# WATER SYSTEM IMPROVEMENTS PROJECT

## Summary

The GPR portion of the proposed project for the Cataract Lake Water Corporation includes the new well pumps and motors for Existing Well #2 and new Well #3; new Standby Generator for use with the new well pump motors; Electrical Upgrades associated with the new well pump motors and standby generator; and Instrumentation Upgrades associated with the new well pump motors. These improvements will result in energy savings.

Estimated Loan Amount: $900,000

**Total GPR Energy Efficiency amount based on Contract/Agreements: $129,500**: $122,000 for construction costs and $7,500 for planning and design. The GPR costs equates to 17.5% of the total project cost.

## Background

The project includes two Divisions of work: 1) a new 150,000 gallon elevated storage tank and 2) well field improvements to include new raw water well and rehabilitation/replacement of the largest existing well. In designing the project, the use of automated control systems and high efficiency equipment were incorporated in order to reduce overall energy costs, better insure efficient operations, and minimize waste and potential environmental issues. These energy reducing components and measure include:

- Replace one existing well pump and motor with a larger but more energy efficient pump and motor.
- Construct a new raw water well which will include a high efficiency pump, motor, and reduced voltage (soft start) motor starter, all of which will reduce the Corporations overall energy costs.
- Upgrade the existing monitoring and control system (I & C) to improve operational efficiency and reduce the potential for spills and equipment down time.
- Provide a new standby generator to provide electrical power during power outages or peak utility use periods.
- Limit the use of the remaining less energy efficient well pump and motor to emergency standby conditions.

The GPR components are considered to be the well pumps and motors and related work components.

## Results - Estimated Energy Cost Savings

To calculate the anticipated energy savings of the project construction, the following analysis compares the electrical usage and cost of Well #2 under current conditions to the upgraded Well

# 2 based on an average daily water consumption of 215,000 gpd (as documented in the PER) and the current utility rate of $0.077 per KWH

**Existing Well Pump # 2 Operating Parameters**:

260 gpm at 342' TDH, Pump Efficiency (nP) at 74%, Motor Efficiency (nM) at 84%
At 260 gpm, pump runs 13.8 hours per day

Calculated Motor Output (BHP) = $\frac{Q \times TDH}{3956 \times nP} = \frac{(260\ gpm)(342')}{(3956)(0.74)} = 30.4$ bhp

Electrical Horsepower = bhp / nM = (30.4) / (0.84) = 36.2 ehp
Kilowatt Power = 0.746 x ehp = 27.0 KW
Average Daily Electrical Consumption = 27.0 KW x 13.8 hrs = 372.7 KWH per day
Avg. Daily Electrical Cost = 372.7 KWH x $0.077/KWH = **$28.70 per day**

**New Well Pump # 2 Operating Parameters**:

400 gpm at 370' TDH, Pump Efficiency (nP) at 81%, Motor Efficiency (nM) at 94%
At 400 gpm, pump runs 9.0 hours per day

Calculated Motor Output (BHP) = $\frac{Q \times TDH}{3956 \times nP} = \frac{(400\ gpm)(370')}{(3956)(0.81)} = 46.2$ bhp

Electrical Horsepower = bhp / nM = (46.2) / (0.94) = 49.1 ehp
Kilowatt Power = 0.746 x ehp = 36.6 KW
Average Daily Electrical Consumption = 36.6 KW x 9.0 hrs = 329.7 KWH per day
Avg. Daily Electrical Cost = 329.7 KWH x $0.077/KWH = **$25.38 per day**

**From the calculations above, it is shown that project construction will result in an energy reduction of 11.6% and an electrical cost savings of $3.32 per day ($1,211.80 per year). The new Well Pump #3 will have a pump efficiency of 84.2% and a motor efficiency of 95.4% and would provide similar savings to Well Pump #2 vs. the existing equipment. Use of the standby generator during peak usage periods and minimizing the use of Well Pump #1 would further reduce the energy consumption for the total system.**

## Conclusions

The proposed well pumps and motors components of the project will reduce the energy usage for the water utility. The improvements will result in an energy savings of approximately 12%.

- Reference Material – Memorandum Dated June 10, 2010, Revised September 23, 2010 by Foresight Engineering, Entitled - Cataract Lake Water Corp. – Water System Improvements Project, Green Project Reserve (Green Initiative) Documentation