

# Drinking Water State Revolving Fund Green Project Reserve

- Interim GPR -



## City of Filer Drinking Water Facility Project

SRF Loan #DW 1703 (pop. 2,508)

\$3,299,660

### Interim Green Project Reserve Justification

#### Categorical GPR Documentation

1. INSTALLS PRESSURE SUSTAINING VALVE (Water Efficiency). Categorical GPR per 2.2-12: *Installing water efficient devices.* (\$35,000)

#### Business Case GPR Documentation

2. INSTALL NEW VERTICAL TURBINE PUMPS WITH PREMIUM ENERGY-EFFICIENT MOTORS AND VFDS IN RAW WATER 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.* (\$259,946)
3. INSTALL NEW BOOSTER STATION PUMPS WITH PREMIUM ENERGY EFFICIENT MOTORS AND VFDS IN SOUTH PRESSURE ZONE (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.* (\$24,531)

# 1. PRESSURE SUSTAINING VALVE<sup>1</sup>

## Summary

- Pressure Sustaining Valve will be installed to ensure a preset pressure in the system is maintained.
- Loan amount = \$3,299,660
- GPR eligible costs = \$35,000
- Green portion of loan = 1.1%

## Background

- The system is hydraulically unstable in that customer pressures on the south end of town tend to be lower than for the rest of the City. The Master Plan recommends the City create a third pressure zone to alleviate this problem, and enable this zone to maintain required minimum standard pressure of 40 psi during peak hour and peak day conditions.



## Results

- Installing pressure-sustaining valve (PRV) – in conjunction with the new VFD pump station - is the most important feature for controlling the pressure fluctuations in this part of the system, improving reliability and reducing inefficiencies.

## Conclusion

- Pressure Regulating valve (PRV) installation = \$35,000
- The PRV is categorically GPR-eligible as it is a water efficient device.
- **GPR Costs Identified**<sup>2</sup>
  - PRV installed = \$35,000
- **GPR Justification:** The PRVs are Categorically GPR eligible (Water Efficiency) per Section 2.2-12<sup>2</sup>: *Installing water efficient devices...*

<sup>1</sup> City of Filer Water System Facilities Plan, JUB Engineers, May 2016 & Draft GPR Technical Memorandum Sept 2019

<sup>2</sup> Attachment 2. April 21, 2011 EPA Guidance for Determining Project Eligibility

## 2. PREMIUM PUMPS & VFDs IN RAW WATER PUMP STATION

### Summary

- A new raw water pump station will be constructed with three vertical turbine pumps to deliver water to the arsenic water treatment plant for filtration and backwash purposes. The pumps will be equipped with premium efficiency motors and variable frequency drives (VFD) to conserve energy and enhance operability.
- Loan amount = \$3,299,660;
- GPR Eligible Costs: \$259,946
- Green portion of loan = 7.9%

### Energy Efficiency Improvements

- The raw water pumps will be equipped with premium efficiency motors and VFDs to conserve energy and enhance operability. The pumps will be used to deliver water to the arsenic water treatment plant for filtration and backwash purposes.

### GPR Justification

- **Premium Efficiency Motors**
  - The vertical turbine pumps have premium efficiency 20 hp motors (95.4% efficient) at an additional cost of approximately \$2,000 (\$1,000 each). Standard efficiency motors are typically 15 to 30 percent lower in cost than premium efficient motors<sup>3</sup>.
  - A standard efficiency 20 hp motor has an efficiency of approximately 92% at 75% of full load.
  - If two of the raw water pumps run for 5,760 hours per year, an energy savings of approximately 1,732 KWH per year will be realized, which equates to a cost savings of \$139 per year assuming \$0.08/KWH.
  - At \$139 per year of energy savings using premium efficiency motors, the payback period for the cost differential between standard and premium efficiency motors (\$2,000) is 14.4 years, which is less than the 20-year useful life of the pumps/motors.
- **Variable Frequency Drive (VFD)**
  - VFD efficiency data were determined by published operating curves by the pump manufacturer.
  - The combined annual energy savings for utilizing VFDs with premium efficiency motors is estimated to be 10,043 KWH per year, corresponding to a cost savings of \$803 per year assuming \$0.08/KWH. This equates to an energy reduction of 21%. This assumes that two of the pumps will pump 550 gpm for 8 months per year while Well #3 is running and 750 gpm for 4 months when Well #7 is running, equating to a weighed annual average pumping rate of 617 gpm.



