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April 1, 2010

VIA HAND DELIVERY

Ms. Ann Cole
Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard, Room 110
Tallahassee, Fl 32399-0850

RE: Docket No. 080677-EI: Florida Power & Light Company's LED Street Lighting Report

Dear Ms. Cole:

In response to the Commission direction in Order PSC-10-0153-FOF-EI (pgs 192-193), I am enclosing for filing in the above referenced docket an original plus seven (7) copies of Florida Power & Light Company's LED Street Lighting Report.

If there are any questions regarding this transmittal, please contact me at 561-304-5639.

Sincerely,

John T. Butler

COM ___
APA 1
ECR 3
GCL 1
RAD 1
SSC 1
ADM ___
OPC ___
CLK ___

cc: Counsel for Parties of Record

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a true and correct copy of the foregoing has been furnished via regular U.S. Mail this 1st day of April, 2010, to the following:

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Florida Power & Light Company
LED Lighting Report

April 1, 2010

Florida Power & Light Company
LED Lighting Report
April 1, 2010

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Executive Summary

In March 2009, FPL initiated a Light Emitting Diode (LED) lighting pilot project in the parking lot of its Juno Beach Corporate Offices. The pilot included the installation of eight LED fixtures, consisting of two different models. The objectives of the pilot were to evaluate the performance of the LED fixtures in the South Florida environment, monitor their energy consumption and assess employees' impressions of the LED lighting. In addition to conducting its Juno Beach pilot, FPL also contacted LED lighting manufacturers, southeastern electric utilities and several municipalities in its service territory to obtain their perspectives on LED lighting and gather information on what other electric utilities and municipalities are doing in regards to LED lighting.

In its recent rate case, Docket No. 080677-EI, FPL was directed to file a report by April 1, 2010 on the results of its Juno Beach pilot project.

Below are FPL's key findings:

FPL's Juno Beach Pilot Project

- The LED lights used in the pilot generated significant (approximately 50%) energy consumption savings, compared to the equivalent high pressure sodium vapor (HPSV) lights. This is consistent with manufacturers' claims;
- Based on survey results, FPL employees overwhelmingly preferred LED lighting over the more traditional high pressure sodium vapor lighting;
- Energy consumption for the two LED fixtures chosen was greater at the conclusion of the pilot than at the onset, by 3% percent and 9% more, for the two LED fixture types, respectively. FPL will continue to monitor this;
- Prices for the two LED fixture types dropped over $500 each during the course of the pilot, an approximate 30-40% reduction in just one year; and
- Even with recent price reductions, the outdoor LED area lights utilized for the pilot are still 4-5 times more costly than comparative current HPSV lighting fixture.

Research and Manufacturers' Claims/Representations

- LED lighting provides many benefits including energy savings, longer life, less fixture maintenance, improved color, contrast and brightness, and reduced lumen loss over time. Lumen is the unit of measure for the amount or power of light emitted;
- Negative considerations with LED lighting include: higher initial costs; vulnerability to heat; unknown long term performance (particularly in a more tropical environment with higher temperatures; humidity and lightning; lack of standards; concerns with higher wattage applications; lighting contrast concerns when LED streetlights are mixed with other conventional lighting applications; and that a one-for-one replacement of current street light technology (e.g., high and low pressure sodium vapor, mercury vapor, metal halide) with LED lights does not always occur since LED lights have little or no light trespass;
- LED technology is evolving rapidly, and significant advances in lumen output and efficacy, as well as reductions in initial costs, are expected to continue to be realized in the next two to three years.

Other Southeastern Electric Companies and Municipalities

- Electric utilities and municipalities currently involved with LED lighting are choosing to do so through pilot projects and programs. The pilots are relatively small in number, ranging from 2-40 fixtures per pilot. The pilot approach allows for LED lighting to mature in technology as well as price, provides utilities additional time to test and evaluate LED products and prevents utilities/customers from being "locked in" with an early offering that quickly becomes obsolete due to price and/or technology changes;
- While most utilities offer energy-only rates for customer-owned LED lighting fixtures, several of the utilities are currently providing utility-owned LED fixture offerings for their pilots through pilot tariff offerings or special non-standard lighting tariff provisions. Again, all of these pilots are small in number, averaging about eight fixtures per pilot;
- The benefits and issues with LED lighting, as described above, are also being observed in the utilities' current pilots.

Streetlight Tariff Comparison – HPSV vs. LED

Based on an analysis comparing FPL's current existing 200 watt HPSV streetlight tariff offering to a comparable LED streetlight fixture, an LED streetlight tariff would be over 28% more costly per month today ($18.65 vs. $14.52). One year from today, using the manufacturer's expected price reduction, the difference is reduced, but still would be over 15% more expensive than the current HPSV tariff ($16.78 vs. $14.52). While FPL's analysis includes significant expected savings associated with the LED fixture's lower maintenance costs and energy usage, these factors are still not enough to offset the LED fixture's higher initial costs, which today are over three times more costly than the comparable HPSV fixture ($625 vs. $199). While manufacturers are predicting that price reductions will occur over the next several years, the magnitude and frequency of these reductions will determine just how quickly LED streetlights become a more cost competitive lighting alternative.

Next Steps

FPL is very encouraged with the prospects for LED lighting. As described above, LED lighting has many benefits. Its drawbacks, particularly high initial costs, untested long-term performance and the fact that there are significant technological advances which are expected in the next several years but have not yet materialized, indicate that LED lighting has not yet reached the point where it would be appropriate for FPL to offer utility-owned LED outdoor or street lighting products. Therefore, FPL believes that its best course of action is to continue its Juno Beach pilot and initiate at least one actual roadway/streetlight pilot in its service territory during the current year (2010), using the most recent streetlight offerings made available by manufacturers. Continuing with the pilot approach will allow manufacturers' expected technology advances and price reductions to materialize and allow FPL and others in the industry to gather more experience and information regarding the performance of these products. This approach also protects customers from being locked into a higher priced technology that could very well become obsolete and/or far more affordable in a year or two.

FPL has been working, and will continue to work, with customers who choose to proceed now with installing and maintaining their own LED outdoor or street lights. FPL provides energy-only rate options (metered as well as unmetered) and will assist such customers in determining the energy charge (and potentially substantial energy savings) for their LED lights.

