City of Rigby Drinking Water Upgrade Project
SRF Loan #DW1807 (pop. 4,193)
$2,000,000

Interim Green Project Reserve Justification

Categorical GPR Documentation

1. NEW WELL PUMP WITH PREMIUM ENERGY-EFFICIENT PUMPS AND VFDS (Energy Efficiency). Categorical per GPR 3.2-2: *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*: VFD can be justified based upon substantial energy savings* ($90,000).

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).

1. PREMIUM PUMP AND VFD

Summary

- As part of a drinking water system improvement project, the City of Rigby will construct a new well pump equipped with premium energy-efficient motor and VFD.
- Total Loan amount = $2,000,000
- Estimated energy efficient (green) portion of loan = 4.5% ($90,000)

Background

- The City of Rigby water system requires an additional well to ensure adequate water pumping and delivery capacity.
- The system requires 7,300 gpm of pumping capacity to meet Maximum Day Demand plus fire flow, but currently has only 6,150 gpm capacity. This could result in low pressure, subjecting the supply to potential contamination or inoperable equipment.
- This project includes installation of a new 2,000 gpm well pump with a VFD.

GPR Justification

Motors/VFDs:

The Baseline Standard Practice for comparison is a standard Epact motor that is not controlled by a VFD[1]. Options for reducing flow to the desired output are recirculating flow or throttling the pump. We assumed a throttled pump for the baseline. Published operating curves by the pump manufacturer provided VFD efficiency data:

- **Proposed Pump - no VFD, standard Epact efficiency motor, throttle pump to desired output**

  Type: Vertical Turbine Hollow Shaft
  Flow 1,500-2,000 gpm, assume 1,750 gpm avg; 2.52 MGD; Head 300 ft. (throttled)
  Motor rating = 200 hp; Motor type = standard efficiency (93.0% assumed at 75% of full load[2]). BHP, existing avg. flow (1,750 gpm) = 158.0 HP; % operation = 33% (average day flow/pump output); % Annual Usage = 50% (average daily operation throughout the year)
  Energy usage = 183,102 kW-hr

- **Proposed Pump - no VFD, with premium efficiency motor, throttle pump to desired output**

  Motor type = premium efficiency (95.4% assumed at 75% of full load)
  Head 300 ft. (throttled)
  BHP, existing avg. flow (1,750 gpm) = 158.0 HP; % operation = 33% (average day flow/pump output); % Annual Usage = 50% (average daily operation throughout the year)
  Energy usage = 178,496 kW-hr

- **Proposed Pump - VFD with premium efficiency motor, ramp VFD to desired pump output**

  Type Hollow Shaft Vertical Turbine
  Head 264 ft; (VFD ramped down to 1685 rpm for desired pump output)

[1] NYS Energy Research and Development Authority, Energy Evaluation Memorandum, Village of Greenport WWTP Upgrade 8-2009.
[2] http://www.copper.org/environment/sustainable-energy/electric-motors/education/motor_text.html

Motor rating = 200 hp; Motor type = standard efficiency (95.4% assumed at 75% of full load). BHP, existing avg flow (1,750 gpm) = 139 HP; % operation = 33% (average day flow/pump output); % Annual Usage = 50% (average daily operation throughout the year) Energy usage 157,076 kW-hr

- **Energy Reduction - comparing standard with premium efficiency and VFD with no VFD**

  Energy usage, standard efficiency w/o VFD 183,102 kW-hr
  Energy usage, w/o VFD 178,496 kW-hr
  Energy usage, w/ VFD 157,076 kW-hr

- The premium efficiency motor with VFD compared to non-VFD, standard efficiency motors, translates into an energy savings = 26,026 kW-hr = $2,600 per year.
- The cost of a non-premium pump without a VFD = $73,700, and the premium pump with VFD = $90,000. Therefore, with an energy savings of $2,600 per year, the pay-back period for the pump with a premium motor and VFD is 6.3years, well within the life of the specified equipment.

Conclusion

- The combined annual energy savings for utilizing premium pumps and VFDs is estimated to be 26,026 kWh/year for motor/VFD system - corresponding to a pay-back period of 6.3 years when compared to the Baseline Standard Practice.
- The premium energy-efficient pump/VFD is GPR eligible by a Business Case as it achieves a pay-back period as compared to the BSP of less than the life of the equipment.
- **GPR Costs Identified**:
  Well pump with VFD = 1 @ $90,000 ea.
- **GPR Justification**:
  The Pump/VFD systems are Business Case GPR-eligible, qualifying per Sect. 3.5-1 (Energy Efficiency)[3]: "*Energy efficient… new pumping systems… (including variable frequency drives (VFDs))" which are cost-effective. Also, per 3.5-9: VFDs can be justified based upon substantial energy savings.*

[3] 2012 EPA Guidelines for Determining Project GPR-Eligibility. Attachment 2

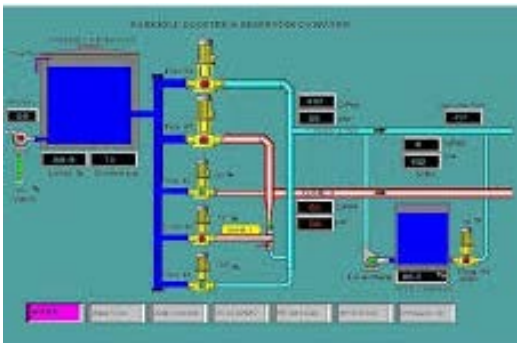
2. SCADA CONTROL TECHNOLOGY

Summary

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

Background / Results

- The new well pump and wellhouse will be integrated into the City's SCADA system. The SCADA system will be used to ensure that the most efficient well and pump is utilized as demands require.
- WELL PUMP: Well 5 was found to be a highly productive well during the pump test. Installing SCADA technology to the new well pump eliminates on/off controls, and allows the new pump to be staged over the expected range of demands. The staged pumping will allow multiple pumps throughout the system to meet a wide range of demands by VFD ramping up and down.



- Using SCADA controls and technology to preferentially run Well 5 over Well 4 will save the City approximately 26% in energy costs.
- OVERALL SYSTEM: The SCADA Graphical User Interface (GUI) program will save energy through reduced travel to and from the wellhouse and by allowing demand and pump operating trends to be optimized.

Energy Efficiency Improvements

- WELL PUMP: Running Well 5 preferentially over Well 4, the City will save an estimated 26.3% in power use. It is estimated this will save the City approximately $5,600 per year.
- OVERALL SYSTEM: Remote SCADA control saves labor and travel costs = 1 person, 1 hour trip (Wellhouse) per day, five days per week at 10 miles per day is approximately $9,100 per year in labor costs; travel cost @ $0.51 per mile = $1,300 per year = total saving of $10,400/yr.

Conclusion

- Total SCADA savings about $16,000 /year in energy and labor costs (payback 1.25 years.)
- **GPR Costs**:

SCADA Equipment	$20,000

- **GPR Justification**: SCADA system costs are GPR-eligible by a Business Case per Section 3.5-7[4]: *"Automated and remote control systems (SCADA) that achieve substantial energy savings."*

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