

# Water System Energy Assessment

McCloud CSD  
PWS CA 4710006



Conducted by: California Rural Water Association

Funding Provided by: USDA Rural Development

Spring of 2018

# Introduction

The California Rural Water Association (CRWA) conducted an energy assessment for McCloud Community Services District. The assessment was provided free of charge to the system thanks to funding provided by the United States Department of Agriculture (USDA), Rural Development. The purpose of the assessment is to determine if there are operational and/or equipment changes that will result in less energy consumption, and cost savings for the system. Their staff provided CRWA with copies of all the necessary utility bills and operational reports, as well as detailed information regarding operation of the water system. CRWA conducted an onsite tour of the system and documented pump and motor information, as well as lighting and HVAC requirements where in use or available. The staff was very professional and accommodating throughout the process, and it was a pleasure to work with them during this assessment.

## System Description

The McCloud Community Services District water system serves a population of approximately 1,300 persons through 728 unmetered service connections. The source of water for the District is groundwater produced from three natural alpine springs. The District purchases electric power from Pacific Power Company at a rate of about \$0.16 per kWh.

**Federal Type:** Community

**State Type:** Community

**Source:** Ground Water

**Connections:** 728

**Residents:** 1,300

## Scope of the Energy Efficiency Assessment

The District's water system enjoys a significant cost savings advantage over nearly all others stemming from the fact that water flows from the springs to elevated storage tanks and no pumps are required to maintain distribution system pressure. In fact, the water delivery system has the potential to be a net positive energy producer if power generation turbines can be installed in the water conveyance system. The scope of this energy efficiency assessment is limited to lighting of District owned facilities including;

1. The Administrative Office Building
2. Maintenance Shop
3. Library
4. Scout Hall
5. Fire Department Building

## Lighting Analysis

A detailed lighting analysis was conducted at several facilities owned or operated by the District. The initial site visit was conducted to establish an inventory of existing lamp types with a corresponding

Table 1: McCloud CSD Lighting Analysis

Room Name	Existing Lamp Type	Existing Lamp Count	Watts per Lamp	Total Watts	Total KW	Hours per Year ON	kWh per year	Cost per kWh (\$)	Cost per Year	Replacement Lamp Type	Watts per Lamp	Total KW	kWh per Year	Energy Savings (kWh)	Cost per Year	Annual Savings	Unit Cost of Retrofit	Total Cost of Retrofit	ROI (months)
Admin Bldg	4ft - T8	26	36	936	0.936	3120	2920	\$ 0.16	\$ 467.25	Lifecbulb Plug&Play	13	0.338	1055	1866	\$ 168.73	\$ 298.52	\$ 6.00	\$ 156.00	6
Employee Back Room	4ft - T8	10	36	360	0.360	3120	1123	\$ 0.16	\$ 179.71	Lifecbulb Plug&Play	13	0.130	406	718	\$ 64.90	\$ 114.82	\$ 6.00	\$ 60.00	6
Maintenance Room	4ft - T8	4	36	144	0.144	312	45	\$ 0.16	\$ 7.19	Lifecbulb Plug&Play	13	0.052	16	29	\$ 2.60	\$ 4.59	\$ 6.00	\$ 24.00	63
Scout Hall	4ft - T8	4	36	144	0.144	350	50	\$ 0.16	\$ 8.06	Lifecbulb Plug&Play	13	0.052	18	32	\$ 2.91	\$ 5.15	\$ 6.00	\$ 24.00	56
Library	4ft - T8	64	36	2304	2.304	468	1078	\$ 0.16	\$ 172.52	Lifecbulb Plug&Play	13	0.832	389	689	\$ 62.30	\$ 110.22	\$ 6.00	\$ 384.00	42
Fire Hall	4ft - T8	18	36	648	0.648	2600	1685	\$ 0.16	\$ 269.57	Lifecbulb Plug&Play	13	0.234	608	1076	\$ 97.34	\$ 172.22	\$ 6.00	\$ 108.00	8
Maintenance Room	8ft - T8	2	75	150	0.150	312	47	\$ 0.16	\$ 7.49	Green Energy Ballast Removed	40	0.080	25	22	\$ 3.99	\$ 3.49	\$ 19.00	\$ 38.00	130
Scout Hall	8ft - T8	18	75	1350	1.350	350	473	\$ 0.16	\$ 75.60	Green Energy Ballast Removed	40	0.720	252	221	\$ 40.32	\$ 35.28	\$ 19.00	\$ 342.00	116
Fire Hall	8ft - T8	8	75	600	0.600	2600	1560	\$ 0.16	\$ 249.60	Green Energy Ballast Removed	40	0.320	832	728	\$ 133.12	\$ 116.48	\$ 19.00	\$ 152.00	16
Fire Equipment Bay	8ft - T8	16	75	1200	1.200	780	936	\$ 0.16	\$ 149.76	Green Energy Ballast Removed	40	0.640	499	437	\$ 79.87	\$ 69.89	\$ 19.00	\$ 304.00	52
Shop	Incandescent	20	100	2000	2.000	3120	6240	\$ 0.16	\$ 998.40	Statco LED Flood	15	0.300	936	5,304	\$ 149.76	\$ 848.64	\$ 13.00	\$ 260.00	4
Fire Hall	Incandescent	2	60	120	0.120	2600	312	\$ 0.16	\$ 49.92	PLT A-19 LED	9	0.018	47	265	\$ 7.49	\$ 42.43	\$ 1.00	\$ 2.00	1
Admin Exterior	165 watt metal halide Wall Pack	1	165	165	0.165	3940	650	\$ 0.16	\$ 104.02	AC Electronics Wallpack Fixture	37	0.037	146	504	\$ 23.32	\$ 80.69	\$ 82.00	\$ 82.00	12
<b>Totals</b>		<b>193</b>		<b>10,121</b>	<b>10.121</b>		<b>17,119</b>	<b>\$ 0.16</b>	<b>\$ 2,739.09</b>			<b>3.753</b>	<b>5229</b>	<b>11,890</b>	<b>\$ 836.66</b>	<b>\$ 1,902.44</b>		<b>\$ 1,936.00</b>	<b>12</b>