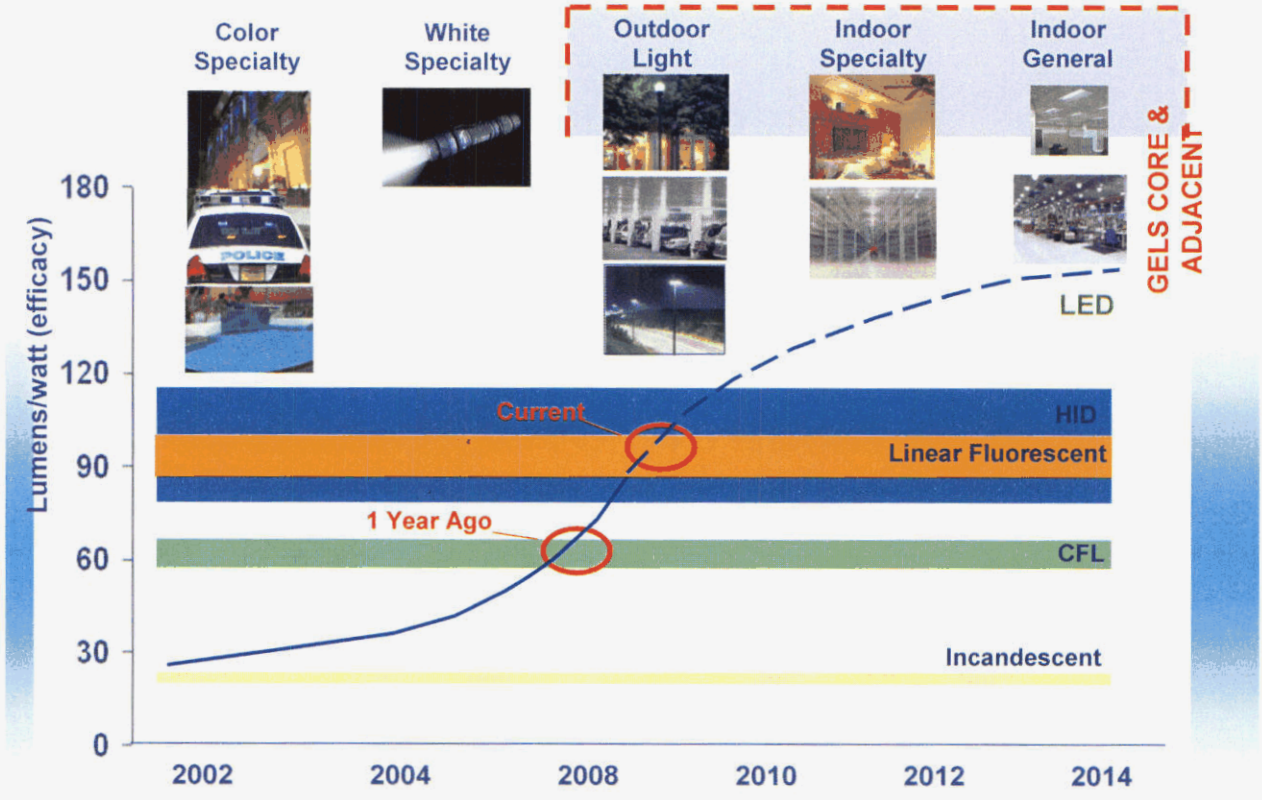
Section I
"LED 101" – What has FPL learned?

LED – Background/History

The LED was first discovered in 1907. LED's are essentially semiconductors (chips) which emit energy in the form of light. The next several decades after its discovery were characterized by slow advances until the late 1960s when Hewlett Packard integrated LED's into the displays of their hand-held calculators.

LED's were limited to the role of indicator and display lights for many years until the last couple of decades. Technological advancement of LED's is moving at a near parallel rate to Moore's Law (describes the rapid pace of technological innovation). LED's can now be found in a large array of electronic devices and appliances, including but not limited to: TVs, radios, watches, traffic signals and now…general lighting.

LED technology is evolving rapidly. General Electric Light Systems (GE) projects a 30% increase in lumen output per year. GE also predicts a 160 - 180 lumens/watt source efficacy rating in the next two to three years for LED fixtures. Large investments are being made throughout the industry for LED fixtures and actual LED's. This is quickly pushing the rate of technological advancement of LED fixtures. Additionally, metrics such as including color rendering index (CRI) and lumen output have benefited. The following chart prepared by GE below shows the progress of LED efficacy (lumens/watt), historically and projected, compared to conventional lighting technologies.



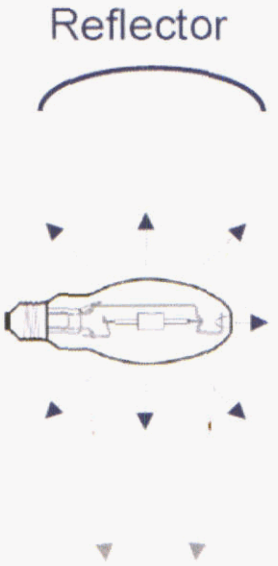
Benefits of LED Lighting

LED lighting offers the following advantages over some of the traditional lighting technologies:

- **Energy savings**
  - Can be up to 50% more energy efficient than a traditional light source.
  - Less total site wattage required due to uniformity.
  - Easily dimmable (lower energy usage).
  - Improved fixture efficiency.
- **Environmentally friendly** – LED's do not contain mercury or mercury vapor unlike fluorescent or high intensity discharge (HID) lamps (i.e. HPSV, mercury vapor, metal halide, etc.). There are no lamps to replace nor do any require special disposal.
- **Longer life** – The actual LED may last up to twice as long if conditions are optimal.
- **Start-up time** – Almost instant start & re-strike time, unlike HID lighting sources.
- **High color rendering index (CRI)** – High CRI of LED fixtures enables colors to be more visible and discernible. Security systems may benefit, since users will be able to identify colors of cars, hair, and other details more easily.
- **Lower fixture maintenance** – High reliability of LED fixtures and longer fixture lives should reduce repair trips to LED fixture.

