Clean Water State Revolving Fund Green Project Reserve
- Final -

Coeur D'Alene FY14 WWTP Upgrade Project Phase 5C.1
SRF Loan #WW1307A Amendment 1 (FY14) (pop. 46,146)
$970,360

Final Green Project Reserve Justification

Categorical GPR Documentation

- INSTALL NEW FINE BUBBLE DIFFUSED AERATION SYSTEM WITH HIGH SPEED TURBO BLOWERS (Energy Efficiency). Categorical GPR per Section 3.2-2: *projects that achieve a 20% reduction in energy consumption; retrofits to compare existing system to that proposed…New POTW projects or capacity expansion projects should be designed to maximize energy efficiency and should select high efficiency premium motors and equipment where cost effective."* ($26,916).
- INSTALLS INSTALL NEW ENERGY-EFFICIENT VFDS AND PREMIUM EFFICIENCY MOTORS ON PROCESS PUMPS AND AIR SCOUR BLOWERS (Energy Efficiency). Categorical per GPR 3.2-2: *projects that achieve a 20% reduction in energy consumption* ($10,319).

Business Case GPR Documentation

- INSTALLS ADVANCED FLUORESCENT LIGHTING (Energy Efficiency). Business Case GPR per 3.5-7: *Upgrade of lighting to energy efficient sources such as …compact fluorescent lighting;* ($2,843).

FY14 SRF Loan Amendment – GPR $ Proportionate Distribution

- In this document, the FY14 SRF Loan Amendment funds are proportionately assigned to the GPR-eligible items that were previously delineated and justified in the comprehensive FY13 Interim GPR Justification.
- The FY14 loan amendment was for the difference between the original loan request of $7,700,000 and the low bid amount of $8,670,367 and was requested shortly after bid opening. It was not applied to any specific portion of the project, but rather to the entire project[1].
- Total amount of FY14 Amendment = $970,360
- Percentage of the total SRF Loan to be allocated to FY14 = $970,360 ÷ $8,670,367 = 11.2%

Categorical

1. Fine Bubble Aeration System

Summary

- Total SRF Amendment 1 = $970,360
- Total GPR costs for fine bubble aeration system = $240,500
- GPR costs assigned to FY14 = $240,500 x 11.2% = $26,916
- Categorical energy efficient (green) portion of FY14 Amendment = 2.77% ($26,916) (Final Cost)
- Annual Energy savings = 71%

Energy Efficiency Improvements

- Fine bubble diffusers provide for a decreased actual oxygen requirement (AOR) to standard oxygen requirement (SOR) ratio of 0.33 compared to 0.50 for coarse bubble diffusers. [2]
- Fine bubble diffusers provide an oxygen transfer efficiency (OTE) of 2 percent per foot of submergence compared to 0.75 percent for coarse bubble diffusers. [3]
- High-speed turbo blowers operate with an increased wire to air efficiency of approximately 73 percent compared to multi-stage centrifugal blowers which operate with a wire to air efficiency of approximately 60 percent.[4]
- The dissolved oxygen control system allows for precise control of the air flow to match the diurnal dissolved oxygen demand which will substantially decrease the power demand of the new system.

Conclusion

- By using a fine bubble diffused aeration system, the City will reduce the required air demand by approximately 43 percent.
- By using high-speed turbo blowers, the City will reduce the power demand by approximately 18 percent.
- By using a combination of fine bubble aeration, high speed turbo blowers, and dissolved oxygen control system, the City will reduce power demand by approximately 71 percent.
- **FY14 GPR Costs:** Fine Bubble Diffusers + High-speed Turbo Blowers + Dissolved Oxygen Control System = **Total FY14 Amendment GPR = $26,916**
- **GPR Justification:** Categorically GPR-eligible (Energy Efficiency) per Section 3.2-2[5]: *projects that achieve a 20% reduction in energy consumption*.

[1] May 9, 2014 email Michael Zeltner, P.E., HDR Engineering Inc.
[2] Sanitaire Diffused Aeration Design Guide.
[3] Ditto.
[4] *Coeur d'Alene Advanced Water Reclamation Facility (AWRF) Phase 5 Expansion Preliminary Design Report*, Section 8 - Blower Building, May 2009.
[5] Attachment 2. April 2010 EPA Guidance for Determining Project Eligibility.

2. New Pumps and Motors[6] (preliminary)

Summary

- Total SRF Amendment 1 = $970,360
- Total GPR costs for new pumps and motors = $92,200
- GPR costs assigned to FY14 = $92,200 x 11.2% = $10,319
- Categorical energy efficient (green) portion of FY14 Amendment = 1.1% ($10,319) (Final Costs)
- Annual Energy savings = 36%

Energy Efficiency Improvements

- Equipment without premium energy-efficiency motors and VFDs result in a power usage of 1,124,000 kW-hr per year at an annual power cost of $73,100.
- Equipment powered by premium efficiency motors with VFDs result in a power usage of 829,000 kW-hr per year at an annual power cost of $53,900.
- The use of premium energy-efficiency motors and VFDs results in a power savings of 295,000 kW-hr per year and an annual cost savings of $19,200.

Conclusion

- By using VFDs and providing premium efficiency motors, the City will reduce their power needs by approximately 295,000 kW-hr per year and annual power costs by approximately $19,200 each year – a 36% overall savings in energy and costs.
- The equipment is GPR-eligible due to the 36% reduction in energy consumption and the payback on the investment (< 5 years) which is substantially less than the useful life of the equipment.
- **FY14 GPR Costs**:
  Variable Frequency Drivers + Premium Efficiency Motors = **$10,319**
- **GPR Justification:** Categorically GPR-eligible (Energy Efficiency) per Section 3.2-2: *"projects that achieve a 20% reduction in energy consumption."*

[6] NOTE: Analysis is preliminary and will be completed when project has been awarded and pump & motor schedules are available

3. FLUORESCENT LIGHTING

Summary

- Total SRF Amendment 1 = $970,360
- Total GPR costs for new pumps and motors = $25,400
- GPR costs assigned to FY14 = $25,400 x 11.2% = $2,843
- Estimated Categorical energy efficient (green) portion of FY14 Amendment = .3% ($2,843)

Energy Efficiency Improvements

- Energy efficient T-8 magnetic fluorescent lighting is approximately 28 percent more energy efficient than standard T-12 magnetic fluorescent lighting for relatively the same light output. [7]
- LED lighting is approximately 58 percent more energy efficient that typical high pressure sodium lighting for relatively the same light output.[8]

Conclusion

- **GPR Costs**:

Equipment Name	Cost
Fluorescent Lighting	
LED Lighting	
Total	**$2,843**

- **GPR Justification**: Advanced fluorescent lighting is GPR-eligible by a Business Case per 3.5-7[9]: *Upgrade of POTW lighting to energy efficient sources such as …compact fluorescent*.

[7] National Lighting Product Information Program, *Lighting Answers*, Volume 1 Issue 1, April 1993.
[8] Global Green Energy, *ROI Analysis - 250W high pressure sodium vs. EcoBright 120W LED street light*, accessed via http://www.gg-energy.com/
[9] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility. Page 10.