

Humboldt Solar Energy Project

Residents of Northern California have been long-time solar energy pioneers, using solar energy to heat their water and solar electricity to power their homes. Historically, solar electricity has been adopted in remote locations in "off-grid" applications, where electric lines are too expensive or impractical to extend. Today, as prices of electricity continue to rise, and the reliability of energy resources becomes less secure, solar electricity is becoming a realistic option for people who are "grid-connected" to the utility electrical system. Current government initiatives have made producing your own electrical power simpler and more cost effective.

As a part of our mission to help the public become better informed about energy conservation opportunities and to provide information on appropriate alternative energy systems, the Humboldt Energy Task Force has contracted with the Renewable Energy Development Institute of Willits, California, to develop this guide. We hope this guide is valuable to you, as you pursue energy savings, cost savings, cleaner air and fun under the Sun!

**Produced by the Renewable Energy Development Institute (REDI), Willits, CA.
with City of Arcata Staff**

Cover by Denise Homer

Step-by-Step Guide for Solar Electricity

This Guide provides both an overview and a step-by-step approach to understanding how grid-connected solar electricity can provide all or some of the power needs of homes and businesses in Humboldt County. Whether you:

- know solar electricity is for you and are ready to move to the next step,
- are interested in the idea of solar electricity but are unsure whether it will work for you,
- want to know if solar electricity is cost effective, or
- are simply interested in lowering your utility bills,

This guide will help you move through the process, **step-by-step**. Follow the steps to find out how a solar electric system can provide a cost-effective way to provide some or all of your power.

You will use worksheets as you go through this guide. The figures you generate, are labeled with letter codes (A, B, C...etc.) It is important to fill out the worksheets in the order they appear in the guide, since the numbers you generate in one worksheet will be used in following worksheets.

It is important to know that the size and costs of PV systems and the availability of financing options for these systems is dependent upon individual circumstances. Throughout this guidebook we will use examples to illustrate concepts presented. The figures generated in the examples may be quite different than the figures you will generate as you plug your own information into the worksheets.

Common Terms Used in this Guide

- **Kilowatt (kW)** - Basic unit of measuring electricity consumption or generation - equals one thousand watts - the equivalent of ten 100 watt light bulbs or the amount of sunlight falling on one square meter on a sunny summer day at noon
- **Kilowatt-hour (kWh)** - One-thousand watts of electricity consumed or generated in a one hour period
- **Grid-connected** - Electricity is provided to a home or business by the electric utility through the power lines, or the "grid"
- **Interconnection** - Electrical customers may now generate electricity at their location from solar electric systems serving loads on site and feeding excess electricity back into the grid through a grid-connected meter.
- **Net Metering** - The process allowing electric consumers to be credited for electrical power generated at their location at the same rate that the utility charges. On an annual basis an electricity customer can furnish some or all of their electricity, however the utility is not required to pay for or credit any excess electricity beyond a customer's annual bill.
- **Direct Current (DC)** - The type of electricity generated by the solar electric array and many other renewable energy technologies.
- **Alternating Current (AC)** - The type of electricity created by the electric utility and used in homes and businesses for most electrical appliances
- **Electric Load**-The amount of electrical power (in watts or kilowatts) consumed by electrical devices.
- **Photovoltaic (PV) modules**-Device that converts the energy of the sun into electrical energy.
- **Photovoltaic array**- A group of PV modules wired together in an array.

An electronic version of this guidebook with links to further resources is available online at [www. arcatacityhall.org](http://www.arcatacityhall.org). Humboldt County Branch Libraries (see telephone directory) have internet access.

Copies of this guidebook containing printed versions of referenced forms and information are available at the Environmental Services Department of Arcata City Hall, and the Eureka Library.

Call City of Arcata Energy Program Specialist: 707-825-2168 for printed guidebooks or to locate copies of the guidebooks with downloaded forms and information.

Solar Works!

...But Will Solar Electricity Work For Me?

This guide will assess whether solar electricity is appropriate for you and your site. Work through the following chapters step-by-step to discover whether solar electricity will work for you:

- 1. How Much Electricity Do I Use Now and What Does it Cost?**
- 2. How Can I Reduce My Electric Consumption?**
- 3. How Do I Size a Solar Electric System?**
- 4. Is Solar Electricity Cost Effective?**
- 5. What Components Do I Need For a Solar Electric System?**
- 6. Who Installs Solar Electric Systems and Where Can I Get the Equipment?**
- 7. What Permits Do I Need?**

How Much Electricity Do I Use?

The first step in determining whether solar electricity will work for you is to understand how much electricity you use.

