

# Are Solar Panels Right for You?

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PRESENTED BY RUSS MACKEAND – FEBRUARY 11, 2023

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2. Selecting a Vendor
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4. Solar System Components
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# California Solar Consumer Protection Guide



Published March 2022

This guide provides important information to homeowners thinking of going solar.

## PUTTING SOLAR ON YOUR HOME IS AN IMPORTANT FINANCIAL DECISION.

Don't sign a contract until you read this document!



This guide is from the California Public Utilities Commission (CPUC), a government agency that regulates privately-owned utilities like Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), and San Diego Gas & Electric Company (SDG&E).

Customers of PG&E, SCE, SDG&E, BVES, and PacifiCorp must initial and sign this guide to connect a residential solar system to the electric grid. The CPUC requires these companies to collect your signed copy of this guide to ensure that you know your rights and have enough information to make a decision. *(This requirement does not apply to solar thermal systems or solar systems in new home construction or multi-family buildings.)*

## Guide Accessibility

- Audio recording available at 855-955-1535.
- Español, 中文, 한국어, Tiếng Việt, Tagalog, Armenian, Portuguese, and Dari versions available at 866-849-8390.

You should understand and initial the first 4 pages and sign at the end of this guide before you sign a contract for a residential solar system.

Initial here if you understand this page \_\_\_\_ (1/4)



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# Selecting a Vendor - 1

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- **You can obtain quotes from several local installers at:**
- Energy Sage: <https://www.energysage.com/>
- Energy Sage is a government funded tool at no-cost to get quotes from several local solar system installers without the installers getting your contact information
- You'll need to provide your name , address and other info and Energy Sage will get quotes from local vendors and forward to you
- You can then contact any vendors if the quote is of interest to you
- Slide information provided by Rick Hearn

# Selecting a Solar Vendor - 2

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- Consider the vendor years in business – Minimum of 8 years
- Consider total installations – Minimum of 2,000 to 3,000 total
- Do employees do the work or do they outsource to another company?
- Sales person – prefer one with technical knowledge of the installation

# Panel Comparisons

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- Panels vary in size and electricity generated
- Right now watts per panel range from 360 Watt to 400 Watt for Residential: Some Commercial Applications use 600 Watt or more
- 11 panel system with 400 Watt is a total of 4.4 kW
- No. of panels recommended based on total house usage for year
- A house that uses 5,600 kWh a year will need about 11 panels of 400 Watt and provide an excess of 10% to 20%
- Panels degrade slowly over time: Best panels at 92% at 25 Years

# Tier 1 Panels

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- SunPower Maxeon
- LG Solar
- Trina Solar
- REC Group
- QCells
- LONGi

# REC Alpha Pure Black Solar Panel

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# Solaria Pure Black Solar Panel

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# Solar System Components

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- Solar Panels - 360 to 400 Watt
- Micro-Converters - One per Panel (Enphase)
- Electrical Panels - 100 AMP 200 AMP 225 AMP
- Battery Backup - 3.3 kW or 10.1 kW (Enphase)







INSPECTION  
MSLC  
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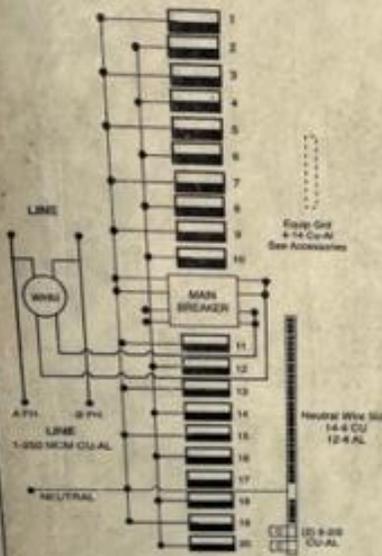
SAL229&



GE Meter Socket Load Center  
Class CTL Panelboard

UL Underwriters Laboratories Inc.  
LISTED  
Class CTL  
Enclosed Panelboard Issue No. C-1724

TYPICAL WIRING DIAGRAM  
40 POLE MAXIMUM



Type 3R Rainproof Enclosure  
Cat No. TSM2020CSCU MOD 2  
TSM2020CFCU MOD 3  
Use only GE type breakers:  
THQP, THQP, THQL, THQL,  
THQL-GPQL, THQL-GPCL OR THQL Breakers

MAIN RATINGS  
120/240VAC, 3-3 WIRE 1-PHASE  
200 AMP MAXIMUM

TIGHTENING TORQUE  
Applies to line, neutral and equipment ground only  
See breakers for their tightening torque.

