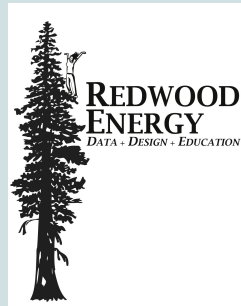


Green Maintenance and Tenant Engagement

Best Practices for ZNE-focused Multifamily Affordable Housing Properties in
Sacramento and Davis, CA

Presented by:
Jenna Bader
Partner, Project Manager
Redwood Energy
JBaderNRG@gmail.com



Health and Safety



Best Practice Recommendations

- ***Low-VOC*** or ***No-VOC*** paints, caulks, and sealants
- ***No carpets***
- ***Non-toxic cleaning***
- Workers to follow ***OSHA*** standards
- Routine ***Building Security*** checks

Heating, Ventilation and Air Conditioning (HVAC)

Best Practice Recommendations

- **Combustion Safety Test**
 - Annually
- **Heating and AC Maintenance**
 - Annually
- **Replace HVAC filters**
 - Every 3 months
- **Refrigerant Charge Test**
- **Fan Watt Draw** at most 0.58 W/cfm and **Fan Air Flow Testing**
- **Duct Testing**



Water Heaters

Best Practices for Areas with Hard Water

- Add ***Water softeners with new water heaters*** (pictured right).
- ***Water Heater Flushes***

Water Heater Flush

Tanks 0-5 years old	Annually
Tanks 5+ years old	Every 2 years
Tankless 0-5 years old	Every 6 months
Tankless 5+ years old	Every 2 years

Source: Green Operations and Maintenance Manual, Redwood Energy, Mutual Housing California



Water heater tank with and without water softener

Recordkeeping

Documentation of Existing Equipment and Maintenance Logs

Understanding what equipment exists and how it's performing

Maintenance Staff to keep logbook posted on wall next to large equipment.

Frequency: Ongoing

Maintenance Staff shall post Maintenance Logs next to equipment at eye-level with an attached pen for ongoing recordkeeping. Once maintenance log is full or after 1 year, whichever comes first, Maintenance Staff shall upload Maintenance logs to Property manager's recordkeeping storage folders.

Equipment Type:

Model #:

Serial #:

Date of Install:

Maintenance Log

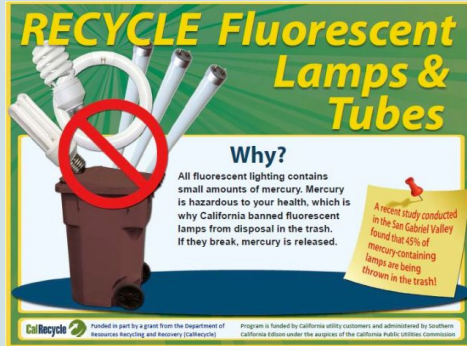
Date	Work Performed	Name/Initials	Signature	Notes

Source: Green Operations and Maintenance Manual, Redwood Energy, Mutual Housing California

Best Practice Recommendations

- Keep records of all ***existing equipment and maintenance logs*** (pictured left)

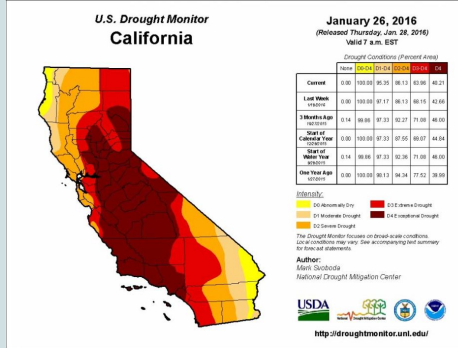
Lighting and Appliances



Best Practice Recommendations

- Replace old lamps with **LED lamps**
- **Motion sensors** and photocell sensor controls
- Replace old appliances with **Energy Star rated appliances**

Water Conservation



Best Practice Recommendations

- **Leak detection** at unit inspections
- **Low-flow** showerheads and toilets
- **Faucet aerators** for sinks

Step 1



Add 1 tablet to the tank. Let sit for 30 minutes.

Step 2



If the bowl turns blue or blue streaks appear, a leak is discovered.