Worksheet I: Enter the total kilowatt-hours (kWh) and total cost from each monthly bill. To find your average kWh cost, divide the Total Cost by Total kWh.

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov	Dec.	Total
kWh:	___	___	___	___	___	___	___	___	___	___	___	___	A ___
Cost: \$	___	___	___	___	___	___	___	___	___	___	___	___	B \$ ___
$\$ \mathbf{B} \text{ ___ } \div \mathbf{A} \text{ ___ kWh} = \mathbf{C} \$ \text{ ___ per avg. kWh}$													

Example:

Worksheet I: Enter the total kilowatt-hours (kWh) and total cost from each monthly bill. To find your average kWh cost, divide the Total Cost by Total kWh.

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov	Dec.	Total
kWh:	<u>425</u>	<u>410</u>	<u>400</u>	<u>360</u>	<u>330</u>	<u>300</u>	<u>310</u>	<u>300</u>	<u>300</u>	<u>330</u>	<u>350</u>	<u>400</u>	A <u>4215</u>
Cost: \$	<u>\$ 70</u>	<u>\$ 69</u>	<u>\$ 67</u>	<u>\$ 62</u>	<u>\$ 56</u>	<u>\$ 40</u>	<u>\$ 42</u>	<u>\$ 40</u>	<u>\$ 40</u>	<u>\$ 58</u>	<u>\$ 60</u>	<u>\$ 68</u>	B <u>\$ 672</u>

$\$ \mathbf{B} \text{ 672 } \div \mathbf{A} \text{ 4215 kWh} = \mathbf{C} \$ \mathbf{0.159} \text{ per avg. kWh}$

For detailed information on how to read an electric bill, go to:
http://www.pge.com/001_res_svc/001a3_understand_bill.shtml

How much will I pay for electricity over the next 20 years?

Photovoltaic (PV) modules are warranted for a minimum of 20 years. When looking to invest in solar electricity it is important to examine how much you will be paying for electricity over the next 20 years.

Worksheet II: Using information from Worksheet I fill in the blanks to calculate how much your electricity will cost over 20 years (in total cost, and cost per kWh) with and without a future increase in the price of electricity.

Scenario 1

Cost without price increases: \$ **B** _____ x 20 yrs x 1.00 = **C1** \$ _____

Average cost per kWh : \$ **C1** _____ ÷ (**A** _____ x 20yrs) = a \$ _____ per kWh

Scenario 2

Cost with 3% annual price increases: \$ **B** _____ x 20 yrs x 1.34 = **C2** \$ _____

Average cost per kWh : \$ **C2** _____ ÷ (**A** _____ x 20yrs) = b \$ _____ per kWh

Scenario 3

Cost with 6% annual price increases: \$ **B** _____ x 20 yrs x 1.84 = **C3** \$ _____

Average cost per kWh : \$ **C3** _____ ÷ (**A** _____ x 20yrs) = c \$ _____ per kWh

Example:

*Example calculations are rounded off for simplicity.

Worksheet II: Using information from Worksheet I fill in the blanks to calculate how much your electricity will cost over 20 years (in total cost, and cost per kWh) with and without a future increase in the price of electricity.

Scenario 1

Cost without price increase: \$ **B** 672 x 20 yrs x 1.00 = **C1** \$ 13440

Average cost per kWh : \$ **C1** 13440 ÷ (**A** 4215 x 20yrs) = a \$ 0.159 per kWh

Scenario 2

Cost with 3% annual price increase: \$ **B** 672 x 20 yrs x 1.34 = **C2** \$ 18010

Average cost per kWh : \$ **C2** 18010 ÷ (**A** 4215 x 20yrs) = b \$ 0.214 per kWh

Scenario 3

Cost with 6% annual price increase: \$ **B** 672 x 20 yrs x 1.84 = **C3** \$ 24730

Average cost per kWh : \$ **C3** 24730 ÷ (**A** 4215 x 20yrs) = c \$ 0.293 per kWh

For more information on rate schedules & tariffs go to:
http://www.pge.com/customer_services/business/tariffs/

How Can I Reduce My Electricity Consumption?


Less kWh = Less \$

Energy conservation costs less and is easier to implement than creating solar electricity. Conservation can easily reduce your monthly electricity consumption (in kWh) by 15%*, saving money by reducing the monthly bill and requiring a smaller solar electric system to meet your electric loads.

* savings depend on the conservation measures implemented

Remember: The beauty of grid-connected solar electric systems is that you do not have to generate all of the electricity you use. You can have a large or a small system. However, the more of your electrical demand that you supply with your system, the less electricity you buy from the utility.

