

**COUNCIL ACTION FORM**

**SUBJECT: POWER PLANT FUEL CONVERSION – DISTRIBUTED CONTROL SYSTEM (DCS) - CHANGE ORDER NO. 4**

**BACKGROUND:**

In November of 2013 the City Council decided to convert the City's Power Plant from coal to natural gas. In May of 2014 the City Council selected Sargent & Lundy of Chicago, Illinois, to provide engineering and construction oversight services for the conversion project.

On March 10, 2015, City Council awarded a contract to Emerson Process Management Power & Water Solutions, Inc., Pittsburgh, PA, for the Distributed Control System (DCS) in the amount of \$1,595,000.

**The action being requested is to approve Change Order No. 4 to the Distributed Control System Contract and the transfer of monies from the Electric Fund balance to increase the contingency for the Power Plant Conversion Project.**

**Description of Change Order No. 4:**

This Change Order is to provide additional Field Service support for the installation, testing, troubleshooting, and startup of Emerson's Ovation distributed control system (DCS), and also to adjust and modify (tune) the DCS to optimize the performance of the units while burning natural gas and co-firing refuse derived fuel (RDF). Emerson's bid proposal allotted (72) days of Technical Direction time, \$14,250 of expenses, and (6) round trips, plus (22) days of Boiler Tuning time, \$10,000 of expenses, and (4) round trips.

Power plant conversions to switch fuels, in the case of coal to natural gas, typically consists of constructing the gas piping infrastructure and installing the control equipment necessary to bring natural gas into the plant, along with changing out the boiler's coal combustion equipment and replacing it with natural gas combustion equipment. The allotted time/expenses in Emerson's bid proposal appeared adequate for this level of work.

However, staff has found that the City's project is much, much more complex than that. As part of our project to convert the City of Ames Steam Electric Plant (Units 7 & 8) from coal to natural gas, the City additionally and concurrently developed and installed a new distributed control system (DCS), built a new control room and DCS equipment room, and retrofitted the turbine-generators with digital controls and excitation systems (plus installed a new steam seal regulating system for Unit 8). In addition to all that, the City took eight (8) other power plant systems controlled by programmable logic controllers

(PLCs) and converted them to be controlled by the DCS. These PLC systems had been developed “in house” and were not well documented; in some cases not at all, and the personnel who either had developed or had key knowledge of the systems were no longer available.

In order to successfully start-up, test, and tune the natural gas delivery system and the boiler combustion equipment, the DCS system and the turbine-generator controls and excitation systems must operate in an integrated and synchronous way with the boiler(s). To get to the point where the boilers, the turbine-generators, the DCS, (along with the other systems), operate well together, requires a tremendous amount of coordinated effort to complete literally thousands of equipment and system checks, including troubleshooting and correcting problems along the way. Adding to this challenge was the testing and tuning to optimize the burning of RDF, which the City’s Steam Electric Plant is believed to be the only Power Plant in the United States to co-fire RDF with natural gas.

**As such, an additional \$326,067.31 is needed in this change order to pay for the extra Technical Direction time required to bridge the gap between the DCS system and the 8 systems which were converted. Also, a greater amount of Boiler Tuning time was needed due to the complexities of burning RDF with the natural gas.**

#### **CHANGE ORDER HISTORY:**

Three change orders have previously been issued for this project.

**Change Order No. 1** for \$39,377.00 was for Emerson to provide engineering, hardware, software, and on-site technical direction associated with adding the new Well #3 RTU I/O, the Bottom Ash Operator Workstation, and the RFD Operator Workstation.

**Change Order No. 2** for \$12,611 was for Emerson to supply, install, and configure five pulse accumulator modules.

**Change Order No. 3** for \$0 was for clarifying that the equipment purchased under this contract is considered personal tangible property, and is therefore exempt from Iowa sales tax.

**The total cost of all change orders, including this Change Order (No. 4), is \$378,055.31.**

#### **PROJECT COST HISTORY:**

**The Engineer’s estimate of the cost for this portion of the Power Plant Conversion Project was \$1,161,000. The original contract for this work came in at \$1,543,012. With this change order, the total cost for the Distributed Control System Contract will increase to \$1,973,055.31.**

Overall, the total project dollar amount committed to date (inclusive of this Change Order No. 4) is \$18,285,326.33. The current approved Capital Improvements Plan includes \$18,112,011 for the Unit 7 and Unit 8 fuel conversion project.

This Change Order will cause the existing project budget to go negative by \$173,316. To cover this shortfall, and to maintain a small balance to cover a few remaining Change Orders, staff recommends the following utilizing the \$361,000 of replacement funds that were accumulated for a coal dozer, front end loader, and water truck, which are no longer needed due to the conversion of the Power Plant to natural gas. These accumulated funds were recently added to the balance in the Electric Fund and are available for re-appropriation.

Therefore, with the approval of this change order staff is recommending that the \$361,000 be transferred to this project budget. The proposed new project budget starts on page 4 of this Council Action Form.

Going forward, staff anticipates a few additional change orders. Most contracts with the contractors regarding the conversion project are done and awaiting retainage payments or closed completely. There is some work yet to be done in the control room, and some additional tuning of the boiler is needed to improve the boiler operation with RDF. Staff expects the remaining project balance to cover this future work.

