Drinking Water State Revolving Fund Green Project Reserve

– Preliminary –

City of Rigby Drinking Water Upgrade Project

SRF Loan #DW1807 (pop. 3,945)

$2,000,000

Preliminary Green Project Reserve Justification[1]

Categorical GPR Documentation

1. NEW BOOSTER PUMP STATION WITH PREMIUM ENERGY-EFFICIENT PUMPS AND VFDS (Energy Efficiency). Categorical per GPR 3.2-2: *projects that achieve a 20% reduction in energy consumption*; *if a project achieves less than a 20% reduction in energy efficiency, then it may be justified using a business case*; also, per 3.5-9*: VFDs can be justified based upon substantial energy savings* ($144,000).

Business Case GPR Documentation

2. SCADA SYSTEM INSTALLATION (Energy Efficiency). GPR Business Case per Section 3.5-7: *"Automated and remote control systems (SCADA) that achieve substantial energy savings"* ($20,000).

Prepared by the State of Idaho SRF Loan Program

June 2018

[1] The GPR Technical Memorandum, due at design completion, will provide updated technical data and cost estimates

1. PREMIUM PUMPS AND VFDS (PRELIMINARY)

Summary

- As part of a drinking water system improvement project, the City of Rigby will construct a new booster pump station with pumps equipped with premium energy-efficient motors and VFDs.
- Total Loan amount = $2,000,000
- Estimated energy efficient (green) portion of loan = 7.2% ($144,000) (Preliminary estimate)

Background

- The City of Rigby water system requires additional reservoir water storage to ensure adequate water pumping and delivery capacity.
- The system requires 8100 gpm of pumping capacity but currently has only 6150 gpm. This could result in low pressure, subjecting the supply to potential contamination or inoperable equipment.
- This project includes construction of a new 1.5 MG ground level reservoir and new booster pump station with a 4700 gpm pumping capacity.
- A new booster pump station will be equipped with three (3) vertical turbine pumps with premium energy-efficient 125 hp motors with VFDs.

GPR Justification

Motors/VFDs:

The Baseline Standard Practice for comparison is a standard Epact motor that is not controlled by a VFD[3]. Published operating curves by the pump manufacturer provided VFD efficiency data:

- **Proposed Pumps - no VFD, standard Epact efficiency motor**
  Type: Vertical Turbine Hollow Shaft
  Efficiency 82%; Flow 1,400 gpm; 2.02 mgd; Head 265 ft.
  Motor rating = 125hp; Motor type = standard efficiency (93.0% assumed at 75% of full load[4])
  BHP, existing avg. flow = 115 hp
  % operation = 33% (average day flow/pump output)
  % Annual Usage = 50% (average daily operation throughout the year)
  Energy usage = 125,078 kW-hr
- **Proposed Pumps - no VFD, with premium efficiency motor**
  (95.4% assumed at 75% of full load)
  BHP, existing avg. flow = 112.24 hp
  % operation = 33% (average day flow/pump output)
  % Annual Usage = 50% (average daily operation throughout the year)
  Energy usage = 122,076 kW-hr
- **Proposed Pumps - VFD operation with premium efficiency motor**
  Type Hollow Shaft Vertical Turbine
  Efficiency 82%; Head 230 ft;
  Motor rating = 125 hp; Motor type = standard efficiency (95.4% assumed at 75% of full load)
  BHP, existing avg flow = 90.75 hp
  % operation = 33% (average day flow/pump output)
  % Annual Usage = 50% (average daily operation throughout the year)
  Energy usage 98,703 kW-hr

[2] City of Rigby Water Facilities Planning Study, Keller Associates, August 2011
[3] NYS Energy Research and Development Authority, Energy Evaluation Memorandum, Village of Greenport WWTP Upgrade 8-2009.
[4] http://www.copper.org/environment/sustainable-energy/electric-motors/education/motor_text.html

PREMIUM PUMPS AND VFDS (CON'T)

- **Energy Reduction - comparing with VFD to without VFD**
  Energy usage, w/o VFD 122,076 kW-hr
  Energy usage, w/ VFD 98,703 kW-hr
- The premium motors with VFDs result in a 21.1% energy reduction compared to non-VFD, standard efficiency motors

Conclusion

- The combined annual energy savings for utilizing premium pumps and VFDs is estimated to be 26,375 kWh/year per motor/VFD system - corresponding to an energy reduction of 21.1% when compared to the Baseline Standard Practice.
- The premium energy-efficient pumps/VFDs are categorically GPR eligible as they achieve greater than 20% reduction in energy consumption.
- **GRP Costs Identified**:
  Booster Station with VFDs = 3 @ $48,000 ea. = **$144,000** (Preliminary Cost Estimate)
- **GPR Justification**:
  The Pump/VFD system is Categorically GPR eligible (Energy Efficiency) per Section 3.2-2 page 9[5]: *Projects that achieve a 20% reduction in energy consumption are categorically eligible for GPR; also, per 3.5-9: VFDs can be justified based upon substantial energy savings.*

[5] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility

2. SCADA CONTROL TECHNOLOGY (PRELIMINARY)

Summary

- The SCADA system will be expanded to include the new booster pump station to improve system controls to maximize efficiency.
- Estimated Loan amount = $2,000,000
- Business Case energy efficiency (green) portion of loan ≅ 1% ($20,000) (Preliminary)
- Estimated annual energy savings $5,000 per year.

Background/ Results

- A SCADA system will be extended to the new booster pump station.
- BOOSTER PUMPS: The existing booster pumps have a recycle line that recirculates unused water during low demand periods. Installing SCADA technology and associated instrumentation to the new booster stations eliminate the requirement for recirculation or throttling. Additionally, rather than being on/off controlled, the new pumps will be staged over the expected range of demands. The staged pumping will allow the multiple pumps to meet the wide range of demands by ramping up and down via a VFD. Using SCADA controls and technology, the staged booster pumps will save approximately 20% of the pumping efficiency due to operating at the optimal efficiency point of the booster pumps, and not recirculating water.
- OVERALL SYSTEM: The SCADA Graphical User Interface (GUI) program will save energy through reduced travel to and from the booster plant and by allowing demand and pump operating trends to be optimized.

Energy Efficiency Improvements

- BOOSTER PUMPS: For the booster pumps it is estimated 20% reduction of power use over a recirculation loop or low flow throttling. It is estimated that the domestic supply booster pumps would save approximately $4,000 per year.
- OVERALL SYSTEM: Remote SCADA control saves labor and travel costs = 1 person, 2 hour trip (All Boosters) per day at 10 miles per day is approximately $18,000 per year in labor costs; travel cost @ $0.51 per mile = $2,000 per year = total saving of $20,000/yr.

Conclusion

- Total SCADA savings about $24,000 /year in energy and labor costs (payback 1.9 years.)
- **GPR Costs**: (Preliminary)

Equipment Name	Cost
SCADA Equipment	$20,000
∴ FY15 Total =	**$20,000**

- **GPR Justification**: SCADA system costs are GPR-eligible by a Business Case per Section 3.5-7[6]: *"Automated and remote control systems (SCADA) that achieve substantial energy savings."*

[6] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility. Page 20.