

# Table of Contents

<b>Introduction .....</b>	<b>5</b>
Case Study: Cayenne Engel, Henderson Nevada .....	6
<b>Chapter 1: Why people go solar .....</b>	<b>8</b>
I. Financial Benefits .....	8
Solar stabilizes energy costs over time.....	8
Solar adds value to your home .....	9
Solar adds credit to your utility account for future use .....	9
Going solar now (rather than later) leverages financial incentives and tax credits.....	10
II. Environmental Benefits .....	10
Solar power is emissions/pollution free .....	10
Solar power provides clean energy for the next generation.....	11
<b>Chapter 2: How solar power works .....</b>	<b>12</b>
I. How light becomes electricity.....	12
II. Watts, kilowatts, and kilowatt-hours.....	13
III. AC and DC Watts.....	14
IV. What are the components of a solar power system?.....	15
The panels.....	15
Mounting hardware for the panels .....	17
Racks to hold the panels at the proper angle.....	18
A DC-to-AC inverter or microinverters .....	19
An electricity meter .....	20
Performance-monitoring equipment .....	20
V. How much energy does the sun make?.....	21

- VI. Do solar panels work in cloudy weather? ..... 23
- VII. How long do solar panels last? ..... 24
- VIII. What Could Go Wrong With a Solar Installation? ..... 26
  - Production Failure ..... 26
  - Electrical Failure..... 28
  - Structural Failure ..... 29
- IX. How Can I Tell if My Solar Panels are Working? ..... 30
  - With One Inverter..... 31
  - With Micro-Inverters ..... 32
- Chapter 3: The step-by-step process of going solar..... 33**
  - I. Step one: Getting quotes ..... 33
    - How to avoid problems with the assessment: ..... 34
  - II. Step two: Design and Permitting ..... 34
  - III. Step three: Installation ..... 35
  - IV. Step four: Commissioning and Interconnection ..... 35
  - V. Step five: Maintenance ..... 36
- Chapter 4: How much it will cost..... 37**
  - I. Is solar right for me, in my house, right now? ..... 37
  - II. Are there any incentives out there to make solar cheaper? ..... 38
    - Rebates ..... 39
    - Tax Credits ..... 39
    - Property Tax Exemptions..... 39
    - Sales Tax Exemptions..... 39
    - Performance Payments and SRECs..... 39
  - III. What can make solar more expensive for me? ..... 40
  - IV. What sized system do I need? ..... 41
  - V. Will my home be worth more after I install solar? ..... 44
  - VI. What is the rate of return on an investment in solar? ..... 45
  - VII. Are there any good examples of people making money on home solar? ..... 45
  - VIII. How else can I save money on energy costs?..... 46
  - IX. How am I going to pay for all this? ..... 47

Pay outright .....	47
Take a loan.....	48
Lease .....	49
Sign a Power-Purchase Agreement (PPA).....	49
<b>Chapter 5: Solar Myths: Busted.....</b>	<b>51</b>
Myth #1: Solar is too expensive.....	51
Myth #2: Even if it's less expensive, I don't have the upfront money. ....	51
Myth #3: Solar will get cheaper, so I might as well wait. ....	51
Myth #4: Making solar panels causes more pollution than the clean energy they produce. ....	52
Myth #5: Solar panels will cause more harm to the environment when they're thrown away in 25 years.....	52
Myth #6: Solar will look ugly on my roof.....	52
Myth #7: Solar is hard to maintain. ....	54
Myth #8: I live in a cold, cloudy place, so solar doesn't work. ....	54
Myth #9: Solar would be a lot cheaper if I just install it myself .....	55
Myth #10: Off-grid is the way to go.....	57
Myth #11: Thieves will steal your solar panels.....	58
Myth #12: Technology will change and leave my installation behind.....	59
Myth #13: States will change their solar policies and I'll have spent thousands with no way to make money on my investment. ....	59
<b>Chapter 6: Going Solar With Other People Around .....</b>	<b>60</b>
I. Working with your HOA.....	60
Step 1. Know Your Rights! .....	60
Step 2. Get to Know Your HOA. ....	62
Step 3. Negotiate and Reach a Compromise .....	62
Step 4. Don't Tolerate Bullying .....	63
II. Your Solar Bill of Rights .....	63
<b>Chapter 7: Connecting to the grid .....</b>	<b>66</b>
I. Using the grid as your battery .....	66
II. More on Net Metering.....	68
III. Take advantage of Time-of-Use .....	69
IV. Take advantage of tiered rates .....	70