Electrical Conservation Measures:

- When buying new electrical appliances, such as a refrigerator or freezer buy energy efficient units. Look for the Energy Star logo: 
- Lighting is one of the largest electric loads in a building. Utilize natural and efficient lighting, like compact fluorescent light bulbs and skylights, to save.
- Rather than using an electric clothes dryer, use a "solar clothes dryer": a clothesline or clothes rack.
- Turn off computer monitors when not in use. You can set your computer to do this automatically through the "power settings" option.
- And of course, don't forget to turn off the lights when you leave the room!

For more energy conservation measures, go to:
www.consumerenergycenter.org/homeandwork/office/index.html OR
http://pge.com/123/pdf_index.s.html OR
Call your local government for energy conservation handouts.

The worksheets below show how conservation measures can reduce your electric bill and the size of a solar electric system.

Worksheet III: Follow the example below to estimate your reduced kWh/yr **after** implementing energy conservation measures.

How many kWh can I save?

With a 15% reduction in electrical usage:

$$A \text{ kWh per yr} \times .15 = D \text{ kWh per yr}$$

What is my total kWh per yr after conservation?

$$\text{New total : } A \text{ kWh per yr} - D \text{ kWh per yr} = D1 \text{ kWh per yr}$$

How much will I save over 20 years by reducing my electrical loads?

$$D \text{ kWh per yr} \times \$ C1a \text{ or } C2b \text{ or } C3c^* \text{ per kWh} = \$ \text{ per year} \times 20 \text{ years}$$

$$= \$$$

* Depending on the scenario you use from **Worksheet II**

Example:

*Example calculations are rounded off for simplicity.

Worksheet III: Follow the example below to estimate your reduced kWh per yr **after** implementing energy conservation measures.

How many kWh per yr can I reduce?

With a 15% reduction in electrical usage:

$$A \text{ 4215 kWh per yr} \times .15 = D = \text{630 kWh per yr}$$

What is my total kWh per yr after conservation?

$$\text{New total : } A \text{ 4215 kWh per yr} - D \text{ 630 kWh per yr} = D1 = \text{3600 kWh per yr}$$

How much will I save over 20 years by reducing my electrical loads?

$$D \text{ 630 kWh} \times \$ C1a^* \text{ .159 per kWh} = \$100 \text{ per year} \times 20 \text{ years}$$

$$= \$2000$$

* Depending on the scenario you use from **Worksheet II**

How Do I Size A Solar Electric System?

The size of your solar electric system depends on how much sun is available at your site, how much area you have for placing a solar system, and how much of your electric load you plan to supply. The more sunlight striking the solar array, the more electricity your system can produce. Of course, the bigger the system, the more electricity you can produce, and the more the system will cost.

How much sun is available at my site ?

Solar energy is a viable energy option for the Humboldt County area.

Coastal Areas: PV can produce approximately 1460* kWh per 100 ft² per year.

Inland Areas: PV can produce approximately 1650* kWh per 100 ft² per year.

** For Humboldt County, at a 30 degree tilt and southern orientation with no shading.*

Determine the amount of sunlight available at your property by mapping your “solar window”.

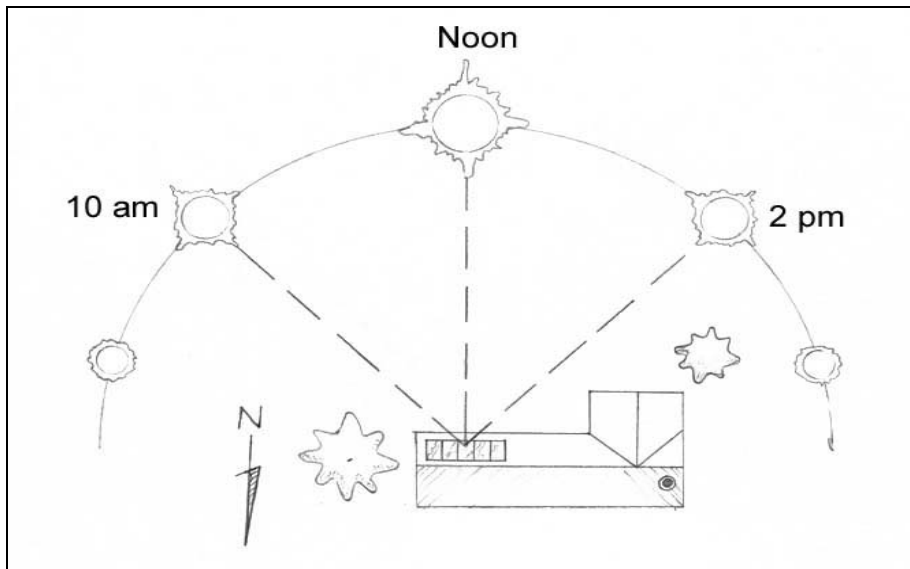


Fig.1: A “solar window” with no shade from 10am-2pm.