Niagara brand Leak Detection Dye Tablets



Waste Management



California's New Goal:
75% Recycling



Best Practice Recommendations

- ***Divert 75%*** of solid waste from the landfill
- ***Recycling*** and ***composting*** with ***Tenant Education***

PLEASE RECYCLE CLEAN PAPER.



Pest Management, Landscaping, Non-Toxic Cleaning

Organic Weed Killer Recipe



1 gallon 20% vinegar

1 Ounce Orange Oil

Apply carefully with spray bottle

*Do not dilute solution

*Apply directly to weeds on hot days (above 70°F) and when soil is dry

*Purchase options: <http://www.planetnatural.com/product/horticultural-vinegar/>

Source: Green Operations and Maintenance Manual, Redwood Energy, Mutual Housing California



Best Practice Recommendations

- ***Organic pest management***
- ***Organic grounds management***
- ***No pesticides***
- ***Green Seal certified non-toxic cleaning supplies***

Solar Arrays



Best Practice Recommendations

- ***Read meters and log data***
 - Monthly
- ***PV/Electrical Inspections***
 - Annually
- ***Clean panels with warm water*** or with a mild soap
 - *Do not use brushes, abrasives, solvents or harsh detergents
 - Annually

Tenant Education Programs to save energy

A 1-year Case Study

160-units of Affordable Housing in San Ysidro, CA

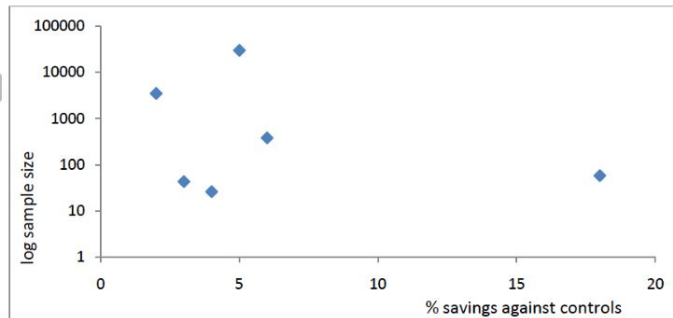
The Research

Persistent 5% energy savings from “clip-on” displays (in-home energy monitors)

-Dr. Darby, Oxford



Figure 2: Number of households issued with clip-on feedback displays against measured electricity savings relative to controls (trials of a year or longer)



Stack and overlap the (3) following types of programs for the best results:

Cognition programs- general and targeted communication efforts. (education, trainings, etc.)

Calculus programs- consumers making economically rational decisions (feedback programs, games, incentives, audits, etc.)

Social interaction programs- rely on interaction among people (social marketing, person-to-person efforts, peer champions, gifts, etc.)

-Susan Mazur-Stommen, ACEEE

Tenant Education Program at Rio Vista



**WEDNESDAY
JULY 8**

4-6PM

FREE QUESADILLAS

RAFFLE PRIZES

GREEN HOME CERTIFICATION

**THURSDAY
JULY 9**

2-6PM

CLOTHING SWAP

LOTERIA GAME

**FREE HEALTHY HOME
CLEANING PRODUCTS**

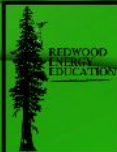
HOSTED BY REDWOOD ENERGY EDUCATION

**COME JOIN THE PARTY AND LEARN HOW TO CREATE HEALTHY HOMES, AND A HEALTHY
WORLD FOR OUR CHILDREN WHILE LIVING ON A BUDGET.**

YOU'RE INVITED!

**Eco
Fair**

**RIO VISTA APARTMENTS
COMPUTER LAB**



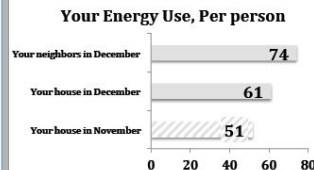
Kick-off event Flyer

Energy Competition Flyer

RIO VISTA SOLAR SAVERS

Apartment 1130-15 January, 2016

You used **-18% less**
electricity than your
average neighbor.



**SATURDAY
FEBRUARY 20, 2016
12-4pm**

Save the date! We will be hosting a KICK-OFF PARTY by the pool handing out organic quesadillas, energy-saving devices for your home, hosting activities and more! Please join us and bring any questions about your home electricity usage, we are happy to help!