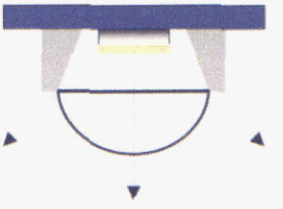
- **Uniform light distribution** – The point source nature of LED fixtures offers superior light control and eliminates 'hot-spots' (areas of increased light) and 'dark-spots' (shadows) inherent in HID fixtures.
- **Low lumen loss** – LED fixtures are expected to exhibit small lumen loss throughout their useful life.
- ***No UV emissions*** – *LED fixtures emit no UV rays.*
- **Wind loading** – LED fixtures are typically smaller in size than typical HID fixtures and therefore may perform better during high wind events.
- **Improved visual acuity**
  - Smoother visual transition due to uniformity.
  - Color consistency unit to unit.
- **Durability**
  - No filament failures, no cathode failures and no glass to break.
  - Vibration resistant.
- **Light control (see diagrams below)**
  - LED fixtures can direct light exactly where it is needed.
  - Greater optical control (light where desired) vs. conventional lighting (360° lamp).
  - Less light trespass with reduced shielding.
  - No "up-light" (dark sky complaint); there is minimal light spillage into the atmosphere.
  - Reduced wasted light.

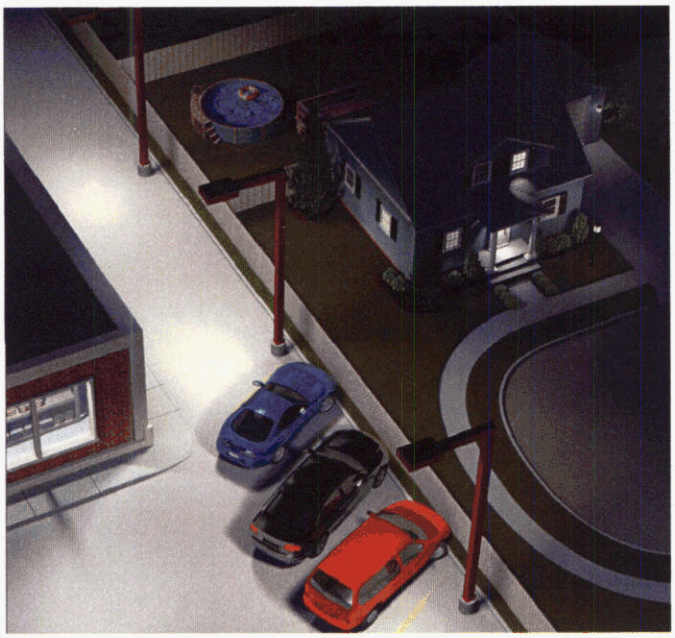
Conventional Bulb



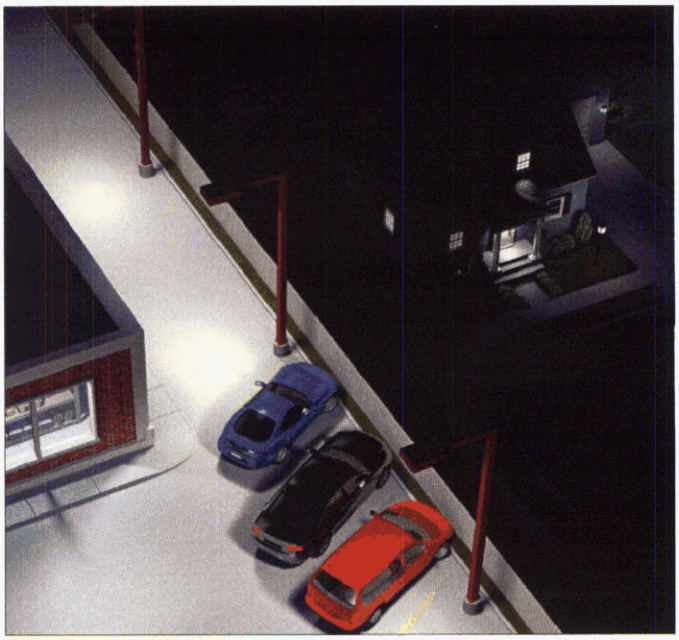
vs.

LED





Conventional Lighting (light trespass)



LED (no light trespass)

Drawbacks/Issues with LED Lighting

- **Initial Cost** – Currently, LED fixtures are significantly more costly than equivalent HID fixtures.
- **Heat** – LED's are temperature sensitive; without proper heat dissipation, LED's can fail prematurely.
- **Unknown long term performance** – Fixture maintenance and useful life expectations in high heat, humid and salt spray climates (such as Florida's) is untested and unknown.
- **Lack of standards** – A lack of standards and uniform test methods to characterize product performance and safety make it difficult to compare and evaluate LED fixture manufacturers on a level playing field (e.g., procedures to be followed in performing measurements of luminous flux, luminous intensity distribution and electrical power). Also, certain standards written for one point source (HID lighting) are not applicable for LED lighting. While some standards have been updated, additional standards are still being developed.
- **Light Control (also listed as benefit)**
    - Can easily cause dark spots on road if fixture not properly mounted; less room for error as compared to HID lighting.
    - Precise light placement is critical to obtaining proper lighting patterns.
    - Sensitive to any movement caused by wind, wood pole deformation due to age, change of pole from vertical (due to automobile accidents, settling, or conductor pull).

- **May not be one-for-one replacement** – LED fixtures may not be a perfect replacement for HID fixtures, especially in higher wattage applications. Lumen output of LED fixtures is also a factor in the inability to replace HID fixtures on a one-for-one basis. More LED fixtures may be needed for the same coverage or around curves than when using HID fixtures.
- **Availability of lumen packages** – The industry has little to offer for higher wattage applications. To be a viable option at higher wattages, LED's need to produce more lumens. Today's low lumen output, LED fixtures may not meet minimum illumination standards.
- **Weight of higher wattage applications** – Currently, higher wattage (400W+) applications can weigh about one-third more than comparable traditional fixtures.
- **Contrast issues** - Retrofits of white spectrum light emitted by LED fixtures, mixed with existing HPSV light, may create visibility/contrast issues for drivers/pedestrians.

