



1016 24th Avenue NW
Norman, OK 73069

TEL 405.329.2555
FAX 405.329.3555

www.GarverUSA.com

TECHNICAL MEMORANDUM

To: City of Davis
Attn: Roger Pulley, City Manager
From: Scott Zotti, PE
RE: Davis Water Treatment Plant Improvements
DWSRF Green Reserve Program

Date: December 7, 2011

Purpose

The purpose of the Technical Memorandum (TM) is to document the energy savings of selected equipment for proposed improvements for the Davis Water Treatment Plant Improvements project. This project has applied for and is slated to receive funding through the Drinking Water State Revolving Fund (DWSRF) loan assistance program. A recent initiative of the DWSRF program is the Green Project Reserve (GPR) fund, which grants principle forgiveness on qualifying equipment. This TM has been prepared with the specific intent of qualifying certain elements of the project which may be eligible for GPR funding. Refer to the engineering report for information not contained herein.

Summary

- The water treatment plant improvements project for the City of Davis proposes new high service pumps to serve the distribution system. The pumps are necessary, as sufficient capacity and hydraulic head is limited with the existing pumps and motors, they have deteriorated in condition, and a new clearwell and distribution pump is being proposed to achieve required disinfection credits. The plant currently uses four high service pumps- 3 new pumps are proposed.
- Anticipated Total Loan Amount = \$8,615,256
- Total high service pump station construction cost estimate = \$250,000
 - Pump equipment costs= \$151,200
 - Valving and piping= \$79,000
 - Electrical and I&C= \$19,800
- Associated qualifying GPR professional/legal/bond fees = \$ 48,372
- Green Project Reserve total = \$298,372 (3.5% of requested loan)
- Annual average energy savings = 91,861 Kw-Hr or \$8,267
- Anticipated total present worth savings over twenty years = \$ 122,999

Background

- The upgraded WTP will have a treatment capacity of 1.62 mgd.
- A new high service pump station is being installed with high efficiency pumps and motors:

Installation	Required No. of Pumps	Flow (gpm)	Head (ft)
High Service Pump Station	3	800	150

- High efficiency pumps motors will be installed to conserve energy
- Automatic floats and VFDs have been included to maximize the efficiency of cycle times of pumps, reduce operator hours, and conserve energy

Results

- High Service Pump Station
 - The proposed new pumps will have a rated efficiency of 85 %
 - The proposed new motors will have a rated efficiency of 94.5 %

Calculated Energy Efficiency

Influent Lift Station Pumps

- Standard pumps on the market have average efficiency ratings of 75 - 85%
- Standard motors on the market have average efficiency ratings of 74 – 90%
- The standard system would require a 50 horsepower pump, and would consume an average of 459,305 Kw-hr annually based on the future average day flow rate.
- The wire-to-water efficiency is the pump efficiency times motor efficiency. For standard pumps and motors for this application, the average efficiency is 0.55 or 55%.
- The wire-to-water efficiency of the high efficiency pump for this application is $0.85 \times 0.945 = 0.80$ or 80%
- Comparing the efficiencies of the proposed pumps and motors with standard pumps and motors:
 $80\% / 55\% = 1.45+-$
- The increased efficiency of the proposed pump over the standard pumps is 45%, which exceeds the 20% recommended minimum efficiency for pumps and motors.
- Example of cost and energy savings for a high efficiency pump that meets the criteria:

Demonstrating Energy and Cost Savings : High Service Pump Station Pumps		
Usage based on 1.62 mgd average day flow rate, 365 days/year operation		
Pump Parameter	High Efficiency Pump	Standard Pump
Manufacturer	Fairbanks Morse 13E.3+	Gusher 10HS-1100
Voltage/ Phase	460/3	460/3
Motor Efficiency, %	94.5	75
Pump Efficiency, %	85	75.5
Power usage, Kw-Hr/Yr	367,444	459,305
Power Save, Kw-Hr/yr	-	(91,861)
Power Cost, \$/Yr	\$ 0.09	\$ 0.09
Operational Cost, \$/Yr	\$ 33,069.96	\$ 41,337.45
Savings, \$/Yr	-	\$ (8,267.49)
Savings, \$/20-Yr (3% infl.)	-	\$ 122,999

Engineering Fees

- GPR qualifying items (before engineering fees) = \$250,000 or 3.6% of construction amount
- Total professional fees for the project = \$1,343,656
 - Engineering/Professional fees= \$1,163,456
 - Bond council fees= \$84,800
 - Local counsel fees= \$42,400
 - Financial advisor fees= \$53,000
- GPR qualifying professional fees= 3.6% x \$1,343,656= \$48,372
- Total GPR qualifying funds = \$250,000 + \$48,372 = \$298,372 (3.5% of total loan).

Conclusion

- An energy efficient high service pump station will save the City an average of 91,861 Kw-hr a year, which equates to 20% less energy consumed.
- Energy reductions will result in operations savings of \$8,268 a year, at 9 centers per kilowatt – hour.
- The total present worth savings over the lifetime of the improvements, or 20 years, is \$122,999.