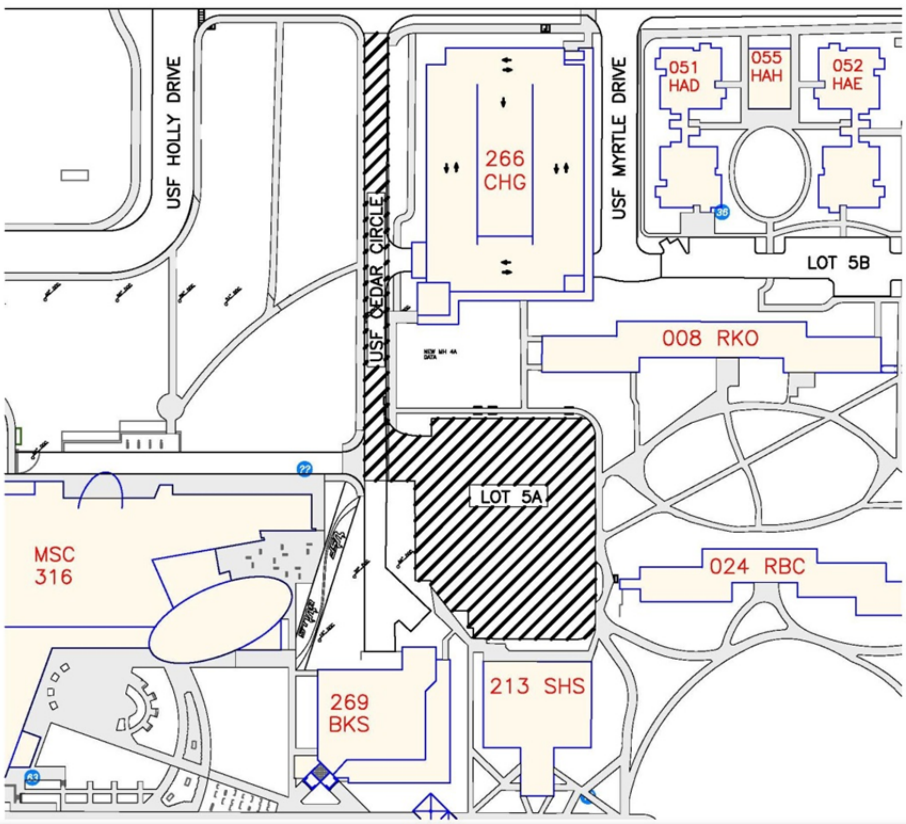
Parking Lot 5A & Cedar Circle LED Lighting Retrofit



USF Facilities, Planning, and Construction

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Proposal Title: Parking Lot 5A & Cedar Circle LED Lighting

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Organization: Collaboration between Facilities Planning and Construction and Parking and Transportation Services

Description:

The project consists of retrofitting Lot 5A and Cedar Circle existing high pressure sodium, cobra head light fixtures with LED lighting systems. Parking Lot 5A and Cedar Circle have high pedestrian volume of students who traverse between student housing and Marshall Center and other campus core locations. In addition, Lot 5A and Crescent Garage, accessed via Cedar Circle, have high volume of nighttime traffic and parking by students, staff, and visitors attending events at the Marshall Center and resident parking for housing. This area is very visible to students, staff, and visitors and the project will complement the recently completed LED retrofit lighting, phase 1, at Crescent Garage partially funded by Student Green Funds.

The goal is to improve the quality of lighting, achieve significant energy savings, and reduce the carbon emissions resulting from inefficient campus lighting. LED lighting systems provide exceptional long lamp life, improve color rendering, the ability to improve light levels with minimal light loss over the life of the system, and achieve substantial energy savings over the existing high pressure sodium lamp fixtures.

LED lighting systems life expectancy ranges between 60,000 to 100,000 hours, depending on the manufacturer. The manufacturer, whose LED retrofit unit is the basis of this proposal, advertises up to 100,000 hours life expectancy. 75,000 hours, industry average, is calculated in the ROI in anticipation of allowing competitive bidding from multiple manufacturers, subject to university approval based on aesthetics and performance. In contrast, high pressure sodium lamps have a life expectancy of 24,000 hours, requiring replacing them at least 3 times over the life of LED systems. Replacing low lamp life high pressure sodium fixtures with longer life LED lighting systems will reduce maintenance costs and energy costs, in result, lower carbon emissions generated by the campus by reducing energy consumption and reducing the number of times for dispatching a maintenance truck to replace lamps.