<sup>3</sup> Page V. Energy Efficient Motor Selection Handbook, Washington State Energy Office

## Conclusion

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- The new pumps, motors, and VFDs for South Pressure Zone are GPR-eligible since the payback period of is less than the useful life of the pumps/motors and the combined premium efficiency motor and VFD achieve greater than 20% reduction in energy consumption.
- **GRP Costs Identified**
  - Three (3) vertical turbine pumps/motors (20 hp each) = \$222,228 (\$74,076 each)
  - Three (3) VFDs = \$37,718 (\$12,572.67 each)
  - ∴ **Total GPR = \$259,946**
- **GPR Justification:** 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.*

### 3. PREMIUM PUMPS & VFDs IN SOUTH PRESSURE ZONE BOOSTER STATION

#### Summary

- New Booster Station pumps for the South Pressure Zone will be installed in the Booster Station to maintain pressure in the South Pressure Zone and provide emergency fire flow to the Main Pressure Zone. The pumps will be equipped with premium efficiency motors and variable frequency drives (VFDs) will also be installed to conserve energy and enhance operability. The pumps were downsized due to the decreased demand of the pressure zone. The original pump station was designed to meet the demand of the entire city.
- Loan amount = \$3,299,660;
- GPR Eligible Costs: Total = \$24,531
- Green portion of loan = 0.7%

#### Energy Efficiency Improvements

- The booster pumps replace the existing pumps, which were oversized for the new South Pressure Zone. The smaller booster pumps are sized appropriately for the application and improve efficiency of the booster station significantly. In addition, the booster pumps will be equipped with a premium efficiency motors and VFDs to conserve energy and enhance operability. The pumps will be used to deliver water to the newly created South Pressure Zone to maintain flow and pressure.



#### GPR Justification

- **Premium Efficiency Motors**
  - Standard efficiency motors are typically 15 to 30 percent lower in cost than premium efficient motors<sup>4</sup>. The cost of the premium efficiency motor is therefore estimated to be approximately \$1,000.
  - The submitted 5 hp motor has an efficiency of approximately 86.9% at 100% of full load.
  - The submitted 15 hp motor has an efficiency of approximately 89.9% at 100% of full load.
  - If the 5 hp pump is used for 2,880 hours per year, an energy savings of approximately 13,450 KWH per year will be realized, which equates to a cost savings of \$1,076 per year assuming \$0.08/KWH.
  - At \$1,076 per year of energy savings by downsizing the 10 hp motor to a 5 hp motor, the payback period for the cost differential between existing and new motor (\$4,000) is 3.7 years, which is less than the 20-year useful life of the pumps/motors.
  - If the 15 hp pump is used for 720 hours per year, an energy savings of approximately 4,514 KWH per year will be realized, which equates to a cost savings of \$361 per year assuming \$0.08/KWH.

<sup>4</sup> Page V. Energy Efficient Motor Selection Handbook, Washington State Energy Office

- At \$361 per year of energy savings by downsizing 25 hp motor to a 15 hp motor, the payback period for the cost differential between existing and new motor (\$5,000) is 13.8 years, which is less than the 20-year useful life of the pumps/motors.
- **Variable Frequency Drive (VFD)**
  - VFD efficiency data were determined by published operating curves by the pump manufacturer.
  - The combined annual energy savings for utilizing VFDs with the downsized motors is estimated to be 13,442 KWH per year (5,265 KWH per year for 5 hp and 8,177 KWH per year for 15 hp), corresponding to a cost savings of \$1,870 per year (\$1,497 for 5 hp and \$373 for 15 hp) per year, assuming \$0.08/KWH. This equates to an energy reduction of 77% for the 5 hp pump and 54% for the 15 hp pump. The previous estimate assumes an average flow rate for the 5 hp pump of 55 gpm and an average flow rate of the 15 hp pump of 140 gpm.



VFD (typical)

## Conclusion

- The new pumps, motors, and VFDs for South Pressure Zone are GPR-eligible since the payback period of (13.1 years) is less than the useful life of the pumps/motors (20 years) and the combined premium efficiency motor and VFD achieve greater than 20% reduction in energy consumption.
- **GRP Costs Identified:**
  - One (1) 5 hp centrifugal pumps/motors = \$4,000
  - One (1) 10 hp VFD = \$6,500
  - One (1) 15 hp centrifugal pump/motor = \$5,000
  - One (1) 20 hp VFD = \$9,031
  - ∴ **Total GPR = \$24,531**
- **GPR Justification:** 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.*