estimate of the “Lights-On” time per week which were then extrapolated to estimate total annual “On-time.” A detailed worksheet was created to estimate current energy consumption & cost values and a prediction of energy consumption & cost values post-retrofit to more efficient LED lamps. **Please see Table #1: McCloud CSD Lighting Analysis**

### Conclusions and Recommendations regarding LED Retro-fit

The results of the lighting assessment indicate an attractive return on investment and the potential to improve lighting quality at the Districts facilities. The analysis is summarized below;

Annual Energy Savings Post Retro-fit:	11,890 kWh
Annual Cost Savings Post Retro-fit:	\$1,902.44
Estimated Cost of Retro-fit (excludes labor to install)	\$1,936.00
Return on Investment:	12 Months

Additional Benefits Associated with the LED Retro-fit:

1. Far less maintenance due to very long life of LED lamps
2. LED Lamps are “instant ON” – no flicker in cold temperatures
3. Potential for Significantly Improving Lighting Quality
4. No hazardous material associated with LED Lighting (mercury in fluorescent tubes)

### Important Notes about Lamp Selection

1. The primary purpose of this report is to provide the District with information about the potential for energy and cost savings available through implementation of a re-lamping project using LED technology.
2. This report should not be construed as a basis for a purchase order for a large number of LED lamps and Luminaries for retrofit.
3. LED lamps are available in a wide variety of light intensity (Lumens) and color (CCT Kelvins). All LED lamps listed in this report are similar to the light intensity (Lumens) of the lamps they are intended to replace.
4. The CCT rating of lamps is very important to the success of any re-lamping project. Light “color” is a very subjective choice that varies from person to person.
5. We strongly encourage the District to consult with a lighting professional and try out lamps of various CCT ratings prior to making a purchase of a large number of lamps for retro-fit. Mistakes in lamp selection can be very costly – **Try before you buy in bulk!**

### Data Collection and Maintenance

The spreadsheet created to assimilate the data can be used to track data over time, allowing for a more accurate accounting of trends when considering electric costs and water flow. We have provided the system personnel with a copy of the spreadsheet created, and encourage them to input future utility system billing and flow data to help you track any inefficiencies in the system and to promote a much more sustainable system for the future.

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Project Item	Energy Conservation Measure Description	Annual Energy Savings (kWh)	Annual Cost Savings (\$)	Estimated Cost of Improvement (\$)	Rebate Total (\$)	Payback (Years)	Reference Pages
Admin Building	LED Light Replacements	1,866	\$298.52	\$156.00		0.52	
Employee Back Room	LED Light Replacements	718	\$114.82	\$60.00		0.52	
Maintenance Room	LED Light Replacements	29	\$4.59	\$24.00		5.23	
Scout Hall	LED Light Replacements	32	\$5.15	\$24.00		4.66	
Library	LED Light Replacements	689	\$110.22	\$384.00		3.48	
Fire Hall	LED Light Replacements	1,076	\$172.22	\$108.00		0.63	
Maintenance Room	LED Light Replacements	22	\$3.49	\$38.00		10.87	
Scout Hall	LED Light Replacements	221	\$35.28	\$342.00		9.69	
Fire Hall	LED Light Replacements	728	\$116.48	\$152.00		1.30	
Fire Equipment Bay	LED Light Replacements	437	\$69.89	\$304.00		4.35	
Shop	LED Light Replacements	5,304	\$848.64	\$260.00		0.31	
Fire Hall	LED Light Replacements	265	\$42.43	\$2.00		0.05	
Admin Exterior	LED Light Replacements	504	\$80.69	\$82.00		1.02	
HVAC Improvements	Energy Efficient HVAC						
Water Loss >10%	Reduce Water Loss to 5%						
		11,891	\$1,902.44	\$1,936.00	\$0.00	1.02	

