CITY OF
HAYWARD
HEART OF THE BAY

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DATE: June 1, 2010

TO: Mayor and City Council

FROM: Director of Public Works

SUBJECT: Authorization for the City Manager to Execute a Professional Services Agreement to Perform Preliminary Engineering Investigation and to Prepare Design-Build Proposals to Upgrade the Co-generation System at the Water Pollution Control Facility

RECOMMENDATION

That Council adopts the attached resolution authorizing the City Manager to execute a Professional Services Agreement with Carollo Engineers to perform preliminary engineering investigation and to prepare a Request for Proposals (RFP) to upgrade the co-generation system at the Water Pollution Control Facility (WPCF), in an amount not to exceed $250,000.

BACKGROUND

As part of the treatment process at the WPCF, bio-gasses are generated and captured. There are three options for disposing of the digester gasses: discharge it to the atmosphere, flare it off (i.e., burn it off), or use it as fuel. Methane, a major component of digester gas, is considered a renewable resource that can be used as a fuel. As other wastewater treatment plants in the Bay Area have done for many years, the WPCF has utilized methane to fuel internal combustion engines to provide electric power. Co-generated power, named for simultaneous generation of electric power and heat, has proven to significantly reduce the need for electric power that would otherwise be purchased from PG&E. Additionally, bio-gas is a potent green house gas; releasing it into the atmosphere is contrary to the City's policies, including the Climate Action Plan.

The existing co-generation engines at the WPCF were purchased and installed in 1981, and have undergone numerous rebuilds over the years. Emission control technology used at that time is now considered to be out-dated and unacceptable. Installation of emission control systems that meet the requirement of the Bay Area Air Quality Management District (BAAQMD) has caused the efficiency rating to be degraded to around 20%, a very low value. In addition, BAAQMD regulations regarding air emissions have become exceedingly stringent, and the existing co-generation emission technology currently used will not meet regulatory permit limits in 2011 and beyond.

The WPCF is the largest energy using entity owned by the City. Annually, the City purchases from PG&E about 6,300,000 kilowatt hours (kWh) of electric energy to operate the treatment plant, at a cost of about $700,000. Co-generation of electric power at the WPCF is used to offset additional energy that otherwise would be purchased from PG&E. In 2009, approximately 2,600,000 kWh were offset by co-generation, realizing a savings of about $338,000 in energy costs.

A new One-Megawatt solar collector system scheduled for construction this summer at the WPCF is anticipated to provide about 1,900,000 kWh of electric energy annually. By improving the production of co-generated energy, more solar energy will be available for sale to PG&E. Energy costs are highest during periods of high-demand on the PG&E grid, which is during the summer months and during the midday. Midday is also the period of maximum solar generation and is the opportune time for the City to sell to PG&E the solar power in excess of the treatment plant's needs. Solar power sales can be maximized when the price of energy is highest by improving co-generation output.

Staff is preparing plans to construct a receiving station at the WPCF to accept waste fats, oils, and greases (FOG). These constituents are the principal waste source for generation of bio-gas. The projected amount of increased gas production from FOG processing is difficult to estimate at this time, as it is related to the amount of FOG delivery and energy content of the waste greases. It is hoped that the receiving station project can yield up to 20% more bio-gas.

DISCUSSION

Staff has researched and reviewed the current technologies available for co-generation of energy and has decided to focus on two: Internal combustion engines (ICE) and Fuel Cells (FC).

Internal Combustion Engines- Internal combustion engines have existed at the WPCF for about thirty years. It is the tried and true classic technology for co-generation. The concern with ICE is that it is not as low in emissions as other options and may not be able to meet ever decreasing emission levels required by the BAAQMD.

