STAFF REPORT

DATE: October 21, 2014

TO: City Council

FROM: Herbert Niederberger, General Manager Utilities, Development, and Operations
Mitch Sears, Sustainability Program Manager

SUBJECT: LED Lighting Project Update

Recommendation

1. Receive update on the LED lighting project.
2. Confirm staff's plan to install warmer, lower glare LED cobra head fixtures on all local level residential roadways, including replacing the recently installed LED cobra head fixtures on local level roadways.
3. Confirm staff's plan to move forward with testing warmer, lower glare LED lighting for installation in the park/greenbelt pathways and decorative post top lighting that is located in downtown and a few residential neighborhoods.
4. Confirm staff's plan to amend the lighting contract with Siemens to incorporate the full scope of services identified in recommendations 2-3 above.

Council Goal(s)

This project supports the following City Council Goals:

- Maintain and improve the infrastructure of the city.
- Reduce resource consumption thus reducing greenhouse gas emissions (GHG)
- Fiscal sustainability.

Fiscal Impact

It is expected that the impact upon the city's general fund will be positive insofar as the retrofit to LED lighting will be financed over a 15 year period and the costs of the financing will be more than offset by the reduced consumption and reduced costs of energy for lighting over the period. The details of the fiscal impact and financing plan will be addressed when the action item for the lighting project contract and financing plan is brought to Council in November.

Background

Since December 2012, the City and Siemens have been working together to develop a project to save energy, money and GHG emissions as well as modernize key community infrastructure.

Current status

City staff and Siemens are finalizing an LED lighting contract and financing plan for consideration by the Council in November. The planned project scope focuses on providing a comprehensive lighting package with warmer LED lighting for residential streetlights, parks, and greenbelts. Prior to this, other energy efficiency elements were originally considered for inclusion in a broader

energy efficiency project, however, they are no longer being considered since they do not meet the City's project objectives of delivering significant energy savings cost effectively . Therefore, the current proposed project scope focuses solely on LED lighting.

As the Council is aware, the City and Siemens implemented the cobra head LED lighting retrofit as a potential first phase of a larger energy efficiency project. Following Council approval in January 2014, LED streetlights have been installed in most residential areas and along all arterial and collector level roads of the City. Due to issues raised in June 2014 about the intensity and color tone of the LEDs being installed, the Council halted the implementation to explore alternative LED options.

The pause allowed staff, the California Lighting Technology Center (CLTC), and Siemens to test alternative LED streetlights and gather public feedback. In general the test showed a preference for warmer colored lights that produce less glare than those that were already installed. According to the CLTC, these results are consistent with LED tests at Stanford and in the City of Oceanside where warmer LED lights are favored. Further, warmer LED lighting is recommended by the locally based lighting design firm Benya-Burnett, the firm that provided public comment during the Council's LED streetlight discussion in June 2014. Details about the light test are included in Attachment 1.

With guidance from the CLTC and community feedback, staff has identified a streetlight fixture that is significantly warmer and saves over 30% more energy and GHG emissions than the LED being replaced. Although this fixture was not available from the manufacturer in time to include in the test, it is identical to the most preferred fixture in the City's test except that it is one step warmer. With warmer color tones and less glare, this fixture is considered an improvement by CLTC and Benya-Burnett over the warmest light tested by the City. Although the City was not able to include this fixture in the test, staff agrees with the subject matter experts and supports installation of this warmer LED on Local level streets. Note: there is not a significant cost difference between the two warmest LED fixtures.

In addition to the general preference indicated for a warmer LED and its energy/GHG saving advantages, there will likely be an energy cost advantage, however it cannot be determined at this time because of uncertainty of what the low energy LED tariff (energy rate) will be in the future. For these reasons staff believes a warmer, lower glare cobra head LED should be the standard for the residential areas of the City. This will require the retrofit of approximately 650 LED cobra heads that were previously installed. While it will involve additional costs for LEDs and labor (estimated $325,000 net), its advantages in the long run outweigh the downside of the added costs. Furthermore it would be awkward to address complaints from those who would prefer the warmer LED cobra heads if the current cobra head LEDs are not changed out. In other words, except for those residential sections on arterials and collectors where the cobra head LEDs have been installed, the City standard for residential will be the new, warmer LEDs.

The Arterial and Collector level roadways would continue using the cooler temperature LED cobra head fixtures that have already been installed. In addition, light shields will be used to address specific, localized issues related to light spill into residences. Shields have been installed at

13 locations in various neighborhoods to address specific light spill concerns and have generally been well received. Criteria for their installation will be developed.

Decorative "post top" street lighting and greenbelt/park lighting will also be addressed in the lighting project contract that Council will consider in November. Staff is continuing to work with the City's partners to identify the lighting solution that best balances warmth, cost, design, and energy savings for post top and greenbelt/park lighting. Based on community feedback and expert opinion on the cobra head's, staff believes the warmer LED lighting is also appropriate for the settings where post top and greenbelt/park lighting are located. The final lighting contract will be structured to allow additional research and testing for post top and greenbelt/park lighting.