<b>Chapter 8: Selecting your installer .....</b>	<b>71</b>
<b>Chapter 9: Solar system maintenance .....</b>	<b>74</b>
General Maintenance .....	74
Rainy Days.....	75
Snowy Weather .....	75
Windy Conditions .....	76
<b>Chapter 10: Selling your house with solar .....</b>	<b>77</b>
I. Are homes with solar really worth more? .....	77
<b>Chapter 11: Going Solar Without the Roof .....</b>	<b>79</b>
I. Community Solar.....	79
II. Invest in Solar.....	81
<b>Glossary .....</b>	<b>82</b>
<b>Infographics .....</b>	<b>85</b>
50 States of Solar Investment Returns .....	85
Do solar panels work on cloudy days?.....	85
How long do solar panels last? .....	85
PACE Financing is helping more people go solar .....	86
How solar can bring a city closer to 100% renewable energy .....	86
Top 5 Solar Incentives.....	86

## Introduction

Welcome to the Solar Power Rocks Ultimate Guide to Powering Your Home with Solar. We've compiled this document as a comprehensive guide to the process of installing solar on a home in the United States of America. It is a companion to our website, <https://solarpowerrocks.com>, the best place on the web for people who are considering solar. While this guide has a lot of helpful information, the site is updated regularly with the most current information about state solar policy and incentives and helpful tips for homeowners who want to know if solar can work for them.

This guide explains the whole process of going solar and contains information about topics as broad as what a kilowatt is and how solar panels work and as specific as how to work with a Homeowners' Association to get approval for your solar project. Because of its comprehensive nature, readers should feel free to skip to sections that are applicable to their unique situation, but it might be a good decision to read it cover-to-cover, to ensure you know what to look for and what to expect.

Since you've chosen to receive this document, you're probably interested in seeing how solar power can work for you. You might be an environmentally-minded person looking to do good for the planet by offsetting your usage of fossil fuels, or you might be a money-minded person who's interested in solar as an investment vehicle. No matter what your reasons, solar is a good choice for a lot of people, and a good investment in almost any state in the union.

And if you know you're interested in solar and you're ready to take the next step, we can help connect you with solar experts in your area. Simply [fill out our form](#) and we'll have a solar expert contact you.

If you feel lost at any point during reading this book, a glossary of terms is provided at the end for your convenience. Please enjoy, and welcome to the world of solar!

Let's take a look at a case study to see how solar can work:

## Case Study: Cayenne Engel, Henderson Nevada



Cayenne Engel wasn't sure if she could afford to install solar, but she was really interested, so she began to do some research, which led her to Solar Power Rocks. When she found out that there were companies interested in installing solar on her home for free, her initial doubts about affordability were erased. As she dug deeper though, she came to the realization that purchasing a system outright was better for her than leasing.

For Cayenne, going solar was an ethical decision. She didn't need it to save her a ton of money, though it's estimated that she'll see a profit once the loan she took out to pay for the system is paid off. "I was interested primarily for environmental reasons," she told us. "I just needed it to be something that didn't cost a lot more than what I was currently paying."

That ended up being more feasible for Cayenne than she expected. Though she'd initially looked at leasing options, owning soon began to look like the best way for her to go solar. "Due to how many people were going with the leasing option, I kept reading about customer service issues and backups due to high demand."

Cayenne strongly preferred choosing a local installer rather than a national leasing company, and after getting several free quotes for system installation, she selected Robco Electric because they featured a good balance between strong customer service and cost. She emphasized she