Fuel Cells-A fuel cell is an electro-chemical cell that generates electricity by converting fuel, typically natural gas, into electrical current. Utilization of bio-gas, which is inferior to natural gas in purity and energy content, is a relatively new application for fuel cell co-generation technology, but it has been successfully employed at some wastewater treatment plants in California to varying degrees of success. Staff has visited several of these sites and learned that fuel cells are very sensitive to their operational environments. One key to successful implementation of fuel cell technology is to adequately address bio- gas quantities and constituencies. Staff is currently implementing measures to define digester gas quantities now being generated along with gas characteristics, such as energy value. The advantages of using FC include its higher efficiency and much lower emissions.

Consultant Selection-Four engineer consulting firms who have experience in developing co-generation projects using digester gas were invited to submit proposals to assist City staff in this endeavor. One firm indicated they would be interested only as a contractor in the design-build

phase of development. Two other firms declined to respond with proposals. The fourth firm, Carollo Engineers, did submit a proposal. Staff has reviewed the Carollo proposal and has determined that it addresses the key issues in the RFP, and that they also possess the expertise and experience to achieve the City's co-generation goals.

Request for Proposals for Design-Build Project-Staff has determined that the best method of selection for an appropriate upgrade for the co-generation system is to invite proposals from firms with experience developing electric power generation using digester gas. Staff has also determined that savings can be realized in costs and in time by utilizing a design-build process. A design-build Request for Proposals (RFP) will include requirements for appropriate bio-gas treatment processes (called gas conditioning) to remove contaminants that otherwise will cause premature failure for either option, but particularly for the fuel cells. Heat recovery from either option has been and will continue to be used to heat bio-solids to temperatures that ensure optimal gas production. Evaluation of existing heat recovery components will be performed by Carollo Engineers during the preparation of the design-build RFP.

Another design consideration is electrical interconnection between co-generation units and electric power distribution at the WPCF. Continued use of existing electrical facilities under either option will be considered, but is expected to be more practical for the ICE option. During development of the design-build RFP, Carollo Engineers will evaluate existing electrical facilities and the existing structure.

It is anticipated that Carollo will provide basic drawings and specifications to a level that will protect the City's interest in the design-build process, at about 30% completion. The documents will also define critical components and material specifications. A bid structure must be included in the design-build RFP to allow a reasonable comparison of the two options that include attendant selection criteria.

The RFP willalso address air quality issues to define what technology will be demanded in the design-build RFP for the ICE option. Emission standards in the near, and particularly the longer term, future are nebulous. To make a fair comparison between the options, provisions must be made for retrofit technologies for the ICE option. Such decisions will be made with professional assistance from Carollo Engineers. A Fuel Cell, on the other hand, essentially has no issues with BAAQMD regulations, as it produces no nitrogen oxide emissions.

ECONOMIC IMPACT

The estimated project costs are as follows:

Consultant Services	$ 250,000
Co-generation construction*	6,700,000
Digester gas analysis	50,000
Administration	100,000
Construction Management and Inspection	50,000
Total:	$7,150,000

*A current rebate from PG&E, Self Generation Incentive Program (SGIP) program is included in the anticipated development cost for fuel cells.

Cost savings will be a result of increased co-generation efficiency (how well the bio-gas energy is converted to useful electric energy). Currently, ICE efficiencies are around 36% for new engines and Fuel Cells are around 47%. These can be compared to the current ICE efficiency of around 20%. The total energy produced by co-generation at the WPCF in 2009 was 2,600,000 kWh. Thus, the ICE option would realize an increase of about 2,080,000 kWh and the Fuel Cells about 3,510,000 kWh. The average annual cost for PG&E energy and demand charges at the WPCF is about $0.13 per kWh. The expected annual savings are $270,000 for the ICE option and $456,000 for the Fuel Cell option.

There are other monetary factors unique to each option. For example, for the ICE option, the improved gas conditioning will decrease the frequency of costly engine overhauls. With the Fuel Cell option, less heat energy will be available for heating bio-solids that would likely require additional purchase of natural gas from PG&E for boiler operation.