LED Street Light Manufacturer Scan

FPL contacted several LED street light manufacturers to obtain a sense of the current state of LED street lighting. The following companies were interviewed via telephone:

- GE Lighting Systems (GE)
- American Electric Lighting (AEL)
- Philips Lumec
- BETA LED
- Lighting Components & Design (LC&D)

The companies interviewed supplied general information regarding LED lighting such as how LED lighting operates (most of which was incorporated into Section II of this report) and also provided insight on its future, including:

- All LED fixture manufacturers interviewed predict LED lighting will eventually replace all other lighting technologies and become the workhorse for street, area and general lighting. LED lighting will replace high pressure sodium vapor lighting as the main means of street lighting once it is able to offer higher wattage applications (such as interstate lighting) and once governing entities adjust their roadway illumination standards. Currently, due to the comparatively low lumen output for higher wattage applications, LED fixtures may not meet minimum illumination standards. The rapid advancement of LED technology will ensure a vastly different look for the LED lighting industry in both the short and long-term.

- One manufacturer noted that the Western and Northern parts of the U.S. have had a heightened interest in LED lighting as compared to the rest of the country. They believe this is mainly due to the larger populations of mercury vapor fixtures in these parts and the colder climates which are more conducive to proper LED operation.

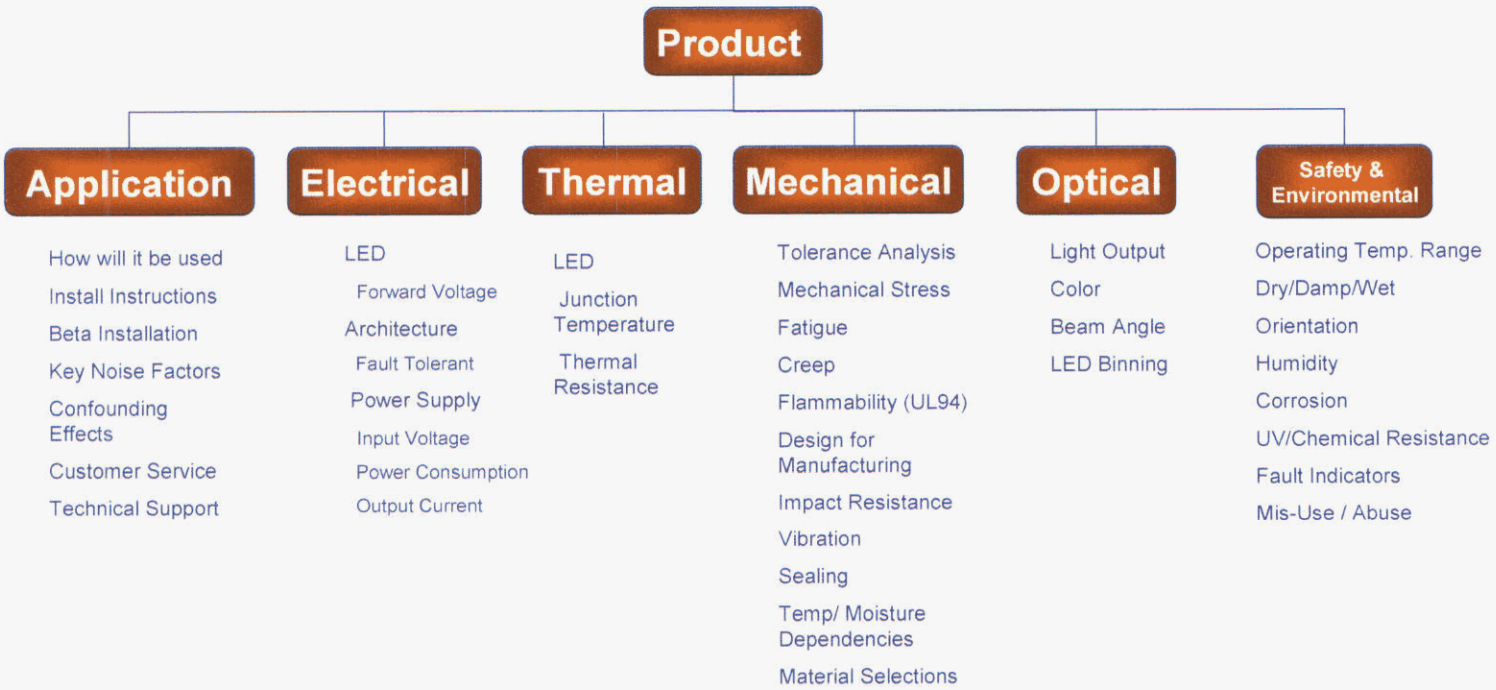
- All manufacturers interviewed plan to offer LED lighting in a variety of markets: Higher wattage roadway lighting, area lighting, parking garage lighting, directional

security lighting, wall packs, pedestrian lighting, indoor panel lighting to replace fluorescents, decorative lighting (traditional post-top, glass acorn, acrylic acorn, etc.), display case lighting and high-bay indoor lighting in places such as factories and warehouses. The flexibility of LED optics has enabled LED fixture manufacturers to move into all segments of outdoor lighting except spotlights and other higher wattage applications (400W+)....for now.

- All manufacturers agree lighting regulations and standards are becoming more aggressive. LED lighting is well on its way to becoming the solution that enables adherence to these new regulations yet still satisfies lighting needs.

- Quality control for LED manufacturers is a major cost driver for LED fixtures. Less than 10% of the LED chips produced actually pass all quality checks and are used for roadway LED fixtures (considered the 'highest' application of LED's). The remaining LED's are used for 'inferior' products which do not require tight specifications when it comes to lumen output and wattage consumption. LED manufacturers are continuously improving manufacturing techniques of LED's which translates to cost savings. For example, one manufacturer opined that a typical LED fixture that cost approximately $2,000 one to two years ago costs approximately $700-$800 today.

When designing a LED fixture, many factors must be addressed. Many of these key design factors are not issues with conventional lighting.



- Of these design factors, heat management is one of the most critical. Heat is a LED's worst enemy; over-heating an LED can dramatically decrease its useful life

from years to months in extreme cases. Achieving proper thermal dissipation design will ensure long-life, reliability of the fixture and high system efficacy ratings.