ENERGY CONSERVATION COMPETITION

**RIO VISTA APARTMENTS
FEBRUARY 15 - MARCH 15**

We invite you to participate in the Rio Vista Building Competition. All 12 buildings will compete for 30 days to see which building can save the most electricity. (Energy savings are based on a % decrease from the previous month's baseline.) The building that has the highest % energy savings from Feb. 15 - March 15, 2016 will receive prizes for each household! Attend the KICK-OFF PARTY Feb. 20th for more info.

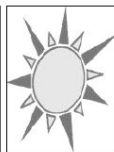
WE CHALLENGE YOU TO FOLLOW THESE ENERGY SAVING TIPS AND SAVE MORE \$\$\$ ON YOUR ELECTRIC BILL, IT'S THAT SIMPLE!

**TURN IT OFF
EVERY NIGHT**

UNPLUG IT.

**LOWER
THERMOSTAT**

**USE NATURAL
SUNLIGHT**



RIO VISTA SOLAR SAVERS

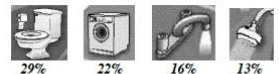
Apartment 1130-15 October, 2015

Hello Rio Vista!

Do you know where your water comes from? San Diego County currently imports 80% of its fresh water from Northern California and the Colorado River. Climate change and rising populations will likely increase the needs for water security in the coming years, and the best way you and your family can prepare is to do your part and conserve water in your home.

As for the future, the city of San Diego is investing in a water purification called Pure Water San Diego, which will supply 1/3 of the County's drinking water by 2035, but that's still 20 years away. So today, try taking shorter showers, flushing the toilet less, and being creative with ways to save and re-use wasted water from your daily life.

WHERE DOES YOUR HOUSEHOLD WATER GO?



Monthly Challenge

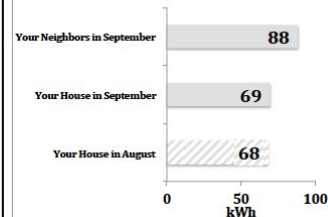
Water: Try a shower timer or dish squeegee to help save water. If you send us a request, including your address and one way you already help save water at home, we will send you one for free!

JBADERNRG@GMAIL.COM

You used **-21% less**
electricity than your
average neighbor.

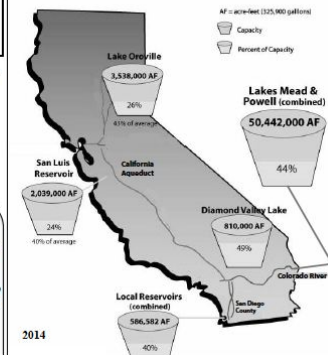


Your Energy Use, Per person



Where Does Your Water Come From?

