

Key Largo Wastewater Treatment District Board of Commissioners Meeting Agenda Item Summary

Meeting Date:

November 14, 2017

Agenda Item Number: M-1

Agenda Item Type:

Information / Presentation

Agenda Item Scope:

Review / Discussion

Recommended Action:

Action

Department:

Engineering

Sponsor:

Steve Gibbs

Subject:

Disinfection Basin Shade Cover with Solar Panels

Summary of Discussion:

The FY18 budget includes a capital project to cover the disinfection basins structure to reduce loss of chlorine residual do to UV exposure and to reduce algae growth in the basins. The budget includes funds for using solar panels in place of standard awning materials. This will provide the benefits of shade as described, along with the added benefit of producing electricity, which will further reduce operating costs at the WWTP. This item requests authorization to publish a Request for Proposals, which may result in the item coming back for approval by the Board to proceed with construction.

<u>Reviewed / Approved</u>	<u>Financial Impact</u>	<u>Attachments</u>
Operations: _____	\$ 115,000.00	1. Memo from Ed Castle
Administration: _____	Expense	
Finance: _____	Funding Source:	
District Counsel: _____	Rate Revenue	
District Clerk: _____	Budgeted:	
Engineering: _____	Yes	

Approved By: _____

General Manager

Date: _____

11-9-17



MEMORANDUM

To: KLWTD Board
From: Ed Castle, PE
Date: November 8, 2017
Re: Disinfection Basins Shade Cover with Solar Enhancement

The FY18 Capital Projects budget includes funding for covering the disinfection basins to provide protection from the sun. This is beneficial for several reasons. It will:

- Reduce sodium hypochlorite consumption by preventing UV breakdown of hypochlorite to oxygen and chlorides.
- Reduce UV degradation of plastics on top of the disinfection basin, including two autosamplers and PVC conduit.
- Limit growth of algae, reducing labor for cleaning and use of shock treatments of sodium hypochlorite.

It is difficult to estimate the reduction in use of sodium hypochlorite. At noon with a clear sky, the half-life of hypochlorite at the surface of the water is about 12 minutes. This means that the chlorine residual will reduce by 50% for every 12 minutes it is exposed to the sun. Since we have approximately 45 minutes of detention time on average, the chlorine residual would drop to approximately 6.25% of what it was at the point of injection. For example, if we had a chlorine residual of 10 mg/l, it would be reduced to 0.6 mg/l by the time it reached the end of the basin.

Based on the above information, 94% of the free chlorine residual is lost to UV degradation. But that rate of degradation only takes place on the surface of the water, and when the sun is high in the sky. To estimate the actual degradation of chlorine residual, the KWLTD staff covered one side of the CCCs and left the other side exposed to the sun. They then measured the chlorine residuals in both CCCs from 7:00 AM to 3:00 PM. The data collected shows that on average, 70.3% of the free chlorine was destroyed by UV degradation by the time it reached the end of the CCC. This rate of degradation would take place from approximately 9:30 AM to 4:30 PM.

Using the above data, calculations show that providing shade to reduce UV degradation of chlorine would reduce the use of sodium hypochlorite by approximately 20.5%. However, it is not clear every day. According to weather statistics, Key Largo has an

average of 256 sunny days per year. Adjusted for cloudy weather, the estimated reduction in sodium hypochlorite use becomes 14.4%.

The budget for sodium hypochlorite for FY18 is \$87,500. Providing shade should reduce the chlorine demand by 14.4%. This reduction in the feed rate of sodium hypochlorite would result in an annual savings of approximately \$12,600.

The FY18 budget includes an expense for providing a frame and fabric covers for the CCCs of \$60,000. That budget figure was based on a WEC estimate. The WEC cost estimate for a similar structure but covered with solar panels is \$115,000, as budgeted for FY18.

The incremental increase in cost for providing solar panels in lieu of fabric is \$55,000. The 3,500 square foot solar array will produce an annual average of 210 kWhr per day. At the current cost of power of \$0.11 per kWhr, the electricity produced by the CCC solar panels would save approximately \$8,432 per year. The estimated payback on the investment would be 6.5 years.

Modern solar panels have a useful life in excess of 25 years. Some manufacturers offer a warranty on output from the panes for 25 years, guaranteeing that the production of electricity will not decrease.