- Another important design consideration relates to surge protection. All LED manufacturers are concerned about the effects of surges on the electrical components of an LED fixture (i.e. electronic driver, photo control relay, etc.) and their performance on electrical grids. A major source of surges is lighting. Being the "lightning capital of the world", Florida offers special challenges to the surge sensitivity of LED fixtures.

The useful life of supporting components in LED fixtures is just as important as the LED's. A concern for manufacturers and consumers alike is specifically geared towards the driver, the device which supplies constant energy to the LED's. Heat and surges can also limit the useful life of theses supporting components as well.

Other Lighting Technologies

The LED fixture manufacturers interviewed were also asked if any other lighting technology shows as much promise as LED lighting. Induction lighting was mentioned and the manufacturers offered the following pros/cons:

Pros – Induction Lighting

- **Longer life** - Up to 100,000 hours of useful life (over 10 years).
- **Color** – Induction provides good white light with a high color rendering index (CRI).

Cons – Induction Lighting

- **Poor photo metrics** - Difficult to bend/shape the light output.
- **Surges** – Does not handle surges well.
- **Lumen output** – Does not produce more lumens than HID sources.

Induction lighting is a good option if customers narrow their focus to long life and white light. Photometric performance and cost cannot be important decision factors if induction lighting is chosen. LED fixtures have already surpassed induction efficacies. While induction lighting has been around for 15-20 years, and many of the manufacturers offer induction lighting products, most utilities have not adopted it for large scale use.

One manufacturer mentioned plasma HID lighting as an emerging technology which may challenge LED lighting. This technology shows promise, but a limited number of manufacturers currently offer plasma HID products. Some limitations associated with the technology are: Heat dissipation (large heat sinks required), short useful life and issues controlling light output.

LED Lighting Activities – Southeastern Utilities

FPL contacted six electric utility partners in the Southeast to get a sense of what they were doing in regards to LED streetlights. Interviews were conducted via conference calls with the appropriate street lighting personnel from each company. Below is a summary of our discussions and findings.

- Five out of the six utilities are conducting one or more pilots using LED lighting. The most mature pilot was initiated over a year and a half ago;
- All pilots are small in nature, ranging from 2 to 40 fixtures in total;
- Most utilities offer energy-only rates for customer-owned LED lighting fixtures;
- Three of the utilities are providing utility-owned LED fixture offerings for their pilots. One utility does so through its two-year Non-standard Lighting Service rate schedule pilot. Currently, this utility has one active pilot in place, consisting of 10 LED fixtures. Another utility provides utility-owned LED lighting offerings thru special provisions contained in its Lighting Service rate schedule. This utility currently has four active pilots, consisting of 12 LED fixtures in total. The last of the three utilities provides utility-owned LED lighting offerings through an approved rate formula used for all new streetlight offerings. Currently, this utility has one active pilot, consisting of 28 LED fixtures.
- Positive observations on LED streetlights included good color rendering, improved light uniformity, energy savings and positive feedback from customers;
- Negative observations included higher initial cost, longer lead times for ordering LED fixtures, lack of availability for higher wattage applications, constant product changes, and the inability to achieve a one-for-one replacement with conventional lighting.

LED Lighting Activities – Municipalities

City of Tamarac

The City of Tamarac recently concluded a seven month LED pilot. The pilot included, 25 fixtures, consisting of several different models. Key findings were as follows:

- Superior light control when compared to HID fixtures was noted although some dark spots were prevalent at locations where pole spacing was large;
- At some locations an acceptable one-for-one replacement was not achieved;
- Initially, water intrusion caused many of the fixtures to fail; however, this issue was subsequently corrected by the manufacturer.

A small second pilot consisting of three LED fixtures in a city parking garage is currently underway. To date, there have been no issues and the fixtures are working properly.

In conclusion, the City has decided not to pursue LED lighting at this time. Their main concern is that many warranties currently offered by LED manufacturers do not span their calculated pay back period. Additionally, the City has begun testing induction fixtures. Three induction fixtures have been installed and the City reports that initial results have been positive. Most recently, the City applied for federal grants to replace all 233 city-owned HID fixtures with induction lighting. The City is expecting a decision sometime this summer.

City of Lauderhill

Due to the currently high initial costs of LED fixtures, the length of the payback period, and the unknown/untested useful life, the City of Lauderhill currently does not have an LED lighting pilot. However, the City has been actively monitoring the technology. In fact, an area suitable for a pilot was identified and encompasses an area of about four city blocks, with a total of 18 street lights. FPL assisted the City with the collection of pertinent details of the area which will assist the City in ultimately choosing a suitable LED fixture.

City of Miami

The City of Miami also has a small LED pilot in place at this time. While evaluations of the technology are not complete, the City reports that positive results have been observed to date. If positive results continue, the City stated they would consider installing LED fixtures in sections of the City.

Other Municipalities

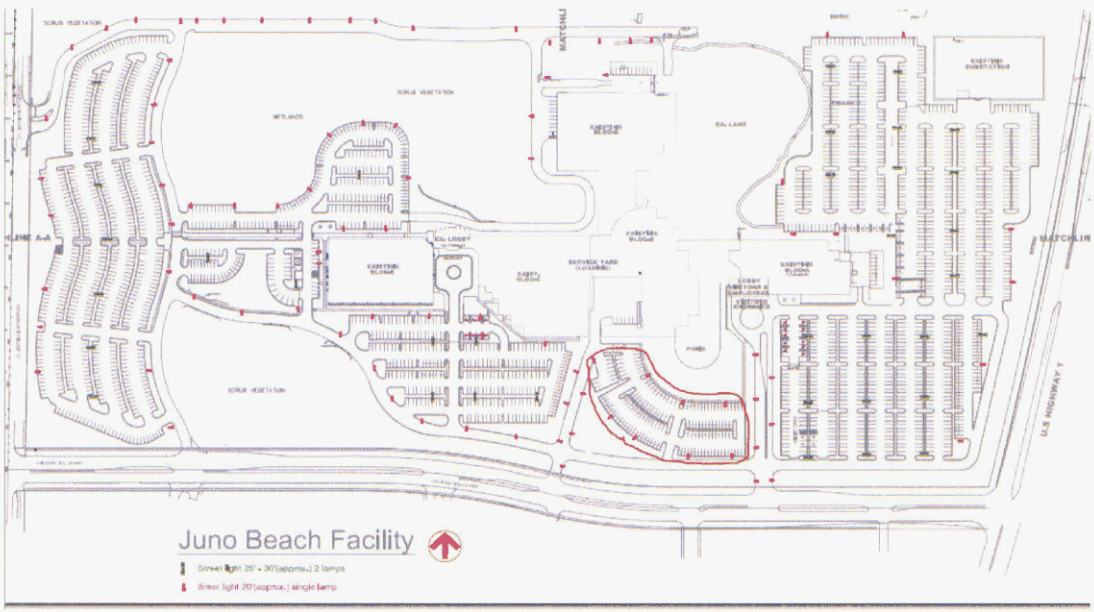
Interest in LED lighting is high among other municipalities in FPL's territory. FPL continues to offer information and assistance in any way possible. For example, Greenacres and Melbourne have contacted FPL for LED lighting information and FPL is aware that many more are evaluating the technology.