Important Reservoirs for San Diego County



Monthly Reports



Energy Competition Results

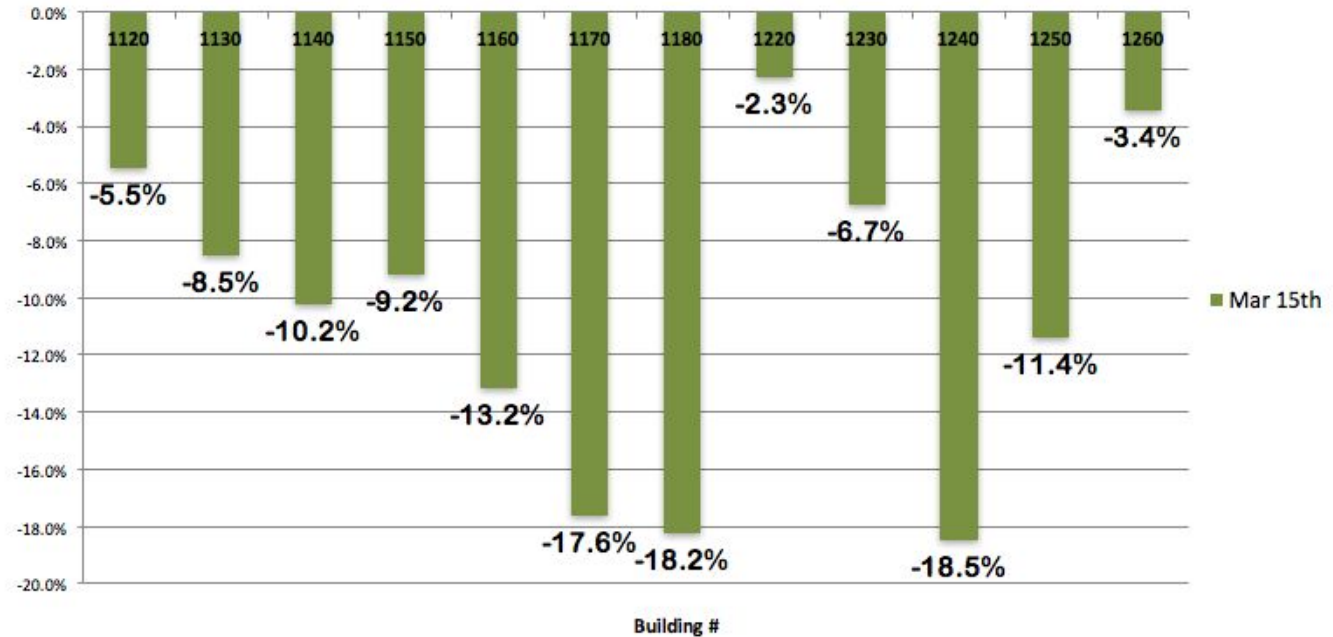
BATTLE OF THE BUILDINGS

Rio Vista Apartments

Feb. 2016 - Mar. 2016

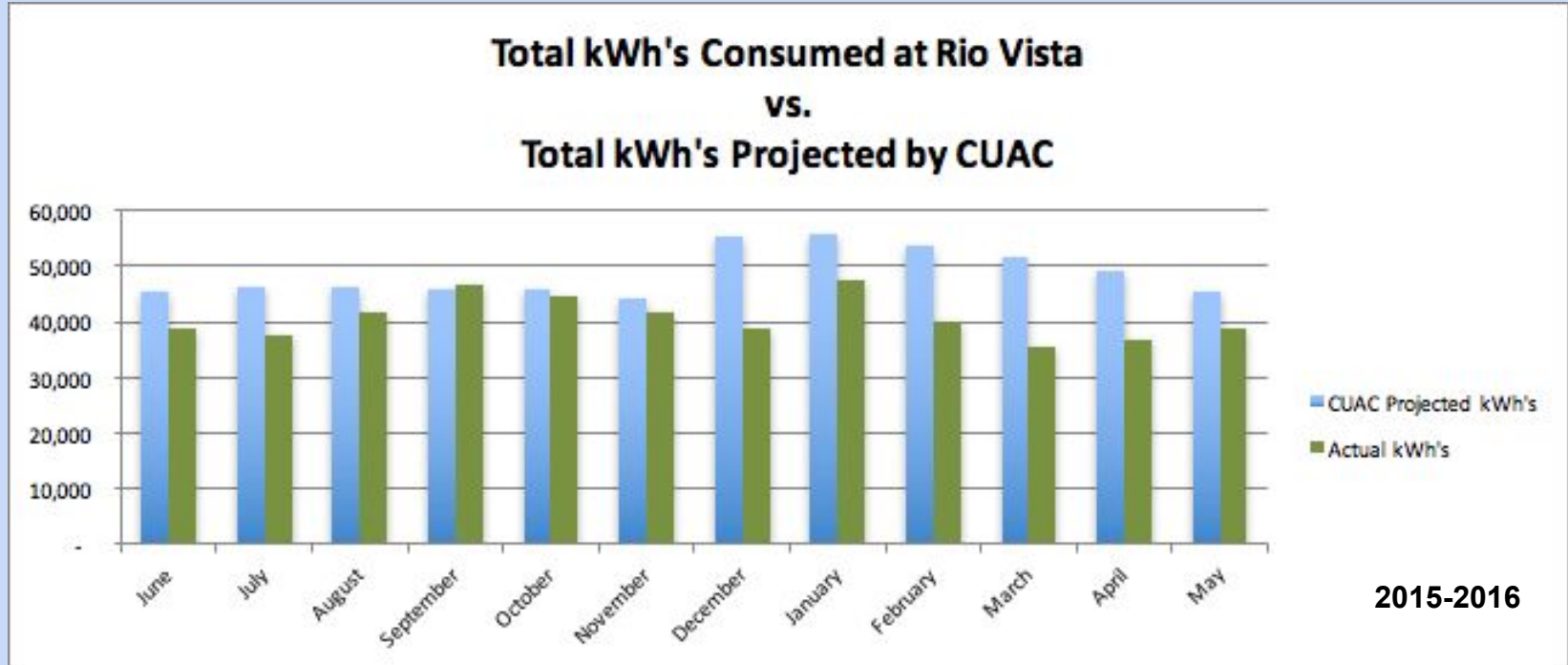
(Energy Savings From Previous Month (%), by Building #)

