PENNVEST Application Review
2011 Green Projects

Project Name: Loyalsock Twp - Act 537 Sewage Facilities Planning Implementation

Applicant: Loyalsock Township

County: Lycoming County

PV Project Number: 41066031106-CS

I. (RO) Is the project *categorically* Green (according to EPA May 20, 2011 guidance)?

(X) Yes No

Explain: **Project will reduce energy use by a minimum of 20% by incorporating VFDs, SCADA control, and appurtenances, so that the overall system will operate more efficiently reducing power consumption.**

Describe the Green scope of the project: **Using VFDs with Gorman-Rupp self-priming, centrifugal pumps as a replacement for the existing constant speed pumps will result in an energy efficiency savings of 20% or greater.**

If yes, include reference to a section in the guidance that explains why it is categorical, and proceed to "III" below. **Project will reduce energy use by a minimum of 20%.**

II. (RO) If the project is green, but not categorically green, it must have a Business Case to be approved by Central Office.

A Business Case is a brief report which briefly describes what the project is and why it is green. All Business Cases must show that the project has identifiable and substantial benefits. Those benefits must be quantified (in terms of water, energy and dollars whenever possible). All projects must be cost-effective.

Describe the Green scope of the project:

Summarize the basis of the Green determination in the Business Case:

List documented water, energy and cost savings:

III. (RO) Category and Dollars

What is the predominant green category?

Water Efficiency	( )
Energy Efficiency	**(X)**
Green Infrastructure	( )
Environmentally Innovative	( )

What is your estimate of the cost of the green components? **$1,695,000**

Keep a copy of this checklist (and the Business Case, if required) in the project file. Send this checklist and the Business Case to Central Office

IV. (CO) Does the Business Case provide a compelling argument that the project provides significant benefits that are recognized in the EPA guidance? (Like energy, water or cost savings).

Yes	( )
No	( )

Explain:

Store a copy of the Business Case (provide as needed for website).

Done	( )
N/A	( )

V. (CO) Priority List Followup:

If the above confirms that the project is Green, ensure that the priority list shows:

( ) The project is approved as Green
( ) Which Green category (Water Efficiency, Energy Efficiency, Green Infrastructure, or Environmental Innovative)
( ) Whether or not the project is "Categorical" Green
( ) Eligible Green dollars

RO Reviewer Name: Robert W. Boos Date: 9/23/11

CO Reviewer Name:_____ Date:_____

Wastewater "Green" Business Case

September 22, 2011

Wastewater Pumping, Conveyance and Bypass Management System Project
Loyalsock Township, Lycoming County, PA
PENNVEST Project Number 41066031106-CS
Total Estimated Project Cost: $14,675,416 Total Estimated Green Amount: $1,695,000

Part A: Establish Relative Benefits

The Problem:

The Loyalsock Township's wastewater system is old and continues to experience excessive infiltration and inflow (I/I) and bypass untreated sewage during wet weather events. The Township is under a Consent Order and Agreement to make repairs to their sewer system and upgrade the aging and deteriorated infrastructure.

The Project:

As part of the proposed Act 537 Plan, many improvements for the existing system were recommended. This project proposes implementing those recommendations. Environmental benefits include eliminating the discharge of untreated sewage to the waters of the Commonwealth during wet weather. A wide range of alternatives were considered and evaluated during the Act 537 planning process. The proposed project is the most cost-effective alternative.

What follows uses rough estimates based on readily-available information. It is provided to establish whether EPA green criteria are satisfied by the project. There is no plan to calculate actual post-project outcomes which would inevitably be somewhat different than the estimate.

Energy savings calculations: rehabilitate and replace the aging and deteriorated interceptor

The existing 18-inch and 24-inch gravity interceptors were installed in 1950s and consist of mostly concrete pipe. The Act 537 Plan identified severe I/I problems for these sewer segments and made the following recommendations to address these problems

- Rehabilitation of approximately 1,660 linear feet of existing 18-inch and 290 linear feet of existing 24-inch Bull Run interceptor from Miller's Run to new McClure's Run Pump Station
- Abandonment of approximately 5,020 linear feet of existing 24-inch Bull Run interceptor from the Bull Run pump station to Miller's Run and construction of new force main from Bull Run pump station to McClure's Run pump station

Flows vary from a low of 0.75 MGD (1.0 MGD minus an estimated 0.25 MGD exfiltration) in dry summers to as much as 4.46 MGD in wet weather. Wet weather flows occur about 40 days per year, generating excess flows of about 3.71 MGD (4.46-0.75), or about 148.4 MGY (40 days X 3.71 MG). Much of the rest of the year (9 months) flows average about 1.368 MGD, with excess flows of 0.368 MGD (1.37-1.0), or 99.4 MGY (270 days x 0.368 MGD). Excess flows therefore total about 247.8 MGY (148.4 + 99.4).