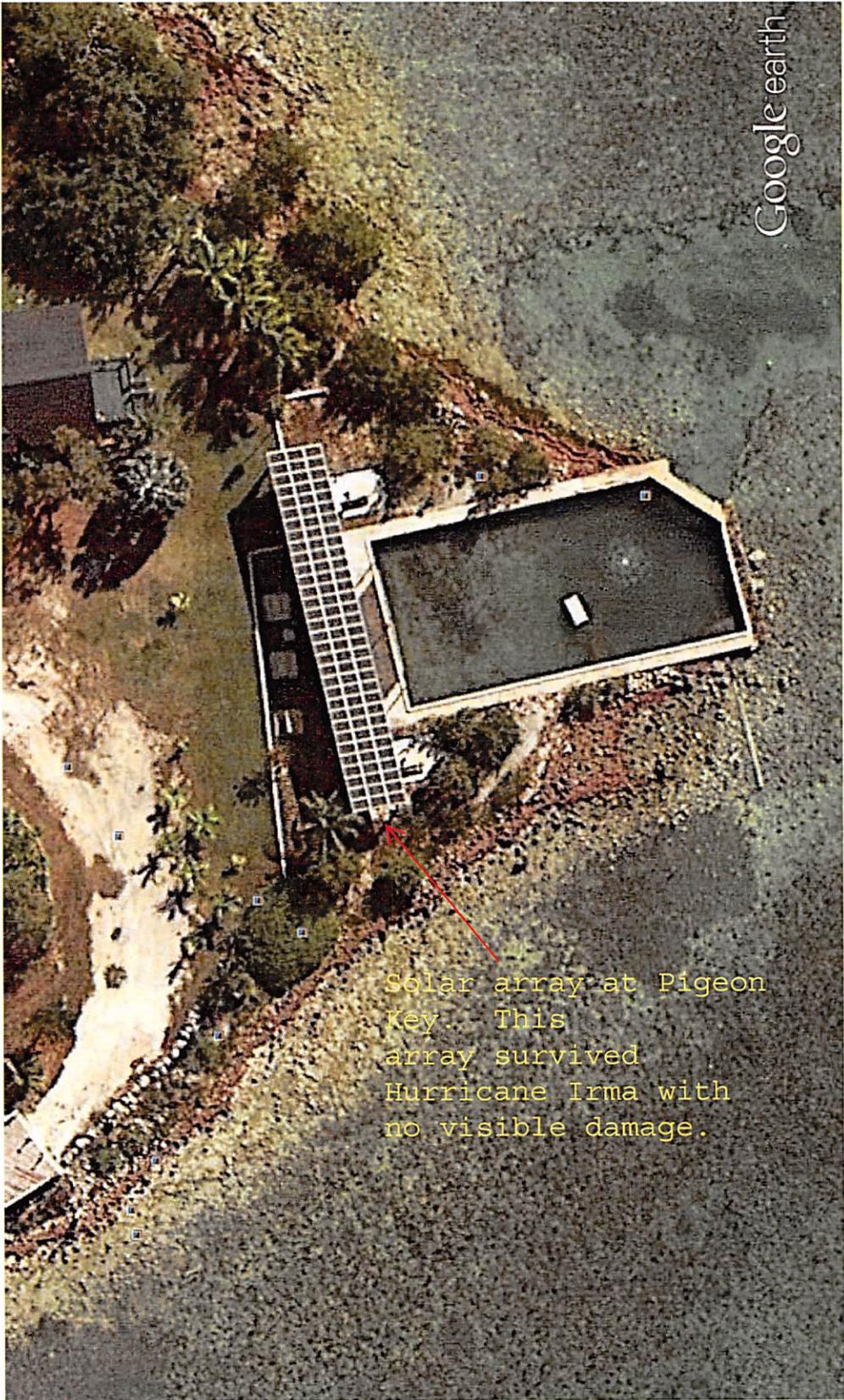
In summary, the benefits of providing a CCC shade covering using solar panels include:

- The same reduction in feed of sodium hypochlorite will be achieved, reducing the annual chemical expense by approximately **\$12,600**
- The incremental increase in cost is only \$55,000
- The payback period for that \$55,000 is only **6.5 years**, after which an annual savings in electricity of \$8,432 will be realized
- The solar panels have a useful file of **25 years**, compared with only 5 years for fabric
- The net savings in electricity over the 25 years will be **\$155,992**



Location of
proposed
solar shade

Google earth



Solar array at Pigeon Key. This array survived Hurricane Irma with no visible damage.