Screwed screws		Internal hex screws		
Co.	ANG. YOUNG	Size	Min.	Max.
14	12	1/8	100	120
12-10	10	3/16	100	120
8	8	1/4	180	200
6-4	4-4	5/16	240	270
3	3	3/8	340	370

ACCESSORIES  
Equipment ground Aids: TGR12  
Front filler plates: 1/2" width-TF4, 1" width-TGLFP1

This Device Meets E.U.S.E.R.C. Specifications

WARNING: The circuit breakers in this box have been selected to protect the wiring. To avoid damage and loss of protection, do not replace with higher ampere rated breakers. If changes are necessary call a qualified electrical contractor.

Replacement Parts  
Meter Cover: MSLC2020MC  
Full Section Cover: MSLC2020FSC  
Branch Co. Cover: MSLC2020BC  
Branch Co. Street: MSLC2020BSP  
Main breaker: THQP2020M

USE COPPER OR ALUMINUM WIRE  
Use 60°C (140°F) or ampacity rated wire on line neutral terminals. See circuit breakers or their wire temperature rating.

ALUMINUM TERMINATIONS: When connecting aluminum wire in CU/AL tag remove oxide film from wire and protect it with oxide inhibiting compound, such as Alcon or Paralox A-15.

MULTIPLE EQUIPMENT GROUND WIRE SIZE (AWG)  
Maximum multiple wires 24, wire size: 18awg, 20awg, 22awg

Solid		Stranded	
Co.	Al	Co.	Al
20, 18	20, 18	20, 18	20, 18
18, 16 & 14	18, 16 & 14	18, 16 & 14	18, 16 & 14
16, 14 & 12	16, 14 & 12	16, 14 & 12	16, 14 & 12
14, 12 & 10	14, 12 & 10	14, 12 & 10	14, 12 & 10

THE CIRCUIT BREAKERS OF THIS PANELBOARD IS CLASSIFIED AS TYPE THQP, THQP, THQL, THQL-GPQL, THQL-GPCL OR THQL. THESE CIRCUIT BREAKERS ARE NOT TO BE USED IN A BRANCH CIRCUIT APPLICATION.

Meter Socket Rating:  
200 Amps Continuous

RAINPROOF CONTACT STUDS

Terminal Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Terminal Size (Co. No. or Size)	1/2"	3/8"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"

1050621P3 Plainville, CT 06062 Plant SAL Assembled in Mexico

DEWEY PEST CONTROL  
939 EAST UNION STREET  
PASADENA, CA 91366  
(877) DEWEY PEST • (877) 335-3873



# Rightsizing Your System

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- Use **[pvwatts.nrel.gov](http://pvwatts.nrel.gov)** tool to estimate the system size for your roof
- This free tool from National Renewable Energy Laboratory helps you scale a solar system for your rooftop to generate the amount of energy you need a year
- You enter your address, premium for module and fixed roof mount for array and try 4.8 KW to start ( supported by 100 AMP electrical panel)
- This tool will show your estimated production in kWh per year by month
  
- Slide information provided by Rick Hearn



Caution: Photovoltaic system performance predictions calculated by PVWatts<sup>®</sup> include many inherent assumptions and uncertainties and do not reflect variations between PV technologies nor site-specific characteristics except as represented by PVWatts<sup>®</sup> inputs. For example, PV modules with better performance are not differentiated within PVWatts<sup>®</sup> from lesser performing modules. Both NREL and private companies provide more sophisticated PV modeling tools (such as the System Advisor Model at <https://sam.nrel.gov>) that allow for more precise and complex modeling of PV systems.

The expected range is based on 30 years of actual weather data at the given location and is intended to provide an indication of the variation you might see. For more information, please refer to this NREL report: The Emer Report.

Disclaimer: The PVWatts<sup>®</sup> Model ("Model") is provided by the National Renewable Energy Laboratory ("NREL"), which is operated by the Alliance for Sustainable Energy, LLC ("Alliance") for the U.S. Department Of Energy ("DOE") and may be used for any purpose whatsoever.

The names DOE/NREL/ALLIANCE shall not be used in any representation, advertising, publicity or other manner whatsoever to endorse or promote any entity that adopts or uses the Model. DOE/NREL/ALLIANCE shall not provide any support, consulting, training or assistance of any kind with regard to the use of the Model or any updates, revisions or new versions of the Model.

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The energy output range is based on analysis of 30 years of historical weather data, and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

## RESULTS

# 7,329 kWh/Year\*

System output may range from 7,122 to 7,438 kWh per year near this location.

