavement classification R3
- The fixtures should be a full cutoff with no significant glare
- Color temperature range 4500-6000 degrees Kelvin
- Warranty for complete units should be no less than 50,000 hours
- The fixture should have a minimum CRI index of 80
- The fixture should be designed to meet a power factor minimum of .95
- The fixture should be in compliance with LM-79 and LM 80
- The fixture should or within the next year be designed to provide dimming feature using a remote monitoring device

If your company is interested in this LED fixture demonstration you may contact Orlando Nova at Orlando.nova@lacity.org or (213) 847-1826. The Bureau would strongly encourage any company to participate in this project as the City of Los Angeles transitions into 21st Century lighting technologies.

REMOTE MONITORING UNITS

In addition to the evaluation of LED fixtures, the Bureau will be conducting a review and evaluation of remote monitoring units. This review will require units that can be mounted on 4 streetlights with all the devices needed to transmit data. Information submitted should include a description of the technology, the protocol used, all reporting aspects, warranty and associated costs for capital and ongoing. The ultimate goal is to have these units coordinate with the LED fixtures. The 4 units will be evaluated from January 2009 to June 2009

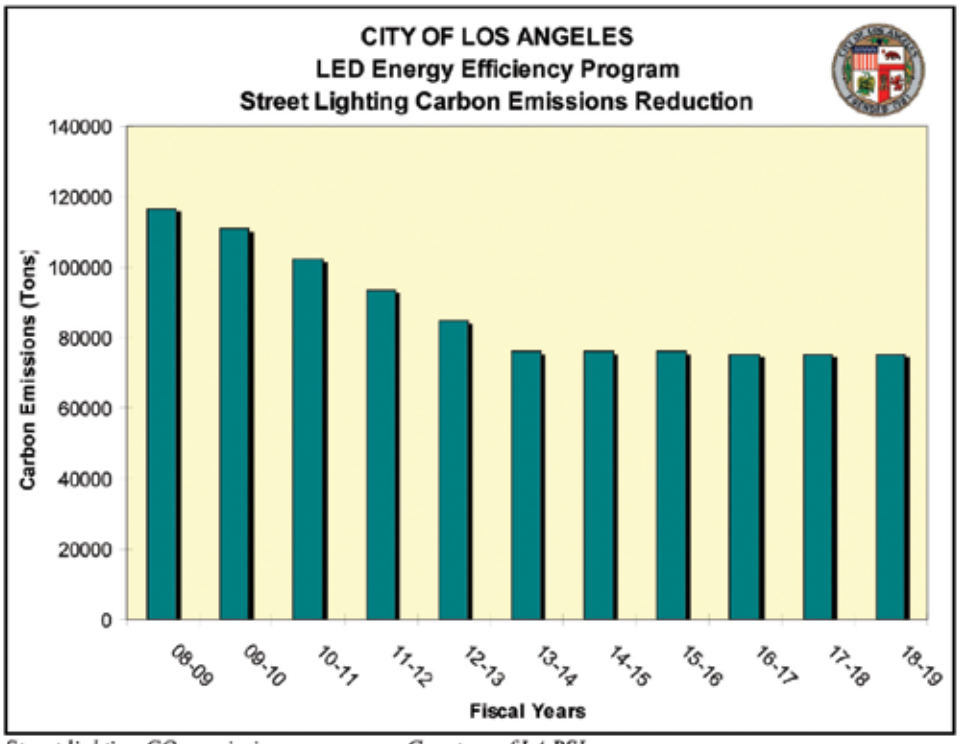
Manufacturers who wish to participate in this demonstration should strongly take into consideration the following suggested requirements:

- The final data must be available in XML format for the City to download on a daily basis
- The remote monitoring units (RMU) should have the capacity to turn on and off the fixtures
- The RMU should have some capacity to report on energy usage
- The RMU should have an automated GPS reporting system or associated remote device

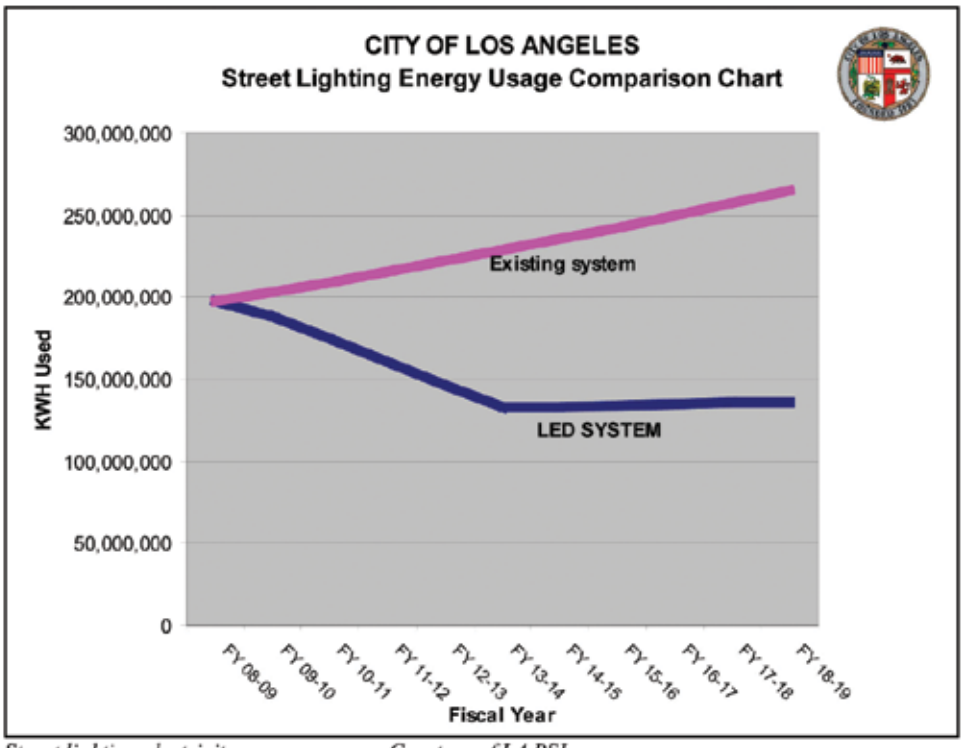
- The RMU should have the capability to be coordinated with an LED fixture for dimming purposes
- The RMU should be able to provide various reports including day burners, reduction in energy or no power available