Look for obstructions, like trees or telephone poles that may cast shadows between 10 am and 2pm on potential solar array locations. Consider a variety of locations for a solar electric array; the yard, detached buildings, or the roof.

Did you know? Renters have options too! Ask your landlord if you can install portable solar devices, or ask if they would be interested in installing a permanent solar electric system.

If you are considering placing your solar array on your roof, be sure to check the condition of the roofing material and structure. If your roof will need replacing in the next 5-10 years, you may consider replacing your roof before installing a rooftop solar system.

How do I map my “solar window”? Go here for help:
<http://cru.cahe.wsu.edu/CEPublications/eb1857e/eb1857e.html>

Note: Solar panels are tilted at an angle to maximize output. This angle is ideally your geographic latitude + or - 15°. **Ex:** Arcata is at 41° N. The optimal tilt angle for a PV system in Arcata is 41° + or - 15° (26°-56°).

How much area do I have for a solar electric system ?

The amount of space you have is one factor that may determine the size of your solar electric array. Find the best location for your solar electric system. Possibilities include: your roof, a shade structure, pole mount, or window awning.

Worksheet IV. Measure the area(s) you think a solar electric array might work.

I have ____ ft². of space available

$$\frac{\text{____ ft}^2}{100 \text{ ft}^2} \text{ per kW} = \text{E } \text{____} \text{ kW (AC)}$$

*A typical PV system will produce 1 kW AC per 100 square feet.

How much will a **E** ____ kW (AC) solar electric system generate?

Coastal Areas: **E** ____ x 1460 kWh per yr = **E1** ____ kWh per yr

Inland Areas: **E** ____ x 1650 kWh per yr = **E2** ____ kWh per yr

What percentage of my Utility bill will be offset?

Without conservation: **E1** ____ kWh per yr ÷ **A** ____ kWh per yr x 100 = ____ %

With Conservation : **E1** ____ kWh per yr ÷ **D1** ____ kWh per yr x 100 = ____ %

How much will the solar electric system reduce my electric bill in the first year?

Savings: **E2 or E1** ____ kWh per yr x \$ **C** ____ per kWh = \$ ____ per year

Example:

*Example calculations are rounded off for simplicity.

Worksheet IV. The amount of sunny space you have is one factor that will determine the size of your solar electric array. Measure the area(s) where you think a solar electric array might be installed.

I have 140 ft². of space available, what size solar system will fit?

$$\frac{140 \text{ ft}^2}{100 \text{ ft}^2} \text{ per kW} = \text{E } \underline{1.4 \text{ kW (AC)}}$$

*A typical PV system will produce 1 kW AC per 100 feet.

How much will a **E 1.4 kW** solar electric system generate in Humboldt?

Coastal Areas: **E 1.4** x 1460 kWh per yr = **E1 2050** kWh per yr

Inland Areas: **E 1.4** x 1650 kWh per yr = **E2 2300** kWh per yr

What percentage of my Utility bill will be offset?

Without Conservation: **E1 2050** kWh per yr ÷ **A 4215** kWh per yr x 100 = **48** %

With Conservation : **E1 2050** kWh per yr ÷ **D1 3600** kWh per yr x 100 = **57** %

How much will the solar electric system reduce my electric bill in the first year?

Savings: **E1 2050** kWh per yr x \$ **C .159** per kWh = \$ **326** per year

For more information about solar electric system sizing go to:
<http://www.consumerenergycenter.org/renewable/estimator/index.html>

Note: PG&E will not pay for excess annual electricity you produce, so don't oversize your system!

Is Solar Electricity Cost Effective?

Unlike the monthly electric utility bills that will NEVER pay for themselves an investment in a solar electric system will eventually pay for itself. While no one can predict what the price or availability for fossil fuels will be next year, or in five or ten or 20 years, history shows that the price for power has continued to rise since the beginning of the utility era and supplies are limited. On the other hand, free solar power is delivered daily to our location and will be for millions of years to come. All that is needed is a solar electric system to convert the free sunlight into valuable AC and DC electricity for use in homes and businesses.

Introduction to Economic Analysis

The cost -effectiveness of an individual solar electric system is completely dependent upon individual circumstances such as electric demand, site appropriateness, and financing capabilities.

