LTP LEE T. PURCELL ASSOCIATES

Lee T. Purcell (1903-1981)
Lee T. Purcell, Jr., P.E., P.P., D.E.E.
Fenton P. Purcell, P.E., P.P., D.E.E.

Consulting Engineers

Jerome Watman, P.E., P.P.
James C. Demitriou, P.E.
John G. Black, P.E.

353C ROUTE 46 WEST • SUITE 240 • FAIRFIELD, NEW JERSEY 07004
TEL.: 973/227-7200 • FAX: 973/227-7255 • E-MAIL: fenton@ltpa.com
INTERNET: http://www.LTPA.com

May 11, 2010

Mr. Shadab Ahmad, Section Chief
Municipal Finance and Construction
N.J. Dept. of Environmental Protection
Division of Water Quality
PO Box 425
Trenton, NJ 08625-0425

Re: NJDEP Project No. S340384-07
NJDEP Priority List No. 1 (FY2010)
Justification for "Green Project Reserve"
MSA Construction Contract Nos. 225 and 235

Dear Shadab,

In accordance with your request, we have made a specific study of the above-referenced construction contracts to determine what "Positive Impacts" the implementation of these contracts will have in terms of Energy, Efficiency and Savings. The following findings are presented:

CONTRACT 225 - REPLACEMENT OF OUTDATED VFDs AT THE WATER POLLUTION CONTROL PLANT

For Contract 225, we have reviewed all of the existing equipment that was designed to work at varying speeds in order to accommodate the varying flow. An analysis of the tasks of each of these pieces of equipment, including the overall electrical efficiencies, electrical momentary overload capabilities, and susceptibility to electrical transient voltage damage. In general, as a large portion of the plant is designed with the capability of matching influent flow with process treatment capability, it became apparent that although the best of available equipment had been installed during construction, overall plant efficiency was no longer meeting the best of "Green Power" standards. Today, electrical equipment designed with "Green Power" capabilities are currently available, and a higher overall operating efficiency is obtainable. This means that the same amount of wastewater process required for "Clean Water" production can be obtained with the use of a smaller amount of electrical power, and therefor results in a saving in electrical costs and the resultant improvement in air quality.

In a review of published data for the Variable Frequency Drives now in use, a steadily increasing rated efficiency is found. From an efficiency of 88 percent in the 1980s, units with an efficiency of greater than 96% are now available. Based on an 88% efficiency for the equipment that is now in operation, it can be seen that if this equipment were to be replaced with drives with an average of 96%, that 8% of the total energy that is required

for the variable speed operation is being needlessly wasted in heat rather than productive operation. An increase of 8% efficiency, indicates that this is a worthwhile Green Power energy saving achievement. There are currently 54 motors operating at the plant under variable speed control. The total horsepower of these motors is 631, and NEC rated at 826 amperes at full load.

Not all motors operate at the same time, and all of them are not operating at full speed at all times. Averaging peak and low flow conditions into a 70% operational load, the average VFD load in amperes for water treatment will be 826 x 0.7 or 578 amperes, continuous. Electrical power is billed in kilowatt hours plus a monthly maximum demand charge. The energy saving that would accrue by virtue of replacement of the existing VFD's with the newest technology would be (578x3x480/1.73)0.8=38.5kW. At today's power costs, this would save 38.5x$8.13 per month or $313.00 in demand charge, and (38.5x24x30)($0.11kW/hr = $3,049.20 kWH costs. Thus the yearly total of reduced energy costs would be ($313.00 + $3,049.20)(12), or $40,344 yearly. Over the expected useful life of the proposed Variable Frequency Drives of 20 years, the savings would amount to $40,344 annually x 20 years, or $806,880. This savings meets Part B, Section II, 4, as an Energy Efficiency Improvement under the Green Project Reserve Guidance for Determining Project Eligibility.

Equating the above to electrical energy savings results in the following:

a) 27,720 kW per month
b) 332,640 kW per year
c) 6,652,800 kW over 20 years

The estimated construction cost for Contract No. 225 - Replacement of Outdated VFDs at the Water Pollution Control Plant is $744,000. This construction contract is a 100% "Green Project" or $744,000.

CONTRACT 235 - REHABILITATE SODA ASH SYSTEMS AT THE WATER POLLUTION CONTROL PLANT

The efficiencies for Variable Frequency Drives have increased for the two (2) soda ash solution pumps (one (1) for each soda ash system) originally installed in the 1990s, and now contemplated to be replaced in 2010 from 88% to 96%. This results in an increase in efficiency of 8%. The total rated amperes at full load amounts to 10.4 amperes for two (2) pumps.

The operating time for each of the two (2) motors for the soda ash systems using an average of 70% operation continuous, the average VFD load in amperes will be 10.4 amperes x 0.70 or 7.3 amperes continuous. Electrical power is billed in kilowatt hours plus a monthly maximum demand charge. The energy savings that would be realized by virtue of replacement of the existing VFDs for the soda ash solution pumps with the more efficient

VFDs would be:

(7.3 amperes x 3 x 240/1.73)(0.08) = 0.24 kW

At present day utility company power costs, this would save 0.24 kW x $8.13 per month or $1.95 in demand charge, and (0.24 kW x 24 x 30)(0.11/kWh) = $19.01 kWh monthly cost. Therefore, the yearly total of reduced energy costs would be ($1.95 + $19.01)(12) = $251.52. Over the expected useful life of the proposed Variable Frequency Drives of 20 years, the savings would amount to $251.52 x 20 years or $5,030.

Equating the above to electrical energy savings results in the following:

a) 173 kW per month
b) 2076 kW per year
c) 41,520 kW over 20 years

The estimated construction cost of Contract No. 235 - Rehabilitate Soda Ash Systems is $60,000. The "Green" portion of this contract is 30% or $18,000.

We trust you will find the above information sufficient to classify these two (2) construction contracts as "Green Projects".

Should you have any questions, regarding this submission, please call me.

Very truly yours,

LEE T. PURCELL ASSOCIATES

Leo T. Purcell, Jr., P.E., D.E.E.
Principal

LTPjr/as
c: Musconetcong Sewerage Authority
Stanley V. Cach, P.E., Assistant Director, MFC, NJDEP
Eugene Chebra, P.E., Bureau Chief, BAM, MFC, NJDEP
Maryclaire D'Andrea, Acting Executive Director, NJEIT