Clean Water State Revolving Fund Green Project Reserve

- Final -

City of Franklin Wastewater Project

SRF Loan #WW1602 (pop. 837)

$2,772,700

Final Green Project Reserve Justification

Business Case GPR Documentation

1. INSTALL NEW VERTICAL TURBINE PUMP WITH PREMIUM ENERGY-EFFICIENT MOTOR AND VFD IN THE REUSE PUMP STATION (Energy Efficiency). Categorical and Business Case per GPR 3.2-2 & 3.4.1: *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; project must be cost effective…energy savings and payback on capital and operation and maintenance costs [must] not exceed the useful life of the asset*; also, per 3.5-9: *VFDs can be justified based upon substantial energy savings* ($49,300).
2. INSTALL NEW SUBMERSIBLE PUMPS WITH PREMIUM ENERGY-EFFICIENT MOTORS IN THE INTERMEDIATE PUMP STATION (Energy Efficiency). Business Case per GPR 3.2-2 & 3.4.1: *if a project achieves less than a 20% reduction in energy efficiency, then it may be justified using a business case; project must be cost effective…energy savings and payback on capital and operation and maintenance costs [must] not exceed the useful life of the asset* ($39,200).

1. New Pump/Motor and VFD in Reuse Pump Station

Summary

- The existing effluent disposal system at the Franklin Wastewater Treatment Plant (WWTP) has various operational and capacity deficiencies. The primary needs and deficiencies of the existing treatment system are inadequate reuse land area and inadequate winter storage volume. A new reuse pump station will be constructed with a vertical turbine pump equipped with a premium efficiency motor and VFD to conserve energy and enhance operability.
- Funding = Approved $2,772,700 SRF loan
- New energy efficient pump/motors and VFD = $49,300
- Estimated green portion of loan = 1.8%


Existing Pump

Background

- The purpose and need of the proposed improvements is to address inadequate winter storage lagoon capacity and reuse (land application) area. Addressing these deficiencies will allow the City to meet discharge limits.
- The proposed improvements at the existing WWTP include the construction of an 26.9 million gallon HDPE lined winter storage lagoon, a duplex submersible intermediate pump station with a valve vault and flow meter vault, a vertical turbine irrigation reuse pump station, 6-, 8-, and 10-inch reuse system piping and valves, a sodium hypochlorite disinfection system, a flow meter vault for an existing pump station, site fencing, and site electrical and control system work.
- The new reuse pump station will be constructed with a vertical turbine pump equipped with a premium efficiency motor and VFD to conserve energy and enhance operability.

Calculated Energy Efficiency Improvements

- **Premium Efficiency Motors**
  - The vertical turbine pump has a premium efficiency 50 Hp motor (94.5% efficient at 75% of full load) at an additional cost of approximately $850. Standard efficiency motors are typically 15 to 30 percent lower in cost than premium efficient motors[1].
  - A standard efficiency 50 Hp motor has an efficiency of 91.6% at 75% of full load.
  - If the irrigation reuse pump runs for 3,864 hours per year, an energy savings of approximately 4,102 KWH per year will be realized, which equates to a cost savings of $330 per year assuming $0.08/KWH.
  - At $330 per year of energy savings using a premium efficiency motor, the payback period for the cost differential between a standard and premium efficiency motor ($850) is 2.6 years, which is less than the 20-year useful life of the pump/motor.

- **VFD**
  - VFD efficiency data were determined by published operating curves by the pump manufacturer.
  - The combined annual energy savings for utilizing a VFD with a premium efficiency motor is estimated to be 46,473 KWH per year, corresponding to a cost savings of $3,718 per year assuming $0.08/KWH. This equates to an energy reduction of 35%. This assumes that the average pumping rate with a VFD will be

[1] Page V. Energy Efficient Motor Selection Handbook, Washington State Energy Office

reduced from the peak rate of 900 gpm for the pump to an average of 600 gpm to more closely match the reuse irrigation system.

Conclusion

- The premium efficiency motor and VFD for the reuse pump station is GPR-eligible since the motor payback period (2.6 years) is less than the useful life of the pump/motor (20 years) and the combined premium efficiency motor and VFD achieve greater than 20% reduction in energy consumption.
- **GPR Costs**: New premium energy efficient pump/motor and VFD = $49,300.
- **GPR Justification**: Premium energy efficient pump/motor and VFD is Categorical and Business Case GPR-eligible by Section 3.2-2, and 3.4-1[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; project must be cost effective…energy savings and payback on capital and operation and maintenance costs [must] not exceed the useful life of the asset*; also, per 3.5-9: *VFDs can be justified based upon substantial energy savings.*

[2] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility. Page 9.

2. New Pumps/Motors in Intermediate Pump Station

Summary

- The existing effluent disposal system at the Franklin Wastewater Treatment Plant (WWTP) has various operational and capacity deficiencies. The primary needs and deficiencies of the existing treatment system are inadequate reuse land area and inadequate winter storage volume. A new intermediate pump station will be constructed with submersible pumps equipped with a premium efficiency motors to transfer wastewater from the treatment lagoons to the new winter storage lagoon.
- Funding = Approved $2,772,700 SRF loan
- New energy efficient pump/motors = $39,200
- Estimated energy efficiency (green) portion of loan = 1.4%

Background

- The purpose and need of the proposed improvements is to address inadequate winter storage lagoon capacity and reuse (land application) area. Addressing these deficiencies will allow the City to meet discharge limits.
- The proposed improvements at the existing WWTP includes the construction of a duplex submersible intermediate pump station with a valve vault and flow meter vault.
- The new intermediate pump station will be constructed submersible pumps equipped with a premium efficiency motors to transfer wastewater from the treatment lagoons to the new winter storage lagoon. The premium efficiency motors will be installed to conserve energy.

Calculated Energy Efficiency Improvements

- **Premium Efficiency Motors**
  - The submersible pumps have premium efficiency 12 Hp motors (92.6% efficient at 75% of full load) at an additional cost of approximately $630. Standard efficiency motors are typically 15 to 30 percent lower in cost than premium efficient motors[3].
  - A standard efficiency 15 Hp motor has an efficiency of 87.6% at 75% of full load.
  - Each of the submersible pumps are designed to discharge the 20-year peak hour flows (375 gpm). Using the average of the average day flows over the 20-year design period, it is estimated that the pumps will run 18% of the year.
  - An energy savings of approximately 429 KWH per year will be realized, which equates to a cost savings of $34 per year assuming $0.08/KWH.
  - At $34 per year of energy savings using premium efficiency motors, the payback period for the cost differential between a standard and premium efficiency motor ($630) is 18.4 years, which is less than the 20-year useful life of the pumps/motors.

Conclusion

- The premium efficiency motors for the intermediate pump station is GPR-eligible since the motor payback period (18.4 years) is less than the useful life of the pump/motor (20 years).
- **GPR Costs**: New premium energy efficient pump/motor and VFD = $39,200.
- **GPR Justification**: Premium energy efficient pumps/motors are Business Case GPR-eligible by Section 3.2-2, and 3.4-1[4]: *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; project must be cost effective…energy savings and payback on capital and operation and maintenance costs [must] not exceed the useful life of the asset.*

[3] Page V. Energy Efficient Motor Selection Handbook, Washington State Energy Office
[4] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility. Page 9.