You now have some idea about the amount of electricity you use, how and why you might reduce your electrical usage, whether your site will work for solar, and what size system you could install if you maximized the available sunlit area. You have also gained an understanding of how much you may pay for electricity in the future.

This information, combined with knowledge about available rebates, tax incentives, and financing opportunities, can help you to decide if solar electricity is cost-effective for you.

Rebates

The following rebate programs are offered on a first-come first-served basis until funds are expended. These rebates help reduce the initial cost of a PV system. Many system dealers and contractors will assist with the completion of this paperwork.

California Energy Commission (CEC) "Buydown" Program

Grid-connected solar electric systems up to 1MW are eligible for a one-time cash incentive of \$4,500 per kW (AC) up to 50% of the installed system cost. Maximum payment of \$2.5 million. Funding is currently available for systems up to 10 kW for homes

and businesses. Complete Buydown Reservation forms and submit for approval of funds. When system is installed and the final inspection is completed file for payment of the Buydown (allow 30 to 60 days).

California Public Utilities Commission

Grid-connected solar electric systems from a minimum of 30kW up to a maximum of 1.5MW are eligible for a one-time cash incentive of \$4,500 per kW (AC) up to half of the system cost. Reservations are made through PG&E. Once installation is complete and the building permit is signed off, apply for the payment of the rebate.

CEC Solar Water Heater and Battery Grant

Grid-connected homes are eligible for up to \$750 in a cash payment to assist with the costs of a solar water heater or a grid-connected solar electric system battery backup.

Tax Credits

Federal Business Energy Tax Credit - Form 3468

Commercial solar electric system applications, both on- and off-grid, are eligible for a tax credit of 10% of the total installed cost minus any cash incentives.

California Solar Energy Tax Credit - Form 3508

Residential and commercial solar electric system applications both on- and off-grid are eligible for a tax credit of 15% of the total installed cost minus any cash incentives or other tax credits. The solar electric system must be not more than 200 kW (AC) and the credit may be taken for as long as 7 years after the initial filing year.

Federal Depreciation - Form 4562

Business use of solar electric systems qualifies for 5 year Modified Accelerated Cost Recovery System (MACRS) depreciation deductions. Basis for depreciation is the cost minus all cash incentives and one-half of the Federal Business Energy Tax Credit. The cash value of the deduction is the adjusted basis amount times the federal tax rate.

California Depreciation Schedule is part of a business tax return. The basis is adjusted by deducting the cash incentives and state tax credit. Non-corporate business taxpayers follow the above Federal 5 year MACRS process. Corporate taxpayers must use a 12 year life and either a 200% Double Declining Balance or Straight-line Method for taking deduction.

To find out more about the available rebates go to
<http://www.consumerenergycenter.org/rebate/index.php>

Financing a Solar Electric System

It is important to understand that when you purchase and install a solar electric system with cash, you are in essence pre-paying your electric bills for at least the next 20 years. A typical solar electric system will last for at least 20 years.

Paying cash for a solar electric system may not be preferred or realistic for everyone. The benefit of financing solar electric systems is that there is little or no initial cost and the monthly loan payment basically replaces your electric bill. Your monthly payments will not change over the life of the loan unlike **electricity cost over time**.

When factors such as inflation are included, the **time value of money** changes too, resulting in the value of your monthly loan payment decreasing over the life of the loan. In other words, \$1000 today will have a lower value 20 years from now.

The following worksheets illustrate how to calculate the total cost and cost per kWh produced (for 20 years) for a residential or commercial solar electric system, including rebates and tax incentives.

The examples following the worksheets present scenarios for financing a residential or business solar system. The figures used are highly case specific, and may be different than the figures you will come up with using your own site and financial information. You will need to discuss your specific situation with a lender to discover the financial options and detailed cost break-downs that would apply for you.

Residential System

Worksheet V: Residential Solar Electricity Cost- Follow the example to calculate your total cost and cost per kWh for a solar electric system.

How much will the installed solar electric system cost?

Total Installed Cost: \$ _____¹ per kW x **E** _____² kW (AC) = **F** \$ _____

How much of a rebate am I eligible for?

Rebate: \$4,500 per kW x **E** _____² kW (AC) (50% maximum) = **G** -\$ _____

How much is the CA tax credit worth

(Installed Cost) - (Rebate)

CA Tax Credit: (\$ **F** _____ - \$ **G** _____) x .15 (15%) = **H** -\$ _____

What's the total cost & total kWh cost over 20 years?