The monetary benefit accruing from FOG cannot be defined at this time, but if a 20% increase in digester gas is realized, this would equate to an energy cost savings of $54,000 for the ICE option and $90,000 for the Fuel Cell option.

FISCAL IMPACT

The FY 2010 Capital Improvement Program (CIP) includes $1,600,000 in the Water Pollution Control Replacement Fund for Co-generation System Alternative and Implementation, which provides sufficient funding for the proposed professional services agreement. This project was developed to explore co-generation alternatives, cost-benefit analyses, and options for implementing the selected alternative. As described earlier in the report, the total cost estimate for constructing the project will in the neighborhood of $7 million, assuming FC option (and somewhat more for ICE option). The recommended FY 2011 CIP includes funding for the design-build project.

PUBLIC CONTACT

No additional public contact is planned for the project. All work will be done inside the WPCF boundary, which is located in an industrial or commercial area. There will be no impact on the neighbors or the public.

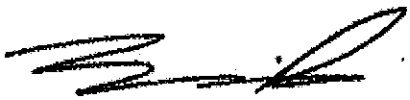
SCHEDULE

Complete Design-Build RFP	September 2010
Receive Design-Build Proposals	November 2010
Award Design-Build Contract	January 4, 2011
Begin Construction	January 2011
End Construction	March 2012

Prepared by: Alex Ameri, Deputy Director of Public Works

Recommended by: Robert A. Bauman, Director of Public Works

Approved by:



Fran David, City Manager

Attachments:

Attachment I - Resolution

DRAFT

HAYWARD CITY COUNCIL

RESOLUTION NO 10-_____

Introduced by Council Member _____

RESOLUTION AUTHORIZING THE CITY MANAGER TO NEGOTIATE AND EXECUTE A PROFESSIONAL SERVICES AGREEMENT WITH CAROLLO ENGINEERS TO PERFORM PRELIMINARY ENGINEERING INVESTIGATION AND TO PREPARE DESIGN-BUILD PROPOSALS TO UPGRADE THE CO-GENERATION SYSTEM AT THE WATER POLLUTION CONTROL FACILITY, PROJECT NO. 7651

WHEREAS, the Water Pollution Control Facility (WPCF) generates electric energy on site (co-generation) that provides about 30 percent of the total WPCF electric energy needs using renewable bio-gas as engine fuel; and

WHEREAS, the existing co-generation equipment is obsolete and the co-generators operate at low efficiency; and

WHEREAS, Bay Area Air Quality Management District regulations have tightened air quality emission standards and the existing co-generation emission technology may not meet projected regulatory permit limits in 2011.

WHEREAS, staff has determined that using a design-build process to procure the co-generation upgrade that will consider internal combustion engines or fuel cells would best serve the City's interest; and

WHEREAS, preparation of a request for proposals to contract with a design-build firm will require the services of a qualified, experienced consulting engineer.

NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of Hayward that the City Manager is authorized to negotiate and execute a Professional Services Agreement with Carollo Engineers to assist the City in preparing a design-build Request for Proposals, to assist the City in choosing a qualified design-build contractor, and to assist the City during the construction phase of the Co-Generation System – Alternative and Implementation

Project, Project No. 7651, in an amount not to exceed $250,000 in a form to be approved by the City Attorney.

BE IT FURTHER RESOLVED, that the City Manager is also hereby authorized and empowered to execute all necessary documents to implement and carry out the purpose of this resolution, and to undertake all actions necessary to take and complete the co-generation system project.

IN COUNCIL HAYWARD CALIFORNIA 2010:

ADOPTED BY THE FOLLOWING VOTE:

AYES COUNCIL MEMBERS:

NOES COUNCIL MEMBERS:

ABSTAIN COUNCIL MEMBERS:

ABSENT COUNCIL MEMBERS:

ATTEST:_____
City Clerk of the City of Hayward

APPROVED AS TO FORM:

_____
City Attorney of the City of Hayward