

ITEM#: 14
DATE: 08-22-23
DEPT: ELECTRIC

COUNCIL ACTION FORM

SUBJECT: RAPID NEEDS PURCHASE FOR UNIT 8 TURBINE REPAIR

BACKGROUND:

On May 11, 2023, Unit 8 turbine experienced a high vibration event causing the unit to automatically shutdown to prevent the possibility of further damage. Power Plant staff conducted an in-depth investigation along with an engineer from General Electric (GE) to help troubleshoot, but was unable to determine the issue for the vibration. Staff and GE determined it would be best to bring in a turbine specialist company to inspect the turbine, starting with the bearings. Bladerunner is the company that last performed the turbine/generator overhaul on Unit 8, and they have also performed an overhaul on Unit 7 as well as two other turbine/generator related projects in the past.

City staff decided to implement a rapid needs purchase for the repair of the turbine and Bladerunner was provided a PO. Per the *Purchasing Policies & Procedures* a "rapid-need situation" occurs when materials and/or services could not have been predicted and must be procured in less than the normal allotted time in order to continue a service to the public". The original scope was estimated at \$42,500. The City's *Purchasing Policies & Procedures* state that "if the cost of purchases related to [an] emergency or rapid need is \$50,000 or more, the using department shall maintain records" of the expenditure. It further states that the using department "shall report the situation and related expenses to the City Manager for presentation to the City Council. The report shall be in a format as directed by the City Manager."

Following the authorization of this "Rapid Needs" purchase by the City Manager's Office, a purchase order was issued to Blade Runner Turbomachinery Services LLC of Navasota, TX in the amount of \$42,500 to open the turbine casing and inspect the unit.

There were three change orders to the purchase order.

CHANGE ORDER NO. 1:

After removing bearings and performing inspections, there still was no evidence to the cause of the vibration. The other possible sources of the vibration included the shaft seals, loose turbine blade(s), and/or a diaphragm. All of these parts were located within the turbine casing which had to be opened in order for another inspection to take place. Once the turbine casing was opened, damaged sections were found. It appeared that a small piece of metal (called a "button," about the size of a dime) broke off one of the front stages of the rotor assembly while the turbine was operating. The button holds each fan blade in place by connecting the blade's tip to several adjacent blade tips. The broken button impacted at least two stages of turbine blades and one diaphragm (a set of stationary blades that adjusts the steam path between rotor stages). As a result of this finding, the rotor was loaded onto a truck and transported to

a turbine shop called Power Plant Services (PPS), to be cleaned and tested using non-destructive evaluation methods to determine if additional damage had taken place.

Change Order No. 1 was to remove the Unit 8 turbine case and rotor, transport the rotor, and perform inspection in a turbine shop in the amount of \$34,600 was approved through the City Manager's Office.

CHANGE ORDER NO. 2:

The rotor underwent three separate forms of non-destructive evaluation. The testing indicated that some of the blade sections impacted by the button needed to be dressed, blended, and straightened, but not replaced. Some of the shaft seals needed to be replaced.

When blades are installed, they are slid into a keyhole and rotated around the shaft to their appropriate position, one-by-one. The process of setting the blades in position does not allow them to be removed without destroying them. The blade with the broken button was located 180 degrees opposite of the keyhole, which meant that 45 blades (half of the blades on this section) had to be removed and replaced to get to the blade with the broken button. Replacement blades needed to be custom fabricated, based on detailed measurements of the profile of the existing blades. **After considering three different alternatives to accomplish the blade manufacturing and assembly, staff approved Change Order No. 2 in the amount of \$299,800 to install 45 replacement blades, repair blades in two other sections, replace the shaft seals, and perform final balance testing.**

CHANGE ORDER NO. 3

While removing the 45 blades, a second blade with a detached button was identified. This second damaged blade is next to the blade that originally had a failed button. It is possible that when these blades were installed a few years ago, the installation process caused some blades to weaken. Therefore, PPS was concerned about the integrity of the remaining blades in the same row. Instead of replacing just half the blades as originally planned, PPS strongly recommended replacing all the blades in this stage of the turbine. PPS was not concerned with the blades in other turbine stages because they were made of a softer alloy; these blades would therefore have been "more forgiving" during the installation process. In addition, the other stages of the turbine passed all diagnostic testing that was undertaken when the turbine arrived at the shop. **Change Order No. 3 in the amount of \$35,000 was issued to replace the extra blades.**

The total of these costs to repair the Unit 8 Turbine was \$411,900. The necessary repairs are now complete, and the Unit 8 turbine has been returned to service. The repair costs have been paid from both the Electric Production Operations and Maintenance budget as well as advancing funds from the Capital Improvement Plan for Unit 8 minor and major turbine overhauls.

ALTERNATIVES:

1. Approve the report of the rapid needs purchase for repairs to the Unit 8 turbine.
2. Refer this item to staff for further information.

CITY MANAGER'S RECOMMENDED ACTION:

To restore reliable electric service to the City's customers in the quickest manner possible the use of a rapid needs purchase was required. Repairs have been completed to critical electric infrastructure through this process and this report to the City Council is fulfilling the Purchasing requirements of the rapid needs purchase. Therefore, it is the recommendation of the City Manager that the City Council adopt Alternative No. 1.