Section II
Juno Beach Corporate Offices LED Lighting Pilot

FPL, in partnership with GE, set out to evaluate LED lighting through an initial pilot in the parking lot at the Juno Beach Corporate Offices. The pilot commenced in March 2009 and concluded one year later. The objective of the pilot was to obtain data/information regarding -

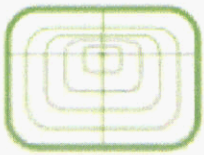
- Product performance in South Florida's environment including its higher temperature, humidity and lightning
- Expected energy savings initially and over time
- Employee impressions of the new lighting

Eight HPSV fixtures were replaced with GE's Evolve LED area light fixtures in one section of the parking lot outlined in red on the next page:

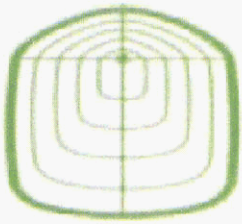


Of the eight GE LED fixtures; three were S5 type and five were F4 type light distribution classifications. The lighting patterns are shown below and approved by the Illuminating Engineering Society of North America (IESNA).

IESNA CLASSIFICATIONS



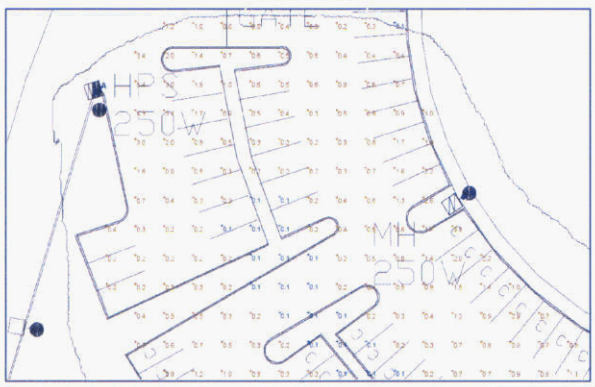
S5
SYMMETRIC
SQUARE



F4
ASYMMETRIC
FORWARD

At the onset of the pilot, illumination readings (in foot-candles) were taken before and after the installation of the LED fixtures. As demonstrated in the following charts, the LED fixtures provided substantially superior uniformity (Avg/Min ratio), eliminated hot-spots (Max fc) and increased minimum illumination levels (Min fc):

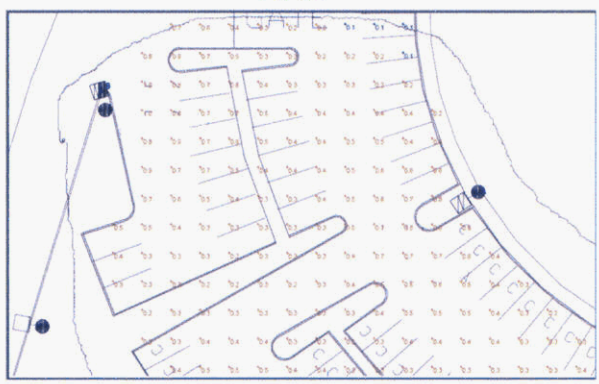
HPSV



Type 5 Fixture				
Average (fc)	Min (fc)	Max (fc)	Max/min Ratio	Avg/Min Ratio
0.75	0.01	7.1	710:1	**75:1**

Type 3 Fixture				
Average (fc)	Min (fc)	Max (fc)	Max/min Ratio	Avg/Min Ratio
0.99	0.05	7.13	143:1	**20:1**

LED



S5 type Fixture				
Average (fc)	Min (fc)	Max (fc)	Max/min Ratio	Avg/Min Ratio
0.90	0.22	1.8	8:1	**4:1**

F4 type Fixture				
Average (fc)	Min (fc)	Max (fc)	Max/min Ratio	Avg/Min Ratio
0.67	0.22	1.35	6:1	3:1

After 12 months, illumination readings were taken again to track lumen depreciation of the LED fixtures. A lumen depreciation of about 3% (0.90 vs. 0.87 for the S5 fixture and 0.67 vs. 0.65 for the F4 fixture) over one year was observed for both LED fixture types, which is actually better than GE's claim of 4-5% lumen depreciation. In contrast, lumen depreciation for conventional (HPSV) fixtures averages 10%.

LED Post Pilot Readings

S5 type Fixture				
Average (fc)	Min (fc)	Max (fc)	Max/min Ratio	Avg/Min Ratio
0.87	0.26	2.13	8.19:1	3.34:1

F4 type Fixture				
Average (fc)	Min (fc)	Max (fc)	Max/min Ratio	Avg/Min Ratio
0.65	0.27	1.38	5.11:1	2.41:1

Performance against surges is a major concern to FPL and GE due to the electronic components of LED fixtures. In the last 12 months, the feeders serving the Juno Beach Office experienced only one momentary interruption. The LED fixtures may or may not have seen a surge resulting from this momentary interruption. More testing is necessary to adequately evaluate the effects of power surges and interruptions before a final determination can be made.

Several before and after photos are presented on the following pages.