LED lighting systems provide more natural light color improving safety and security over high pressure sodium lamps. LED lighting systems produce more natural white light, 72 color rendering index and campus standard 4100 degrees Kelvin temperature, compared to high pressure sodium lamp yellow light, 22 color rending index and 2100 degrees Kelvin temperature. LED lighting white color gives the psychological impression of more light, truer color, and better security. The LED lighting system natural white light is preferred by the University Police over high pressure sodium yellow lighting that gives the opposite psychological impression of less light, indistinguishable colors, and less security. LED lighting systems natural white light improves drivers and pedestrians ability to see objects, to distinguish colors, and makes people feel safer than high pressure sodium yellow light.

LED lighting systems provide the ability to improve light levels in the parking lot with minimal light loss over the life of the system, while reducing energy use. High pressure sodium lamps emit light straight out of the filament requiring reflectors and lens to help distribute the light downward and outward. Dirt accumulation on the reflectors and lens, called dirt depreciation factor, results in higher light loss over the life of the lamp decreasing the light output and ultimately the light levels. In contrast, LED lighting systems consist of multiple individual light emitting diodes (LEDs), each with their own directional optic, such as forward distribution, wide distribution, or area round or square distribution, eliminating the need for reflectors or lens to help distribute the light, minimizing light loss contributed to dirt accumulation. Also, the ability to select the number of LEDs, optics, and their placement allow the manufacturer to maximize the light output and distribution to produce higher and more uniform light levels, at the same time reduce energy use. Essentially, LED lighting systems improve light levels while consuming less energy than the existing high pressure sodium fixtures.

LED systems provide substantial energy savings over the existing high pressure sodium fixtures. The goal is to retrofit the existing high pressure sodium fixtures with energy saving LED retrofit units and at the same time increase the quality and levels of light without incurring the cost of adding light pole assemblies. The high pressure sodium lamps are 250 watts, 312 input watts due to the ballast factor. The LED retrofit unit input watts for an equivalent unit to the 250 watt high pressure sodium is 98 watts, resulting in 68% savings. The existing levels along Cedar Circle are adequate, so equivalent LED retrofit units to the 250 watt high pressure sodium fixtures will be used. However, the objective is to improve the light levels in parking Lot 5A while saving energy, so, the intent is to replace each high pressure sodium fixture with a 168 watt LED unit, increasing the amount of light while reducing the energy consumption by 46%.

LED retrofit units recently installed in Crescent Hill Garage, in the Post Office Lot 4, and at Holly Drive and West entrance to CPT have proven to be reliable and have improved the quality of lighting while using less energy.

The methods to assess the outcome of the project include confirming the energy savings and the design photometric levels. Perform load measurements of the input watts of the high pressure sodium fixture and the LED retrofit unit to confirm the anticipated energy savings. Perform light levels measurements, using a light meter, to compare the LED units' actual light levels to the design light levels.

Facilities Management will communicate the project and benefits to the university in the Facilities Management presentation scheduled each year. The Facilities Management team conducts a number of presentations each year that provide the university community with an opportunity to learn about new projects, including energy conservation projects, on the campus. The presentations are uploaded onto the VP for Administration website for the university community to view.

Budget Justification:

The requested funding is $10,675. The following breakdown represents the requested funding.

LED retrofit unit cost	$650, 13 total units = $8,450
LED retrofit unit labor cost	$125, 13 total units = $1,625, includes permit fees
Facilities Management Fee	$600
Total	$10,675

The LED retrofit cost represent the materials cost.
The LED retrofit unit labor cost represents the labor cost, including lift truck and permit fees, to install the units.
The Facilities Management Fee represents the university management fees for the project.

Resource Matching:

The departments fiscal year funding are already in place and due to the university and state's budget constraints there are no matching funds available for this project.