% Difference
(%) = Higher Energy Use
compared to Last Month
(-) = Lower Energy Use
compared to Last Month



Source: Redwood Energy Data Analysis of a 1-year Tenant Education Program at Rio Vista

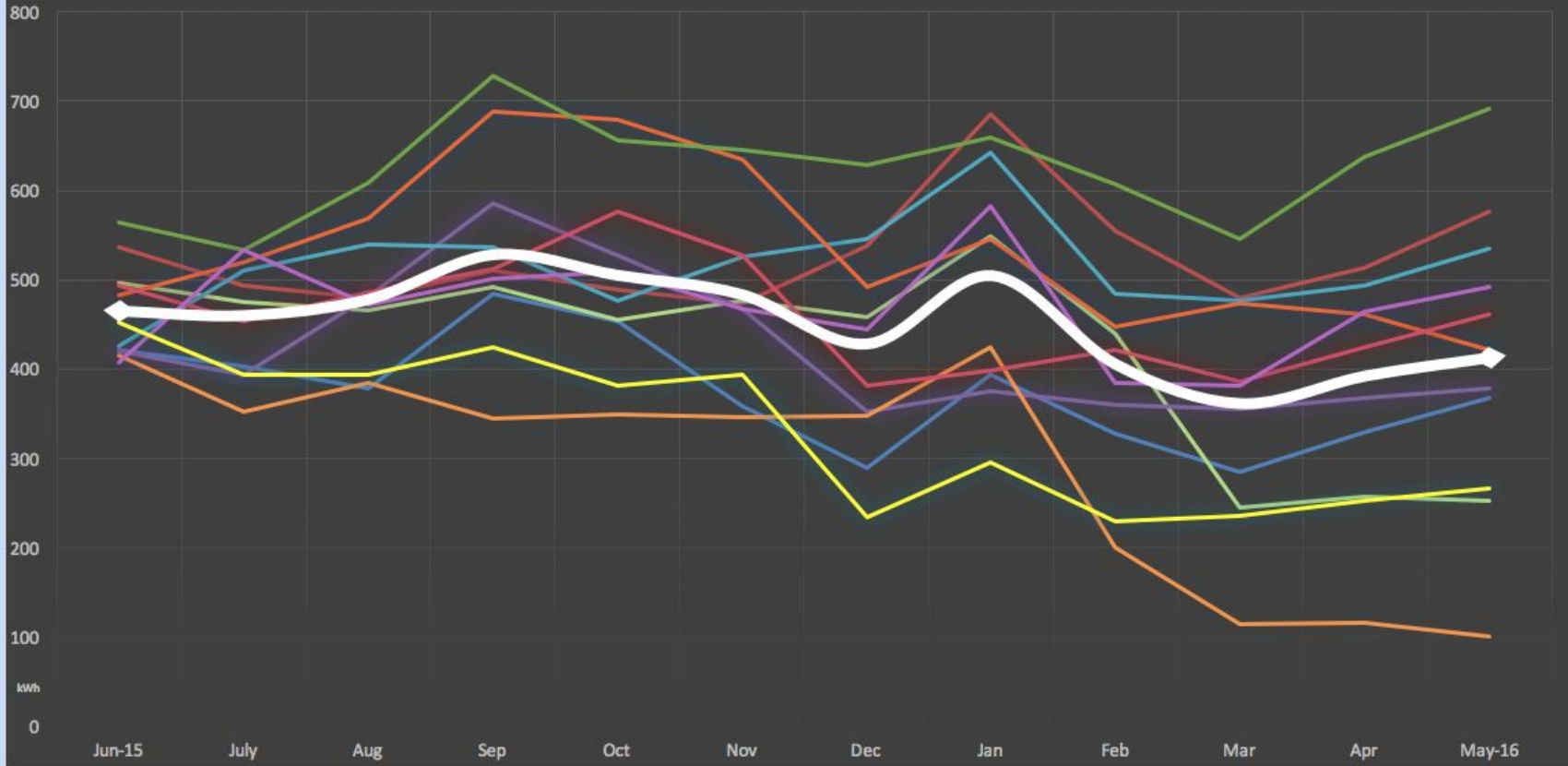
Overall Results: Rio Vista used **17% less** energy than predicted by the CUAC!