\$ **F** _____ - \$ **G** _____ - \$ **H** _____ = **I** \$ _____
 \$ **I** _____ ÷ (**E1 or E2** _____) x 20 yrs = \$ _____ per kWh

¹ Prices range from \$8,000 to \$12,000 per kW (AC)

² Solar System Size - See Worksheet IV

Residential Example:

*Example calculations are rounded off for simplicity.

Worksheet V: Residential Solar Electricity Cost -Follow the example to calculate your total and cost per kWh for a solar electric system.

How Much will the installed solar electric system cost?

Total Installed Cost: \$ 9,000¹ per kW x E 1.4² kW (AC) = **F** \$ 12,600

How much of a rebate am I eligible for?

Rebate: \$ 4,500 per kW x E 1.4² kW (AC) (50% maximum) = **G** -\$ 6,300

How much is the CA tax credit worth?

CA Tax Credit: $(\text{Installed Cost}) - (\text{Rebate})$
 \$ F 12,600 - \$ G 6,300 x .15 (15%) = **H** -\$ 945

What's the Total Cost & Total kWh cost over 20 years?

\$ F 12,600 - \$ G 6,300 - \$ H 945
 \$ I 5,355 ÷ (E1 2150) x 20yrs

= **I** \$ 5,355
 = \$.13 per kWh

¹ Prices range from \$8,000 to \$12,000 per kW (AC)

² Solar System Size - See Worksheet IV

Residential Financing Examples:

Compare the cost per kWh generated in the following cases to results of C1, C2, and C3:

Case Study 1

Unsecured Loan:

Fannie Mae Energy Loan: (Finance solar electric system with an unsecured 10 yr loan)

Loan amount = \$ 5,355 Total Cost of System

Loan Payment At 9.9% for 10 yrs = \$ 8,678 Total payments = \$ 72 per mo.*

Electric Savings* =

(PV system output 2050 kWh x Cost of electricity \$.159 per kWh) ÷ 12 months = \$ 27 per mo.*

Net Monthly Payment = **Loan Payment** - **Electrical Savings**

Average kWh Cost for 20 years = \$8,678 ÷ (20 yrs X 2050 kWh per yr)

= \$ 45 per mo.*
 = \$.212 per kWh*

Case Study 2

Secured Loan:

Real Estate Mortgage Loan: (add cost of solar electric system to 30 year mortgage)

Loan Amount = \$ 5,355 Total Cost of System

Loan Payment At 7% for 30 yrs = \$ 12,946 total payments = \$ 36 per mo. *

Electric Savings* = 30 yr total at \$.159 per kWh - = \$ 27 per mo. *

Interest Deduction = 30% State and Federal tax rate - = \$ 6 per mo. *

Net Monthly Payment = **Payment** - **Savings and Deduction**

Average kWh Cost for 30 years = \$12,946 ÷ (30 yrs X 2050 kWh per yr)

= \$ 3 per mo. *
 = \$.211 per kWh*

* These numbers are specific to the case study ONLY. Your loan payment, savings, and net monthly payment will vary with choice of loan, specific location and choice of equipment. **Remember: You will still be paying your gas bill!**

Business System

Worksheet VI: Commercial Solar Electricity Cost-Follow the example to calculate your total cost and kWh cost of solar electric system.

How much will the installed solar electric system cost?

Installed System Cost: \$ _____¹ per kW x **E** _____² kW (AC) = **J** \$ _____

How much of a rebate am I eligible for?

Rebate: \$ 4,500 per kW x **E** _____² kW (AC) (50% maximum) = **K** - \$ _____

How much is the Federal tax credit worth?

Fed Solar Tax Credit: $\frac{\text{(Installed Cost)} - \text{(Rebate)}}{\text{\$J}} - \text{\$K} \times 10\% =$ = **L** - \$ _____

How much is the CA tax credit worth?

CA Solar Tax Credit: **\\$J** - **\\$K** - **\\$L** x 15% = - \$ _____

How much is the Federal Depreciation?

Fed Depreciation: Adjusted basis** x 30% federal tax rate = - \$ _____

How much is the State Depreciation Worth?

CA Depreciation: Adjusted basis** x 5% state tax rate = - \$ _____

What's my net cost after the incentives over 20 years?

Subtract all rebates and tax incentives from the system cost = \$ _____
\$ _____ per kWh

¹ Prices range from \$7,000 to \$11,000 per kW (AC)

² Solar System Size- See Worksheet IV

** Adjusted basis for Federal Depreciation is the Installed Cost **minus** all of the Rebate and **one-half** of the Fed Solar Tax Credit. The adjusted basis for CA Depreciation is the Installed Cost **minus** the Rebate and all of the CA Solar Tax Credit.