# McCloud CSD

	Pre Assessment	Post Assessment	Savings
Total Energy Consumption (kWh)	17,119	5,229	11,891
Current energy rate (\$)	0.16	0.16	0
Total Energy Costs (\$)	\$2,739.09	\$836.66	\$1,902.44

### **Feasibility of Streetlight Retrofit Program:**

The McCloud Community Services District provides street and roadway lighting services for the McCloud community. The existing streetlights are a mixture of District owned streetlights and those owned by the Pacific Power Company. A full analysis of the District's streetlight program is beyond the scope of this report. However, California Rural Water Association encourages the District to open a dialog with Pacific Power Company regarding a possible retro-fit project to conserve energy via the street lighting program. Many of the District-owned streetlights have already been retro-fitted to LED technology. However, the bulk of the streetlights are owned by Pacific Power and are still using high pressure sodium lamps drawing about 85-watts each. These are the best candidate for LED retro-fit given that luminaries using only 50-watts each are available on the market with an attractive return on investment.

### **Feasibility of "In-pipe Turbine Technology" for Generation of Electric Power**

The total dynamic head and flow conditions in the pipelines conveying water from the springs to the storage tank(s) appears to be favorable toward considering a Co-gen project at the McCloud CSD. This too is beyond the scope of this report. However, CRWA encourages the District to begin a dialog, starting with Pacific Power and the District's engineer to determine whether the head and flow conditions warrant further study. A brochure describing the technology is included as an attachment to this report.

### **LED Lighting Technologies**

Consider a LED lighting replacement program in areas where conventional lighting is used as the energy consumption can be significantly less. As an example if you replace 75 watt incandescent bulb with a 9 watt LED replacement (same lumen output) and operate the light 8 hours/day/5 days/week/year at \$.13/kWh the cost would be \$20.28 vs \$2.43 respectively, a savings of 88%.

### **Water Loss and Energy Implications**

There is a basic rule in the drinking water industry that *unaccounted for water*, water that has been produced and entered into the distribution system, of less than 10% is within reason considering meter inaccuracies, accounting errors, unmetered flushing, stolen water, and known leaks prior to repair. If the water loss exceeds 10% however there should be concern about where the water is going and the associated energy cost that is going with it. To determine the cost do the following calculation, include all water loss down to 5% which can be achieved in many systems with time.

Example: System produces 91,250,000/Year

System's energy cost is \$.56/1,000 produced (Look in "**Assessment Findings**" for yours)

System's unaccounted for water is 15% (use 10%)

Calculation:  $91,250,000 \times .10 = 9,125,000 \div 1,000 = 9,125 \times \$.56 = \mathbf{\$5,110.00}$  **Electrical cost for lost water.**

California Rural Water Association may be able to provide leak detection and water loss audit guidance at no cost. Contact CRWA to see if your system qualifies.

### **Solar Technologies**

We strongly recommend you pursue opportunities for solar power as this generally produces savings in the 20% - 50% range in electric costs which could be significant for the system.

### **Funding Opportunities**

DSIRE [www.dsireusa.org](http://www.dsireusa.org) is the most comprehensive source of information on incentives and policies that support renewables and energy efficiency in the United States. It is funded by the Department of Energy. Currently there are over 195 programs listed for California.

USDA, Rural Development [www.rd.usda.gov](http://www.rd.usda.gov) provides financing for water, wastewater, solid waste, and storm water facilities for a number of purposes including but not limited to energy efficiency improvements.

National Rural Water Association (NRWA) – has a Rural Water Loan Fund specifically designed to meet the needs of small water and wastewater systems. They have established a new emphasis on energy efficiency projects that improve water and/or wastewater system sustainability through lower energy costs. There are no administrative or processing fees involved with this loan program.

Key Points:

- 1) Low interest rate (currently 3%)
- 2) \$100,000 maximum or 75% of project cost, whichever is less
- 3) Maximum 10 year term
- 4) Quick turnaround, generally only a few days from application to funding

[www.nrwa.org/initiatives/revolving-loan-fund/](http://www.nrwa.org/initiatives/revolving-loan-fund/) for more information

### **Closing**

The California Rural Water Association would like to thank you for the opportunity to provide this Energy Efficiency Assessment Report. Your staff was kind and very helpful; it was a pleasure working with them. Should you have any questions or concerns please contact our office at 916-553-4900 or email me at [jwendele@calruralwater.org](mailto:jwendele@calruralwater.org).