#### **ALTERNATIVES:**

- 1a. Approve the transfer of \$361,000 from the available balance in the Electric Fund to the Power Plant Conversion project.
- 1b. Approve contract Change Order No. 4 with Emerson Process Management Power & Water Solutions, Inc., Pittsburgh, PA, for the Distributed Control System in the amount of \$326,067.31.
2. Reject contract Change Order No. 4.

#### **MANAGER'S RECOMMENDED ACTION:**

The Power Plant's existing Distributed Control System was over 14 years old, and is no longer supported by the manufacturer. An exhaustive study of the Power Plant's DCS system by Sargent & Lundy, our consulting engineering firm for the conversion project, showed that the existing DCS could not be reasonably upgraded and needed to be wholly replaced. This change order with Emerson is needed to extend the technical direction so that the DCS system can properly communicate with the other critical Power Plant systems, and improve the operation of the boiler.

Therefore, it is the recommendation of the City Manager that the City Council adopt Alternative No. 1 as stated above.

## **POWER PLANT CONVERSION PROJECT BUDGET**

The overall project budget and commitments to date are summarized below. To date, the project budget has the following items encumbered:

<b>\$18,112,011</b>	<b>Current Project Budget</b>
	<u>Sargent &amp; Lundy, LLC</u>
\$1,995,000	Encumbered not-to-exceed amount for Engineering Services
\$2,395,000	Engineering Services Contract Change Order No. 1
\$174,000	Engineering Services Contract Change Order No. 2
\$154,000	Engineering Services Contract Change Order No. 3
	<u>GE Power Inc.</u>
\$3,355,300	Contract cost for Natural Gas Conversion Equipment
\$29,869	Equipment Contract Change Order No. 1
(-\$321,600)	Equipment Contract Change Order No. 2
(-\$51,000)	Equipment Contract Change Order No. 3
\$1,620	Equipment Contract Change Order No. 4
\$0	Equipment Contract Change Order No. 5
\$32,679	Equipment Contract Change Order No. 6
\$62,310	Equipment Contract Change Order No. 7
\$121,360	Equipment Contract Change Order No. 8
	<u>Emerson Process Management Power &amp; Water Solutions, Inc.</u>
\$1,595,000	Contract cost for DCS equipment
\$39,377	DCS Contract Change Order No. 1
\$12,611	DCS Contract Change Order No. 2
\$0	DCS Contract Change Order No. 3
<b>\$326,067.31</b>	<b>DCS Contract Change Order No. 4</b>
	<u>GE Energy Control Solutions, Inc.</u>
\$814,920	Contract cost for TCS equipment Bid 1
\$244,731	TCS Bid 1 Contract Change Order No. 1
\$34,000	TCS Bid 1 Contract Change Order No. 2
\$0	TCS Bid 1 Contract Change Order No. 3
\$16,854	TCS Bid 1 Contract Change Order No. 4
\$41,760	TCS Bid 1 Contract Change Order No. 5
	<u>General Electric International, Inc.</u>
\$186,320	Contract Cost for Turbine Steam Seal System - TCS Bid 2
\$24,536	TCS Bid 2 Contract Change Order No. 1

\$150,000	TCS Bid 2 Contract Change Order No. 2
\$0	TCS Bid 2 Contract Change Order No. 3
\$9,208.42	TCS Bid 2 Contract Change Order No. 4
	<u>Henkel Construction Co.</u>
\$898,800	Contract cost for Control Room Installation General Work Contract
\$66,782	Control Room Contract Change Order No. 1
\$17,683.54	Control Room Contract Change Order No. 2
	<u>TEI Construction Services, Inc.</u>
\$1,572,019	Contract cost for Mechanical Installation General Work Contract
\$8,750	Mechanical Contract Change Order No. 1
\$156,131	Mechanical Contract Change Order No. 2
\$187,984	Mechanical Contract Change Order No. 3
\$9,785.37	Mechanical Contract Change Order No. 4
\$3,032.17	Mechanical Contract Change Order No. 5
\$7,725.98	Mechanical Contract Change Order No. 6
\$3,032.16	Mechanical Contract Change Order No. 7
\$21,673.58	Mechanical Contract Change Order No. 8
\$175,496.89	Mechanical Contract Change Order No. 9
\$48,486.22	Mechanical Contract Change Order No. 10
\$12,539.88	Mechanical Contract Change Order No. 11
	<u>FPD Power Development, LLC</u>
\$3,145,149	Contract cost for Electrical Installation General Work Contract
\$12,044.24	Electrical Contract Change Order No. 1
\$41,265.65	Electrical Contract Change Order No. 2
\$123,893.91	Electrical Contract Change Order No. 3
\$64,743.87	Electrical Contract Change Order No. 4
	<u>Graybar Electric</u>
\$98,560	Contract cost for UPS System
(-\$1,010)	UPS System Contract Change Order No. 1
	<u>Hertz Equipment Rental Corporation</u>
<u>\$166,835.50</u>	Contract cost for Portable Electric Space Heaters
<b>\$18,285,326.33</b>	<b>Costs committed to date for conversion</b>

(\$173,315.67)	Existing Project Balance
<b>\$361,000</b>	Transfer of additional funds from Electric Fund Available Balance
<b>\$187,684.33</b>	<b>New Project Balance</b> to cover miscellaneous equipment and modifications to the power plant needed for the fuel conversion