It is predicted that the I/I reductions seen from the rehabilitation and replacement work under this project will equate to approximately 10%. The project is therefore estimated to eliminate 24.78 MGY of excess flows per year (247.8 MGY * 10% = 24.78). 24.78 MGY = 47.4 GPM [24.78 MGY * 10^6 G/MG / (365 days/year * 1440 min/day) = 47.4 GPM], saving:

kWh = Runtime (hrs/year) * Q (gpm) * TDH (feet) * 0.746/[(3960 * wire-to-water effic)]
= 8760 hrs/year * 47.4 gpm * 62.2 feet * [0.746 /(3960 * 0.7)]
= 8760 * 47.4 * 62.2 *(0.746/2772)
= 8760 * 47.4 * 62.2 * 0.0002691
= 6,949 kWh / year
@ $0.10/kWh = $694.9 / year

I/I Reductions will also alleviate the hydraulic capacity overloads to the pump station as well as the WWTP, thereby reducing treatment costs for the Township residents. Based on $2.32/100 cf, this will equate to approximately $76,850 per year.

Energy savings calculations: energy efficiency pumping system

Loyalsock Township strives to utilize green components such as Variable Frequency Drives (VFDs) and selecting pumps that will operate in their most energy efficient condition as is planned for this project.

- All pumps and motors are designed to operate in their most efficient zone.
- VFDs are incorporated to increase the energy efficiency of the pump by optimizing the pumping rate.
- Dual force main are proposed between the Bull Run pump station and McClure's Run pump station to lower friction losses in the piping system also reducing the pumping requirements while accommodating flows experienced during wet weather events.
- The SCADA control and monitoring system is an integral part of this project and is utilized to provide automated operation of the pump stations and enhance the overall operation of the system.

Using VFDs with Gorman-Rupp self priming, centrifugal pumps rather than constant speed pumps will result in an energy efficiency savings of 20% or greater. Efficiency values for the Bull Run and McClures Run pumping systems are shown below. Please note that these values are calculated in terms of the amount of flow produced (GPM) per unit of power (BHP) used to produce the flow.

Bull Run PS – Normal Duty Pumps: Gorman-Rupp Model V6A60-B, 50-hp motors
At 950 GPM: 28.8 GPM/BHP
At 700 GPM: 33.3 GPM/BHP
At 500 GPM: 34.5 GPM/BHP
At 300 GPM: 30.0 GPM/BHP

Therefore, pumping at 500 GPM is about 20% more efficient than pumping at 950 GPM.

Bull Run PS – High Flow Pumps: Gorman-Rupp Model T10A3S-B, 75-hp motors
At 2150 GPM: 33.6 GPM/BHP
At 1500 GPM: 42.9 GPM/BHP
At 1000 GPM: 45.5 GPM/BHP
At 700 GPM: 40.0 GPM/BHP

Therefore, pumping at 1000 GPM is about 35% more efficient than pumping at 2150 GPM.

Bull Run PS – Montoursville Pumps: Gorman-Rupp Model V6A60-B, 60-hp motors
At 800 GPM: 17.4 GPM/BHP
At 600 GPM: 22.2 GPM/BHP
At 400 GPM: 26.7 GPM/BHP

Therefore, pumping at 400 GPM is about 53% more efficient than pumping at 800 GPM.

McClures Run PS – Normal Duty Pumps: Gorman-Rupp Model T10A3S-B, 50-hp motors

Simplex Operation:
At 2050 GPM: 51.3 GPM/BHP
At 1500 GPM: 60.0 GPM/BHP
At 1000 GPM: 64.5 GPM/BHP
At 750 GPM: 57.7 GPM/BHP

Therefore, pumping at 1000 GPM is about 26% more efficient than pumping at 2050 GPM.

Duplex Operation:
At 2965 GPM (1483 GPM/Pump): 40.1 GPM/BHP
At 2000 GPM (1000 GPM/Pump): 45.5 GPM/BHP
At 1500 GPM (750 GPM/Pump): 48.4 GPM/BHP

Therefore, pumping at 1500 GPM is about 21% more efficient than pumping at 2965 GPM.

McClures Run PS – Wet Weather Pumps: Gorman-Rupp Model T10A3S-B, 75-hp motors (Assuming about 15 feet of water in the storage tank)
At 1850 GPM: 92.5 GPM/BHP
At 1000 GPM: 117.6 GPM/BHP

Therefore, pumping at 1000 GPM is about 27% more efficient than pumping at 1850 GPM.

From the data above, by incorporating VFDs, SCADA control, and appurtenances, the overall system will operate more efficiently reducing power consumption.

Total Project Cost:

CONTRACT NO. 1 - GENERAL CONSTRUCTION	$8,642,000
CONTRACT NO. 2 - ELECTRICAL CONSTRUCTION	$384,960
CONTRACT NO. 3 - HVAC CONSTRUCTION	$48,900
CONTRACT NO. 4 - FORCE MAIN CONSTRUCTION	$2,916,470
CONTRACT NO. 5 - SANITARY SEWER LINING	$183,900
SUBTOTAL	$12,176,230
10% Construction Contingency	$1,217,623
Engineering Fee	$750,000
Interest during Construction	$266,000
Permit Application Fees	$2,550
Bonding Counsel Fee	$50,000
Legal Fee	$20,000
Administrative Cost	$10,000
Surveying	$34,566
Geotechnical Engineering	$15,000
Other Fee	
PHMC Investigation	$66,242
Water Tapping & Connection Fee	$4,325
Railroad Crossing Application, License and Insurance Fees	$62,880
Total Project Cost	$14,675,416

Green Project Components:

Pumps, VFDs, SCADA system	$1,695,000