If your company is interested in this remote monitoring unit demonstration you may contact Kurt Sato at kurt.sato@lacity.org or (213) 847-1502. The Bureau would strongly encourage any company to participate in this project as the City of Los Angeles transitions into 21st Century lighting technologies.

APPENDIX D: PROGRAM ENERGY SAVED & CO_2E EMISSIONS



Street lighting CO_2e emissions per annum. Courtesy of LA BSL.



Street lighting electricity use per annum. Courtesy of LA BSL

APPENDIX E: KEY REFERENCE MATERIALS

OAKLAND, CALIFORNIA – 2008

This is Phase III of a long-running LED pilot test conducted by Pacific Gas & Electric Co., a utility company based in San Francisco, CA. The report demonstrates improvements in LED technology over time – it is remarkably comprehensive in its comparison of a 100W HPS street light and a 56W LED street light.

SAN FRANCISCO, CALIFORNIA – 2008

This report, also authored by PG&E, tests 4 different LED street lights to replace 100W HPS street lights in downtown San Francisco. The report contains an excellent hi-resolution analysis of these luminaires' photometric performances.

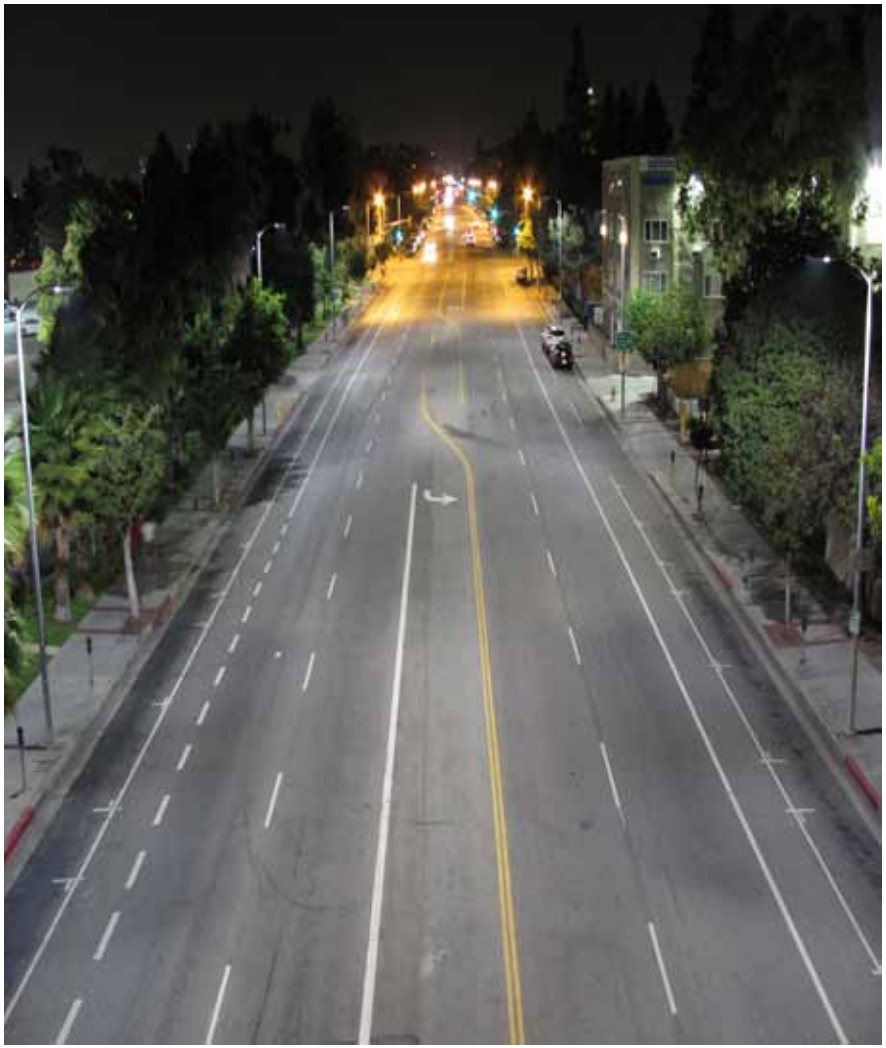
ANCHORAGE, ALASKA – 2008

In an effort to reduce light pollution, cut utility bills and enhance safety, Anchorage conducted two large pilot tests of induction and LED street lighting systems for residential and commercial areas, including dimming systems. Anchorage has begun the full retrofit of its 16,000 luminaires from HPS to LED – the first phase of this, encompassing almost 4,000 luminaires of 150W and 250W size, has been completed. Payback will occur in less than 7 years; energy savings have so far achieved a 58% threshold. LED luminaires are from Beta Lighting.

APPENDIX F: BEFORE AND AFTER PHOTOS OF PROGRAM (HOOVER ST BETWEEN 30TH AND 32ND STREETS)

LABSL

Before (310 W HPS)



LABSL

After (LED)