Attachments

1. Cobra head Streetlight Options Considered

ATTACHMENT 1

Cobrahead Streetlight Options

Retrofit of cobra head streetlights to LED's was approved by Council in January 2014 with installations beginning in May 2014. Community concern over the original LED light fixtures selected for this retrofit lead Council to pause the project in early June 2014. The pause allowed staff, the California Lighting Technology Center (CLTC), and Siemens to order and install test LED streetlights and gather public feedback.

Following the Council's postponement, City staff, Siemens, and the CLTC met to outline an approach to identify and test additional LED streetlights. The objective was to identify lighting fixtures for residential streets with lower glare and warmer colors. The CLTC evaluated and identified possible test fixtures using four criteria:

1. Angle. The angle that the light leaves the fixture.
2. Optic Area. The size of the LED surface area contributes to the intensity of the light produced. Generally, more intense light is produced by higher concentrations of LED's.
3. Color Temperature (warmth). The lower the color temperature, the warmer the light.
4. Lumens. The amount of light produced.

In addition, the CLTC recommended that the test fixtures be run at varying power levels which also affects the light output. Based on these criteria, City staff, Siemens, and the CLTC identified several options to test that are reasonably available from manufacturers.

The test location and period were publicized through a press release, direct contact with residents who had provided comments, and through the City's social media outlets (Facebook/Twitter/Nextdoor).

The test included seven fixtures: 5 new LED and 2 existing LED retrofits. This mix allowed for a direct comparison between the new and existing LED fixtures. The test survey ran from August 13th to August 24th. A total of 124 responses were received through the City's on-line survey.

For the purposes of analysis, survey participants' 1st and 2nd choices for more preferred streetlights are grouped with the 6th and 7th choices grouped as less preferred. Staff notes that residents with concerns about the LED streetlights may have had a greater motivation to participate in the survey. Though this was not intended to be a rigorous survey it does provide an indicator of community preferences for the lights that were installed. The results of the test are summarized below:

Cobra head streetlight test

Preference (From high to low)	Type	Color Temperature (Kelvin)	Watts	Power Amperage (mA)	Test Results % of respondents*
(Preliminary Staff Recommendation)	**Green Cobra Jr**	**2700K**	**19w**	**270mA**	**Not available at the time of testing. Recommendation based on participants' preference for warmer lights and CLTC guidance.**
1	Green Cobra Jr	3000K	19w	270mA	More Preferred: 51% Less Preferred: 18%
2	ECobra	3000K	22w	270mA	More Preferred: 47% Less Preferred: 23%
3	Green Cobra Jr	3000K	24w	350mA	More Preferred: 36% Less Preferred: 19%
4	ECobra	3000K	28w	350mA	More Preferred: 31% Less Preferred: 24%
5	GE	3000K			More Preferred: 22% Less Preferred: 44%
6	ECobra (Existing)	4000K	29w	350mA	More Preferred: 16% Less Preferred: 61%
7	ECobra (Existing)	4000K	29w	350mA	More Preferred: 15% Less Preferred: 66%

* The remaining respondents registered moderate high or low preferences.

As indicated, preferences appear to be driven primarily by color temperature (warmth), wattage, and power. Additionally, the preferred fixture has a more dispersed LED surface area (optic area) and a lower angle cut-off. While staff is not basing its preliminary recommendation solely on the survey, it does indicate that there are factors that influence preference.

Cobra head streetlight options considered

Staff, CLTC, and Siemens considered five options to address warmth and glare issues.

1. Shielding only – Not recommended. Low cost option that addressed specific issues related to light spill but did not address warmth or general glare issues. Staff anticipates that shields will be used in specific instances on an as needed basis but do not provide a comprehensive or consistent solution.

2. Dim existing LED fixtures – Not recommended. This option was tested. As determined by the CLTC and City staff, this option did not result in significant or perceptible changes to warmth or glare.
3. New lower temperature fixtures only on remaining HPS – Not recommended. This option would result in roughly half of Davis neighborhoods with one type of LED fixture and the other half with a different type. Not recommended due to inconsistency of lighting types/level/glare in different neighborhoods.
4. New lower temperature fixtures in all residential areas – **Preliminary Recommendation**. Addresses warmth and glare issues in residential neighborhoods in a consistent manner.
5. Lens to color and diffuse light on all fixtures – Not Recommended. Infeasible – not available on the market.

As noted, light shields are not recommended as a stand-alone solution but can address specific, localized issues related to light spill into residences. Shields have been installed at 13 locations in various neighborhoods to address specific light spill concerns and have generally been well received.