Month	Solar Radiation (kWh / m <sup>2</sup> / day)	AC Energy (kWh)
January	4.46	475
February	5.00	479
March	6.01	626
April	6.60	656
May	6.81	698
June	7.31	715
July	7.57	763
August	7.48	747
September	6.79	664
October	5.77	588
November	4.89	498
December	3.90	418
<b>Annual</b>	<b>6.05</b>	<b>7,327</b>

### Location and Station Identification

Weather Data Source	Lat, Lng: 33.89, -117.94	1.0 mi
Latitude	33.89° N	
Longitude	117.94° W	

### PV System Specifications

DC System Size	4.4 kW											
Module Type	Premium											
Array Type	Fixed (roof mount)											
System Losses	14.08%											
Array Tilt	20°											
Array Azimuth	180°											
DC to AC Size Ratio	1.2											
Inverter Efficiency	96%											
Ground Coverage Ratio	0.4%											
Albedo	From weather file											
Bifacial	No (0)											
Monthly Irradiance Loss	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

### Performance Metrics



# Electric Car Considerations

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These factors impact the number of solar panels required to support an electric car:

- Fuel Efficiency of the EV
- Miles Traveled Per Day
- Wattage of Solar Panels
- Average Hours of Sun Per Day

## Approximate Estimate from Internet for Tesla

- 10,000 Miles a Year ( 28 Miles a Day ) requires about 7.3Kwh/day or about 4 – 400 Watt Panels

# Government Incentives

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- The Federal Tax Credit was increased to 30% and extended to 2032
- Tax credit includes the cost of Solar Panel System, Battery Backup and the cost of an upgrading the electrical panel 200 AMP (Option)
- Tax credit is applied to taxes owed in a tax year
- If the total cost of the system is \$15,000 the credit is \$4500
- If total taxes owed were only \$3,000 then a credit of \$1,500 could be applied to the next tax year

# Solar System Costs

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## **Recent Solar System Cost Estimates for February, 2023:**

- 11 Panel System at 400 Watt/panel for 4.4 kW
- \$15,000 - 30% Fed Tax Credit (\$4,500) = \$10,500
- Battery Backup System - 3.3 kW - \$10,000 (provides 8-10 Hrs.)
- Battery Backup System - 10.1 kW - \$16,000
- Upgrade Electrical Panel from 100 AMP to 225 AMP - \$3,750
- Financing Rate is About 3.99 % Now

# Net Energy Metering 3.0 - April 13

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**The California Public Utility Commission (PUC) voted on**

**December 15, 2022 to replace NEM 2.0 with new NEM 3.0 rules.**

- Californians can be grandfathered into NEM 2.0 by submitting an Interconnection Application to SCE by no later than April 13 2023
- Solar owners under NEW 3.0 will earn about 75% less on excess electricity they push to the grid
- The change is intended for new systems to include battery storage so you can draw the energy from the battery at night versus pay high rates
- Adding a battery system will increase the payback period for the total system

# Installation Timeline – Approx. 3 Months

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- Obtain Quotes/Select Vendor - February 13 - 2 Weeks
- Sign Contract - February 27
- Site Survey Completed - March 13 - 2 Weeks
- Receive Design Plan - April 3 - 3 Weeks
- Submit Permits/Interconnection App - April 10 - 1 Week **(Deadline for NEM 2.0)**
- Installation (1 Day) - May 17 4-5 Weeks
- City Inspection - May 24 - 1 Week

# Potential Return on Investment

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- System Cost of \$15,000 with 20% excess capacity for a homeowner with an electric bill of \$125/ month
- Cost is \$15,000 – 30% Tax Credit = \$10,500
- Cost still due to Edison is about \$12 to \$15 per month (\$180yr)
- Since system has 20% extra energy over current electric bill, the \$125/month would have cost you \$150/month
- Savings per year would be \$1,800 - \$180 = \$1,620
- Return on investment in 6.5 years ( \$10,500 / \$1,620 yr.)

# Solar System Warranties

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- Manufacturer Warranty on Solar Panels of 25 Years
- Manufacturer Warranty on Micro-Converters of 25 Years
  - Installation Co. Warranty on Workmanship of 25 Years
- Installation Co. Warranty on Roof Leaks of 25 Years
- Manufacturer Warranty on Batteries of 10 Years however there is a cycle warranty so it could be less than 10 Years
- Batteries normally have 60% of capacity after 10 Years

# Edison Electricity Rates February 2023

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	<b>WEEKDAYS</b>	<b>WEEKENDS/HOLIDAYS</b>	<b>COST kWh</b>
➤ MID-PEAK	5 PM - 8 PM	5 PM - 8 PM	\$0.52496
➤ OFF-PEAK	12 AM - 8 AM	12 AM - 8 AM	\$0.33552
➤ OFF-PEAK	8 PM - 12 AM	8 PM - 12 AM	\$0.33552
➤ SUPER	8 AM - 5 PM	8 AM - 5 PM	\$0.28816
OFF-PEAK			
➤ SELLING UNUSED ENERGY BACK to EDISON is ABOUT			\$0.05