Source: Redwood Energy Data Analysis of a 1-year Tenant Education Program at Rio Vista

Trends of (11) Highest Energy Users Rio Vista Apartments 2015-2016 data

A B C D E F G H I J K AVG



Source: Redwood Energy Data Analysis of a 1-year Tenant Education Program at Rio Vista

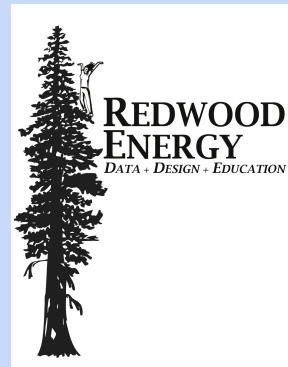
Best Practices

- Work with ***Property Manager*** to get their support upfront
- ***Connect with Residents***, visit the site multiple times to check-in and offer help with utility bills
- Collect energy data on the ***same day of every month*** for consistent results
- Have ***translators available*** for all tenant-preferred languages
- Use ***Demonstration apartments***, offer a full energy and sustainability retrofit and in-return, allow visitors inside for educational demonstrations

Thank
you!



Jenna Bader
Partner, Project Manager
Redwood Energy
JBaderNRG@gmail.com



Appendix 1- HVAC

HVAC Replacement Plan

Developing a goal towards improved health, safety and energy efficiency for all.

- **Fuel switch to all-electric.** The benefits of fuel switching will save the tenants money on utility bills, save the environment by not promoting fracking, and lead to 100% solar-powered projects. The costs will not increase as a result of fuel switching.
- **10+ year old HVAC equipment** should have a replacement plan in place.
- **Replace entire HVAC system when one part fails.** When replacing split systems, replace the indoor furnace, and outdoor condenser unit, and fan blower motor at the same time to decrease the likelihood of low efficiency or premature failure of the system.
- **Energy Star Quality Installation** of new HVAC equipment
- **Obtain a Building Permit** for whole system HVAC replacements, duct work replacement, or fan coil replacement. Should you not get a building permit, the 2016 and 2019 building codes will require a **SEER 20** and **HSPF 10** or greater compressor/heat pump.
- **Add an Energy Star Programmable Thermostat** when replacing HVAC systems to help save energy without compromising comfort. Ideal settings are **<70°F** for Heating and **>78°F** for Cooling.



Setting	Time	Setpoint Temperature (Heat)	Setpoint Temperature (Cool)
Wake	6:00 a.m.	< 70° F	> 78° F
Day	8:00 a.m.	Setback at least 8° F	Setup at least 7° F
Evening	6:00 p.m.	< 70° F	> 78° F
Sleep	10:00 p.m.	Setback at least 8° F	Setup at least 4° F

Source: Green Operations and Maintenance Manual, Redwood Energy, Mutual Housing California

Appendix 2- Lighting

Lighting Replacement Checklist	
Type	Energy Star LED lamp
Funding	Search for local utility rebates before purchasing in bulk
CRI	82+
Color Temperature	Around 2700K
Efficacy (Lumens/Watt)	80+ L/W
Outdoor Lighting	Dark Sky compliant, Energy Star LED lamp

Source: Green Operations and Maintenance Manual, Redwood Energy, Mutual Housing California