High Pressure Sodium Vapor Lighting (Before)

LED Lighting (After)

High Pressure Sodium Vapor Lighting (Before)

LED Lighting (After)

As can be seen in the photographs, differences are noticeable between the two lighting technologies:

HPSV

- **Appears to be darker despite producing more lumens**
- **Emits amber light**
- **Objects blend with each other** – Objects are less noticeable.
- **Hot spots around pole** – Increased lighting levels in close proximity of pole.

LED Lighting

- **Appears to be lighter despite producing less lumens.**
- **Emits white light**
- **Objects can be distinguished easily** – Most notable in first set of pictures; row of bushes towards left of both photographs.
- **Better color differentiation** – Notice the white van on the left side of the frame is more pronounced in the LED photo.
- **Superior light uniformity** – Minimal hot and dark spots.

Energy consumption readings were taken for both the HPSV and LED fixtures at the onset of the pilot for comparison purposes. At the end of the pilot, readings were obtained once more from the LED fixtures to verify if energy savings were constant throughout the life of the pilot.

Energy Savings – HPSV vs. LED

	HPSV	LED (F4)	LED (S5)	TOTAL LED
(a) Quantity of Fixtures	8	5	3	8
(b) Power Consumption - Per Unit (watts)				
Per Manufacturer Specs	250	85	205	N/A
Actual (Onset of Pilot)	249	80	199	N/A
Actual (End of Pilot)	249	87	205	N/A
(c) Power Consumption – Total (a x b) (watts)				
Per Manufacturer Specs	2000	425	615	1040
Actual (Onset of Pilot)	1992	400	597	997
Actual (End of Pilot)	1992	435	615	1050
Power Consumption - Total Savings				
Per Manufacturer Specs				48% (1040w vs. 2000w)
Actual (Onset of Pilot)				50% (997w vs. 1992w)
Actual (End of Pilot)				47% (1050w vs. 1992w)

Post-Pilot Observations

Consumption Readings

- LED fixtures' actual consumption readings, in total, were 47% (final) to 50% (initial) less than the HPSV readings.
- HPSV fixture readings indicated little or no variation from manufacturer specifications, actual onset and actual final readings.
- LED fixtures readings indicated more variations and both the LED F4 and S5 fixtures' final readings showed increased consumption from their initial readings (9% and 3%, respectively). While no conclusion can be drawn on this single initial and post pilot consumption reading comparison, this is something that FPL will continue to monitor going forward.

Physical Inspection of LED – End of Pilot

- No corrosion, wear or tear was observed.
- One LED fixture indicated ant intrusion

Feedback from FPL employees at the Juno Beach office employees who use this portion of the parking lot regularly was also an important part of this pilot. To obtain this feedback, two surveys were conducted. The first survey was conducted soon after the installation of the LED fixtures, with a follow-up survey at the end of the pilot. The purpose of the follow-up survey was to see what, if any, opinions changed throughout the life of the pilot. The four survey questions were directed at comparing the LED lights to the HPSV lights in terms of the quality of the light (color, clarity and aesthetic appeal), brightness of the light, evenness of light coverage, and effectiveness of the lights on the overall security of the parking lot. Both the initial and follow-up surveys of FPL employees yielded very positive results and overwhelming acceptance of the LED lighting.

Section III
LED Price/Cost Evaluation

Streetlight Tariff Comparison – HPSV vs. LED

To illustrate the price/cost comparison for an LED light vs. FPL's current and more conventional HPSV lighting offering, FPL has provided the analysis below. The monthly charges for FPL's HPSV 200W Cobra Head fixture represented below are from FPL's currently approved streetlight tariff (SL-1). For purposes of this analysis, these charges remain constant. For the comparable LED L80 fixture, FPL has provided two different charges: first, charges based on the L80 fixture price today and second, the L80 fixture charges reduced by 15%, which reflects the manufacturer's price expectation one year from now. Additionally, the LED maintenance charge was assumed (for simplification and illustrative purposes) to be 50% less than the conventional HPSV fixture, based on

manufacturers' representations that maintenance costs for the LED fixture will be lower. The non-fuel energy and fuel/other energy charges have been reduced to reflect a 38% reduction in kWh usage. This 38% reduction reflects the manufacturer's rating for the LED80 fixture's line wattage. Of course, these charges will need to be refined when FPL actually reaches the point of developing an LED offering.

		(1)	(2)
	HPSV	LED L80	LED L80
Charge	200W	March 2010	March 2011
Fixture	$ 6.22	$13.65	$11.78
Maintenance	$ 1.55	$ 0.78	$ 0.78
Non-fuel Energy	$ 2.39	$ 1.49	$ 1.49
Sub-Total	$10.16*	$15.92	$14.05
Fuel/Other Energy **	$ 4.36	$ 2.73	$ 2.73
Total Monthly Streetlight Rate	$14.52	$18.65	$16.78

* As represented in FPL's currently approved SL-1 tariff, Sheet No. 8.716, effective March 1, 2010
** Includes current fuel, all other adjustment clauses, and gross receipts tax charges as of March 1, 2010

As can be seen from this analysis, the LED fixture cost is the primary barrier that must be overcome in order for LED lighting to become a cost-competitive option for utilities and their customers. Based on the assumptions provided above, the LED L80 tariff charge would be over 28% more costly today and over 15% more costly a year from now than the equivalent HPSV 200 watt fixture charge.

Section IV
Next Steps

LED Roadway/Streetlight Pilot Project

FPL is planning an LED roadway/streetlight pilot, which will be initiated during the current year (2010). While the Juno Beach office pilot was focused towards evaluating outdoor LED area lighting (walkways, parking lots, etc.) as well as the overall technology, our second pilot will focus specifically on LED street lighting. Although, many LED roadway/streetlights pilots have already begun around the country the available roadway product lines from the major manufacturers have been limited. As the major manufacturers – such as GE and AEL are unveiling their roadway product lines, FPL is working to evaluate the products for this second pilot. FPL will also benefit from expected price reductions and the maturation of LED technology at the time of implementation. The pilot is scheduled to last at least one year, with performance checks and data collection planned throughout the life of the pilot, similar to the Juno Beach pilot.