Business Example:

*Example calculations are rounded off for simplicity.

Worksheet VI: Commercial Solar Electricity Cost-Follow the example to calculate your total cost and kWh cost of solar electric system.

How Much will the installed solar electric system cost?

Installed System Cost: \$ 8,000¹ per kW x E 10² kW (AC) = **J** \$ 80,000

How much of a rebate am I eligible for?

Rebate:=\$ 4,500 per kW x E 10² kW (AC) (50% maximum) = **K** - \$ 40,000

How much is the Federal tax credit worth?

(Installed Cost) - (Rebate)

Fed Solar Tax Credit: \$ J 80,000 - \$ K 40,000 x 10% = **L** - \$ 4,000

How much is the CA tax credit worth?

CA Solar Tax Credit: \$ J 80,000 - \$ K 40,000 - \$ L 4,000 x 15% = - \$ 5,400

How much is the Federal Depreciation?

Fed Depreciation: \$ Adjusted basis** 38,000 x 30% federal tax rate = - \$ 11,400

How much is the State Depreciation Worth?

CA Depreciation: \$ Adjusted basis** 34,600 x 5% state tax rate = - \$ 1,730

What's my net cost & the kWh cost after the incentives over 20 years?

Subtract all rebates and tax incentives from the system cost = \$ 17,470
\$.053 per kWh

¹ Prices range from \$7,000 to \$11,000 per kW (AC)

² Solar System Size- See Worksheet III

** Adjusted basis for Federal Depreciation is the Installed Cost minus all of the Rebate and one-half of the Fed Solar Tax Credit. The adjusted basis for CA Depreciation is the Installed Cost minus the Rebate and all of the CA Solar Tax Credit.

Financing Case Study for an Equipment Lease

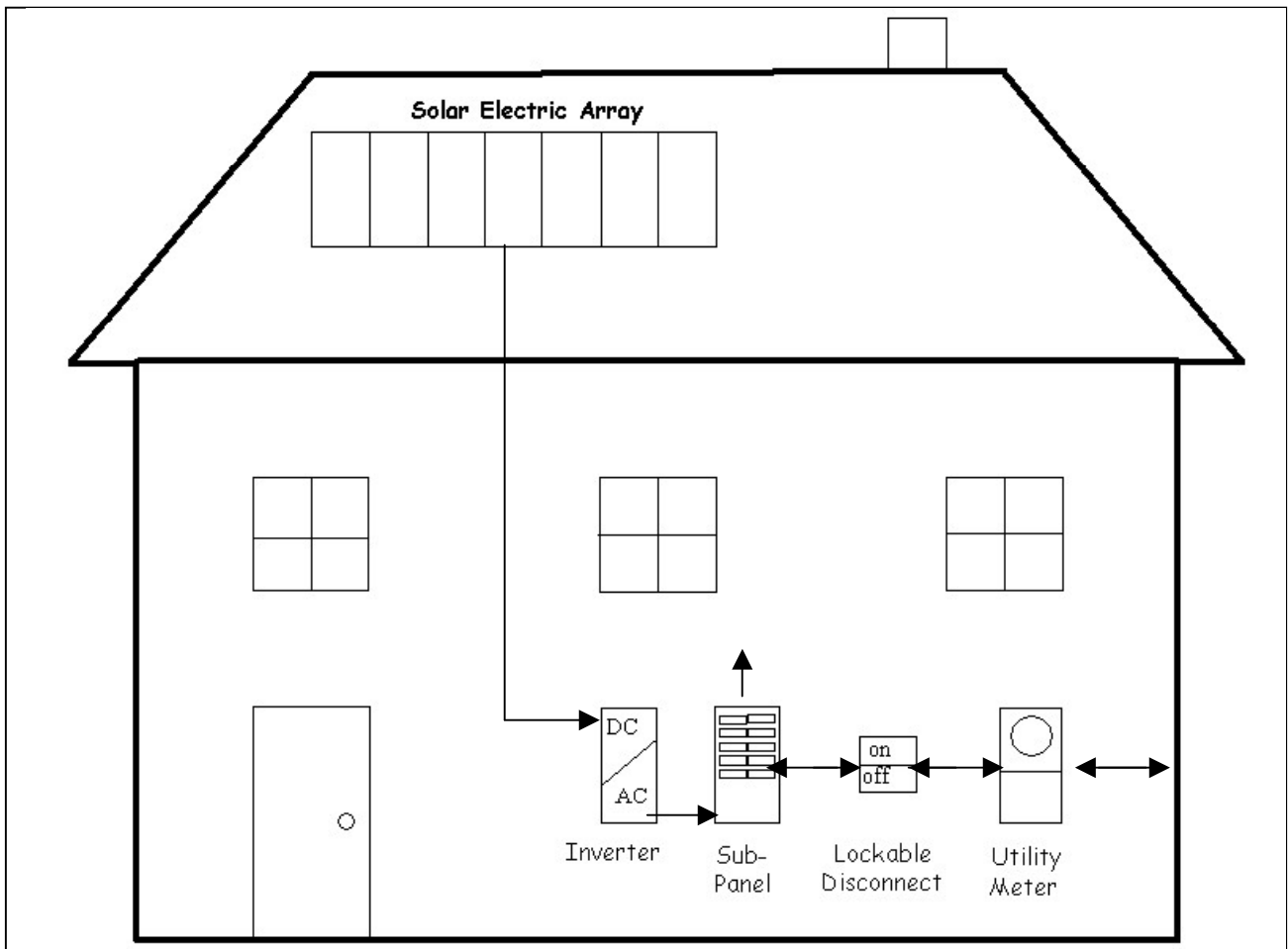
Lease Amount	= \$ 40,000 (after 50% cash rebate)	
Loan Payment At 9% for 15 years	= \$ 74,340 (Total Payments)	= \$ 413 per mo.*
Savings from Credits & Deductions (avg. over 15 yr)	-	= \$ 140 per mo.*
Electrical Savings*	-	= \$ 200 per mo.*
Net Monthly Payment		= \$ 73 per mo.*
Average kWh Cost	= \$ 39,791 ÷ (15 yrs X 14,600 kWh per year)	= \$.182 per kWh