# Benefits of a Solar System

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- Hedge Against Energy Inflation
- Federal Solar Tax Credit of 30 % for All Related Equipment to 2032
- Solar Energy is Cleaner than Fossil Fuels
- Solar Increases Your Home Value Possibly by 4.0 %
- Lifespan of Solar Panels Has Increased and Warranties are 25 Years

### Stay informed about your annual bill

<b>Your new charges Due monthly</b>	<b>Year-to-date charges: \$52.03 Settled at end of 12-month billing period (on or about 07/23/23)</b>
<i>If you pay only this month's new charges, you may owe a large amount at the end of your 12-month billing period.</i>	<i>You may make additional payments anytime. Payments will not show up in your year-to-date charges. They will create a credit on your account. Any remaining balance forward will be settled against any charges in your 12-month settlement bill.</i>
	<b>You are in billing month 6 of 12.</b>

### Your cost varies by time of day

Winter cost periods (Oct 01-May 31)

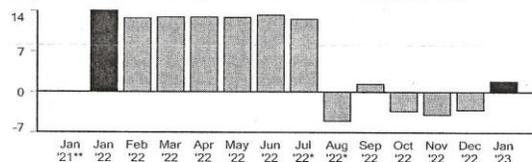
	Weekdays	Weekends & Holidays
Mid peak	5pm - 8pm	5pm - 8pm
Off peak	12am - 8am 8pm - 12am	12am - 8am 8pm - 12am
Super off peak	8am - 5pm	8am - 5pm

### Your past and current electricity usage

	Electricity (kWh)	
Winter Season - Consumption		Your next billing cycle for meter 222012-914916 will end on or about 02/07/23.
Mid Peak	74	<b>Consumption</b> is the total amount of electricity imported from SCE.
Off peak	190	
Super off peak	38	
<b>Total electricity usage this month in kWh</b>	<b>59</b>	
Winter Season - Net Generation		<b>Net generation</b> is the amount of excess electricity exported to the grid by your generating system.
Mid Peak	0	<b>Total electricity usage</b> is your system's total net generation minus your total consumption.
Off peak	0	
Super off peak	-243	

### Your daily average electricity usage (kWh)

2 Years ago: N/A      Last year: 14.28      This year: 1.90



\* Irregular billing period  
\*\* No data available

### Details of your tracked charges

Your rate: TOUD-5-8PM  
Billing period: 12/09/22 to 01/08/23 (31 days)

**Delivery charges - Cost to deliver your electricity**

Baseline credit	30 kWh x -\$0.09086	-\$2.73
Baseline credit	29 kWh x -\$0.09758	-\$2.83
Energy-Winter		
Mid peak	55 kWh x \$0.27438	\$15.09
Off peak	139 kWh x \$0.23481	\$32.64
Super off peak	-164 kWh x \$0.21338	-\$34.99
Mid peak	19 kWh x \$0.26594	\$5.05
Off peak	51 kWh x \$0.22750	\$11.60
Super off peak	-41 kWh x \$0.20669	-\$8.47

**Generation charges - Cost to generate your electricity**

SCE

Energy-Winter		
Mid peak	55 kWh x \$0.25058	\$13.78
Off peak	139 kWh x \$0.10071	\$14.00
Super off peak	-164 kWh x \$0.07478	-\$12.26
Mid peak	19 kWh x \$0.30240	\$5.75
Off peak	51 kWh x \$0.13742	\$7.01
Super off peak	-41 kWh x \$0.10738	-\$4.40
<b>Energy Charge Total</b>		<b>\$39.24</b>

**Additional information regarding your Net Consumption/Generation:**

- Your year-to-date energy charges total as of previous month: \$12.79
- Your current month energy charge total: \$39.24
- Your year-to-date energy charges: \$52.03
- Your year-to-date kWh: -307 kWh

# Solar Wi-Fi App

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## **Your Solar Installation will include a Wi-Fi App for Your Smart Phone**

- Tracks kWh of Energy Produced by Day, Week, Month, Year and Lifetime for the Total System and Each Panel
- Shows Peak Power of Your System at a Given Time of Day
- View Status of All Devices
- Your Solar Company Monitors Your Energy Production

# Next Steps

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## **There is Time to meet the April 13 Deadline**

- Need to select a vendor and sign a contract by February 28
- Do your due diligence in comparing vendors and speak with friends and neighbors who have installed solar systems for their input
- Obtain a commitment from the vendor to meet April 13
- If you have an HOA you need to submit a request for approval which can be done shortly after April 13 once you have the design
- Monitor selected vendor to ensure they meet milestone dates

# Questions ?

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If you have any questions after today's presentation contact:

Russ MacKeand at [rmackeand@yahoo.com](mailto:rmackeand@yahoo.com)