FPL is in the process of evaluating suitable locations for the pilot. The goal is to subject the LED fixtures to the environment most likely to test the durability and performance of streetlight LED fixtures (i.e. salt spray, wind, lightning, urban setting, etc.) seen

throughout its service territory. FPL is looking for the following attributes in potential areas for the pilot:

- Heavily traveled, high exposure areas – FPL is interested in customer feedback and is assessing several methods of collecting opinions from customers, including a service where customers can text-message their comments;
- Areas which currently contain lower wattage HPSV fixtures – Preferably HPSV 120V cobra head fixtures less than 400W;
- Uniform pole spacing;
- Uniform street light attachment height;
- Straight thoroughfares (no curves);
- Minimal vegetation;

To the extent that it can, keeping in mind the attributes provided above, FPL will also look for opportunities to partner with municipalities on this pilot.

Customer-Owned LED Street Lights

Currently, FPL customers have the option of installing customer-owned and maintained LED fixtures, utilizing FPL's energy-only rate offering. For un-metered energy-only circuits, line wattage of the LED fixture is the only piece of information needed to properly bill customers. The line wattage is the total consumption of the LED as well as other electronic components contained within the LED fixture. Line wattage should be provided by the manufacturer of the LED fixtures or may already be included in the manufacturer specification sheets.

Once line wattage is obtained, it is input into the following equation to compute kWh per month:

- kWh per month = $\frac{\text{Line Wattage X 4,240 hrs. (\# of hrs. lights on per year)}}{\text{12 months X 1000}}$

KWh per month is then multiplied by FPL's street light energy rate as outlined in the customer-owned lighting portion of the SL-1 rate schedule. This method gives FPL unlimited flexibility in handling the myriad of different LED fixtures currently on the market and benefits customers by giving them accurate cost and energy usage figures specific to that LED fixture. As an example, using the same fixtures in the analysis discussed on pages 19 and 20, the HPSV 200W and the LED L80 fixtures have line wattages of 249 and 157, respectively. Utilizing the above formula, monthly kWh for the HPSV 200W and LED L80 fixtures equates to 88kWh/month and 55kWh/month, respectively. Using currently approved rates, the monthly energy-only charge would be $6.75 (HPSV 200W) and $4.22 (LED L80), which reflects the energy savings provided by the LED L80 fixture.

A metered energy-only circuit is another alternative customer's may choose for customer-owned and maintained LED lighting circuits. Customers choosing this alternative will be billed the exact monthly energy consumption. Metered circuits will easily account for energy savings as a result of emerging technologies such as dimming, wireless control systems, motion detectors, etc. With the rapid advancement of LED technology, energy saving features will find their way into LED fixtures in a mass scale in the near future. Also, future retrofits or upgrades by the customer, along with the technological advancements looming on the horizon, will not need billing adjustments. Customers will be able to observe actual energy consumption figures and accurately quantify energy savings through metered energy-only circuits.

To ensure customers, such as municipalities and home owner's associations, are well informed of and understand FPL's LED lighting activities, energy-only rate offerings and that FPL's willingness to work with them on LED lighting projects, FPL will be increasing its customer communications on these matters. This would include developing a brochure/pamphlet similar to the one FPL developed for its Juno Beach LED pilot (which FPL has attached to this report).

Section V
Conclusion

FPL was among the first companies in the nation to pilot LED lighting. FPL is committed to making smart, cost-effective lighting technology investments. LED lighting promises to conserve energy, reduce costs and reduce light pollution but requires further technological advancement and economies of scale to be an economically viable choice for FPL to offer to our customers. It is also imperative that FPL understand LED streetlights' performance in Florida's challenging environmental conditions. FPL will continue with its LED pilot in its Juno Beach corporate offices and will move forward with a roadway/streetlight LED lighting pilot to ensure that we select lighting products that meet the expectations of our customers.

FPL will also continue to work with customers who choose to proceed now with installing and maintaining their own LED outdoor or street lights, by continuing to offer its energy-only rate options and assisting such customers in evaluating those options for their needs.

FPL

LED streetlights

A green technology

FPL is a leader in clean energy, conservation and environmental stewardship. That's why we're among the first companies in the nation to pilot outdoor LED (light emitting diode) streetlights. We're committed to making smart, cost-effective technology investments to improve efficiency and reliability.

LED lighting promises to conserve energy, reduce costs and reduce light pollution, but may require further technological advancement and economies of scale to be an economically viable choice for our communities. In the meantime, FPL is piloting LED streetlights to understand their performance in Florida's hot and salty weather conditions.

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FPL pilots LED streetlights

As a pilot program, FPL installed LED streetlights at our Juno Beach campus in March 2009, and will monitor their performance and energy consumption over the course of 12 months. Heat is known to reduce the lifespan of the semiconductor chips that run LED lights, so we are closely monitoring the impact of Florida's extreme weather conditions during this pilot.

Our pilot will conclude in mid-2010 and at that time, we will share our findings with our municipal partners.

Potential benefits of LED

- **Energy efficiency:** LED streetlights are expected to use 30 to 50 percent less energy than HPSV or metal halide streetlights.
- **Longevity and maintenance:** LED lights are expected to last at least two times longer than traditional streetlights while requiring less maintenance.
- **Light quality:** LEDs emit a higher quality, more evenly distributed light.
- **Impact on sea turtle nesting:** FPL and The Florida Fish and Wildlife Commission are researching LEDs' potential to reduce light pollution near sea turtle nesting grounds.

Current challenges of LED

- **Cost:** LED streetlights are significantly more expensive than traditional streetlights. As the industry achieves economies of scale and costs decline, LED streetlights will become more economically viable for our communities.
- **Longevity and maintenance:** Because LED streetlights are new to the market, their maintenance needs and life expectancy are unknown in Florida's extreme weather conditions.
- **Visibility and contrast issues:** The use of LED white spectrum light alongside existing HPSV amber light may cause visibility and contrast issues for drivers and pedestrians.
- **Lighting standards and regulations:** At both state and local levels, existing lighting standards and regulations for light uniformity, contrast and glare reduction must be updated to include LED lighting issues and benefits.

Floridians count on FPL to make smart investment decisions. That's why we're thoroughly testing LED streetlights to make sure they're the right decision for our communities.

For more information on FPL's environmental stewardship, please visit:
www.GenerationClean.com

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