Timeline and Milestones:

The schedule and procedures will adhere to the University Facilities Planning and Construction Guidelines and the Building Code Administration Policies and Procedures. The anticipated schedule, from the Student Green Energy Fund Council notification of approval, is as follows:

4 Weeks	Design and Bid
1 Week	Award to Lowest Bidding Contractor
2 Weeks	Purchase Order Request
4 Weeks	Product Lead Time and Delivery
2 Weeks	Product Installation
1 Week	Final Inspection and Goals and Objectives Verification
14 Weeks Total Schedule	

Evaluation Metrics:

Evaluation metrics include visual observation to confirm improved lighting, load measurements to confirm energy savings, and light levels measurements to confirm designed levels.

Plan for Sustainability:

The project promotes the Office of Sustainability initiatives and the University of South Florida's strategic goals of creating a sustainable campus environment by replacing high pressure sodium light fixtures with LED lighting systems that conserve energy, reduces carbon emissions, and consists of materials that can be recycled at the end of their life expectancy. The LED lighting systems life expectancy is 68% longer than the existing high pressure sodium fixtures. They save maintenance costs and reduce carbon emission by reducing the amount of dispatches for maintenance trucks to replace lamps. The LED lighting systems input watts are approximately 46% to 68% less, depending on the LED retrofit unit, than the high pressure sodium lamps, conserving energy and reducing carbon emission gases generated by the campus. Also, the LED lighting systems components can be recycled, conserving resources and reducing waste when replaced at the end of their life expectancy.

Amount Requested: The requested funding is $10,675.

Annual Energy Savings:

13 existing 250 watt high pressure sodium lamps and ballasts, 321 input watts each, removed: total 4.17 kW.

Cedar Circle - 7 LED retrofit units, 98 input watts each, installed: total 0.69 kW

Parking Lot 5A – 6 LED retrofit units, 168 input watts each, installed: total 1.00 kW

The lights operate an average of 10 hours a day, 365 days a year: 3,650 hours per year.

Energy Saved: (4.17 kW – 1.69 kW) x 3,650 = 9,052 kWh x $0.085 per kWh = $770 per year.

Return of Investment:

Life Expectancy of LED Units: 75,000 life hours / 3,650 operating hours per Yr = 20 Yrs

Energy Savings per Year ($): $770

Payback (Yrs):

> *Estimated HPS Lamp Replacement Costs over Life of LED amortize per Year:*
>
> *{{($100 lift + $35 lamp) x (75,000 LED life hours / 24,000 HPS hours)} x13 fixtures} / 20 Yrs = $274*
>
> Payback = Net Installation Costs / (Annual Energy Savings + Maintenance Savings)
>
> Payback = {($10,675 / ($770 + $274)} = 10.2 Yrs

20 Year Cash Flow ($):

> 20 Yr Cash Flow = (20 Yrs – Payback (Yrs)) x Annual Savings
>
> 20 Yr Cash Flow = (20 – 10.2) x ($770 + $274) = $10,231

ROI:

> ROI = Annual Savings / Installation Cost
>
> ROI = ($1,044 / $10,675) x 100% = 9.78 %

Greenhouse Gas Emission (per EPA):

The project's goal is to reduce the amount of carbon dioxide (CO_2) and other greenhouse gases released into the atmosphere. Reducing energy consumption and the amount of times maintenance vehicles are dispatched for lamp replacements allows the university to reduce the greenhouse gases released into the atmosphere. The calculator on epa.gov website (http://www.epa.gov/cleanenergy/energy-resources/calculator.html) was used to calculate the anticipated greenhouse gas emission annual reduction.

The estimated greenhouse gas emission reduction is 6.2 Metric Tons of CO_2 or CO_2 equivalent annually.

Typical Campus Cobra Head, High Pressure Sodium, Light Fixture

Example of Cobra Head LED Retrofit Unit (Holly Drive and West Entrance to CPT)

Close Up View of Cobra Head LED Retrofit Unit

Example of LED Cobra Head Fixture (Magnolia Drive & Hawthorn Drive)
(example of alternate manufacturer that may be considered)

Parking Lot 5A – Northwest View

Parking Lot 5A – Southwest View

<u>Cedar Circle - North View</u>

<u>Cedar Circle – South View</u>