*** These numbers are specific to the case study ONLY. Your loan payment, savings, and net monthly payment will vary with choice of loan, specific location and choice of equipment. Remember: You will still be paying your gas bill!**

What Components Do I Need?

A solar electric system is composed of:

- Solar Electric Array made up of Photovoltaic (PV) Modules that convert Sunlight to DC electricity
- Inverter(s) to convert DC electricity to AC electricity
- Visible and Lockable Disconnect Switch for isolating the system from the Utility for safety reasons during servicing and repair.
- Meter to measure electricity generation and consumption.



To find out which components are certified by the State of California go to www.consumerenergycenter.org/buydown/equipment.html

Who Installs the System & Where Can I Get The Components?

Before buying any equipment, you must decide whether you, the property owner, or a licensed contractor will install the grid connected solar electric system.

Owner Install?

If an owner will install the system, they will need to create and fill out all necessary documents of the system specifications and provide the necessary drawings as well as purchase all of the equipment. Installing the solar electric system yourself may reduce the total cost but requires a fair amount of knowledge about working with electricity. Solar electric systems can produce dangerous shock potential. Make safety the first priority.

Contractor Install?

The Contractor will need to have an A, B, C-10, or C-46 license to install solar electric systems. The solar system will need to have a full five-year warranty on parts and labor, to be eligible for a rebate. Hiring a contractor can streamline the permit process, assist with all the necessary paperwork, and ensure safe installation of the solar electric system.

For a complete list of licensed contractors within California go to
<http://www.consumerenergycenter.org/buydown/installation.html>

For a list of retailers selling solar electric & other renewable energy equipment go to:
<http://www.consumerenergycenter.org/buydown/retailers.html>

What Permits Do I Need?

In order to safely install a solar electric system and interconnect to the Utility grid you must get permission from the City or County, and the Utility. The City and County require building permits, while the Utility requires an "interconnection agreement" to install a grid-connected solar electric system.

1. Apply for a Building Permit. If you are within city limits, go to the City building department. If you are outside the city, go to the County building department.

City Permits: Arcata: 822-5956 Eureka: 441-4155, Fortuna: 725-7600, Ferndale: 786-4224, Blue Lake: 668-5655, Rio Dell: 764-3532

Humboldt County Permits: 445-7245

2. Apply for an "Interconnection Agreement" Required By PG&E. Note that there are different requirements for systems over 20 kW.

For more information about Interconnection Agreements, go to:
http://www.pge.com/gen/retail_gen_net_metering.shtml

3. Install the System taking all safety precautions to prevent electrical shock from the utility or the photovoltaic modules

4. Get the Final Inspection & Signoff from the building department and then from PG&E. NOTE: For safety reasons NO electricity should be generated into the grid until the Utility company has approved the system. Wait for the sun to shine and then **Watch your meter run backwards making valuable solar kilowatt-hours worth real money!**