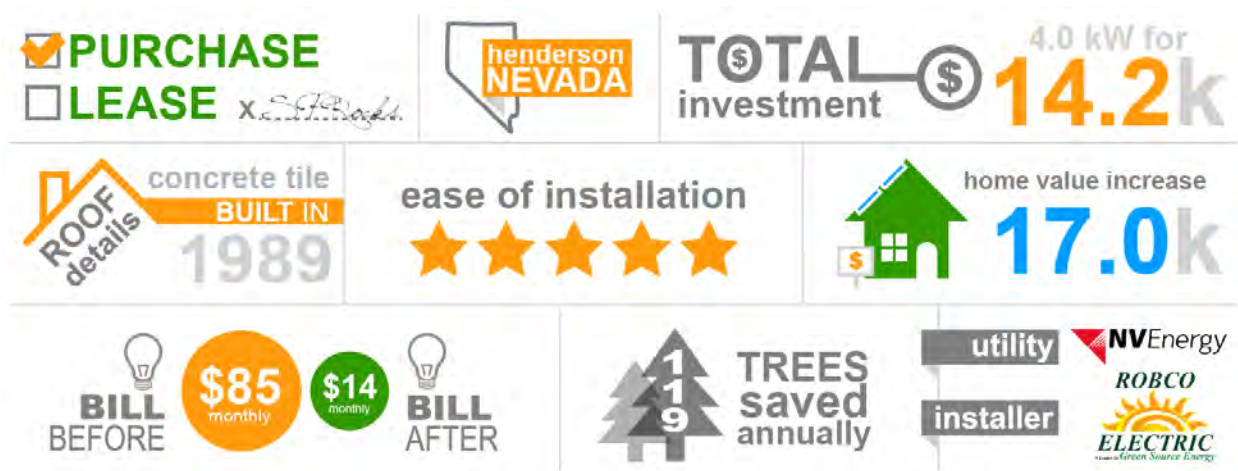
took the time to do the research, because she wanted to get it right. And though it hasn't been long since her panels were installed, Cayenne is happy with her choice, saying, "The customer service is excellent and I was surprised at how fast everything moved."










Once Cayenne selected an installer and arranged for financing, her next potential roadblock was her HOA. She wondered if they would have an issue with her slapping solar panels on her roof. Fortunately, Cayenne's fears were quickly dispelled. After getting word from her neighbors that they had no issue with Cayenne's choice to go solar, she moved forward with the process. In fact, her neighbors, even those she doesn't know well, are asking about her solar experience.

Cayenne's story shows that it's possible for a homeowner to start producing their own energy from the sun without breaking the bank or trying to save up until a magic number is reached. Despite her initial doubts about affordability, Cayenne took the time to see if she could make it work and now she's producing clean energy that reduces her electric bill and will make her money in the long term.

Cayenne's story has it all—a challenge to overcome, a dashing heroine to overcome it, and a happy ending. She's just one of the millions of Americans whose lives have been improved because they embraced solar. Sometimes, it's just that easy.

If you'd like to see whether you can be the next happy American on that list, read on to find everything you ever wanted to know about solar, and then some.



<input checked="" type="checkbox"/> <b>PURCHASE</b> <input type="checkbox"/> <b>LEASE</b> <i>x SFRough</i>		<b>TOTAL investment</b> \$ <b>14.2k</b> <small>4.0 kW for</small>
 <b>concrete tile BUILT IN 1989</b>	<b>ease of installation</b> 	 <b>home value increase 17.0k</b>
 <b>BILL BEFORE \$85 monthly</b>	 <b>BILL AFTER \$14 monthly</b>	 <b>19 TREES saved annually</b>
<b>utility</b> 		<b>installer</b> 

# Chapter 1: Why people go solar

Solar power is not just for treehuggers and back-to-the-landers anymore.

For many years after commercially-produced solar panels became available, they were accessible only to very wealthy environmentalists and survivalists or very willing-to-spend-their-life's-savings environmentalists and survivalists. But with modern technological advancements in the design and manufacturing of solar panels, equipment costs have come way down.

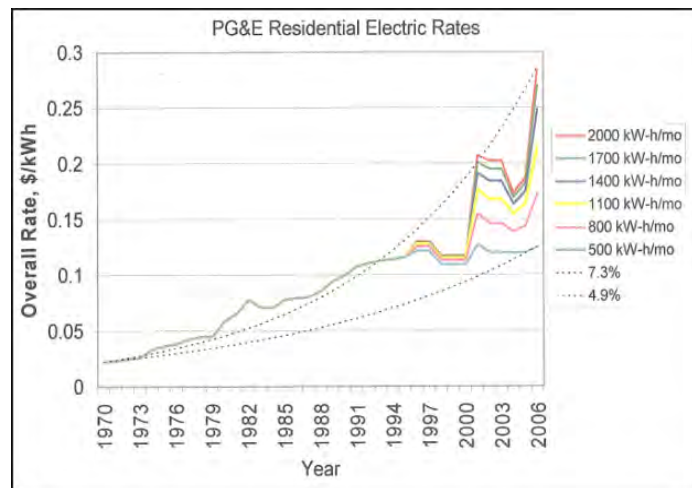
Some of those old treehuggers even ran for office, and now the federal government and state legislatures have also recognized the benefits of solar power by offering some helpful rebates and tax incentives. With lower materials costs and the aforementioned incentives, solar has become a great investment all across the United States, often outperforming the major stock indices. Here are the reasons people go solar today:

## I. Financial Benefits

It's a pretty simple calculation: solar panels have come way down in price while utility rates have gone up. Here's how financial benefits add up to big returns for solar investors:

### Solar stabilizes energy costs over time

Current utility rates are just that. They are *current* – meaning they have been a lot lower in the past and there is no reason to believe they will be decreasing any time in the near future, unless you start generating some of your own power. Below, you can see the average cost of energy per kilowatt-hour in California. Over the past 30 years, this rate has increased at 6.7% per year. Look for this number to increase all over the U.S. in the coming years because of higher coal and natural gas prices and legislation to tax or penalize carbon emissions, among other things.





By getting ahead of the curve and going solar, you can lock in future energy costs over several decades that are significantly lower than you are currently paying. Here's a more practical example of why going solar for this reason makes a lot of sense. As you probably know, airlines have had problems maintaining their profitability after fuel hikes early in the new millennium. Many are charging for additional bags, and some are now charging for water. Water! Well, in the mid-2000s, United filed for bankruptcy, Delta almost tanked, and others like American and US Airways had to merge with each other to stay afloat.

Southwest was the only airline that made it through this continuing price surge. While other airlines were failing, they consistently reported their high profits. Why? They locked in the price of fuel years ahead of time at a good rate by buying fuel futures.

Sunshine is free. Installing solar panels you purchase with cash is like buying fuel futures for the next 25-plus years. Don't be the next United Airlines. Even if you don't have pensions to sever, the money you save can be used for other things—like your bottom line, groceries, or your next tank of gas.

### **Solar adds value to your home**

Having solar equipment on your home increases its value. How much? Appraisers are still getting their act together on this one and they may vary a bit from one to another, but according to The Appraisal Journal, [solar energy adds \\$15-\\$20 times yearly energy savings to resale value](#). Let's say you own a home in Pennsylvania and you install a solar power system on your roof, and it ends up saving you \$1,000/year in electricity bills. That means your home would increase in value \$15,000-\$20,000. That's as much as the system will cost, so your initial investment is recouped immediately and pays a \$1,000 dividend the first year. Instead of getting upset every time your utility raises power rates, you get a raise instead!

And we aren't just blowing smoke, here. Long-term studies of home sales in California and Colorado have shown strong correlations between solar installations and increases in home value. Homes with solar even sell faster than those without. Thanks for doing all that hard work, government researchers!

### **Solar adds credit to your utility account for future use**

Many states have [net metering](#) guidelines they must follow when home or business owners install energy-producing equipment. Net-metering does not involve people from the public works department in orange hard hats coming to measure the height of your basketball hoop net with meter sticks. Instead, your power company is obliged to purchase power you generate back from you at a wholesale rate.

So, let's say you've got some solar panels up on your roof for the summer but you decide to go on and take a vacation for a month or so. All the power that is being generated gets credited to your account. At the end of the year, if you use as much power as you feed back into the grid, your power bill is almost nothing.

## **Going solar now (rather than later) leverages financial incentives and tax credits**

Incentives and tax credits for solar are made available to homeowners in many states (check your state's page at our site, <http://solarpowerrocks.com> for further details). In some areas, you can deduct up to 50% of the cost of your solar power system (including installation!). But these tax credits are not permanent. In fact, some states are phasing out the rebates and credits they offer because they've already helped so many people get solar on their roofs. In almost all states, incentives will be stepped down over the next several years until they expire—now's the time to lock them in.

Even after electric rate prices make solar more cost effective on its own, people who buy now will have purchased the same technology as the latecomers, but the government will have paid up to half the price. These rebates are already paid for out of your taxes and utility bills... TAKE THEM BACK!

The available rebates and tax credits are the main reason that going solar makes so much sense financially. In some states, the payback time for a new solar power system is as little as 4 to 6 years. Since a system is expected to function at a high level of performance for at least 25 years, the energy savings over that time add up to thousands and thousands of dollars, representing internal rates of return (IRRs) of 15% or more, double that of a long-term investment in the stock market.

## **II. Environmental Benefits**

### **Solar power is emissions/pollution free**

Unlike burning coal, oil, or even wood, solar power is clean. That is to say, there are no residual accumulating pollutants after a day's worth of energy generation. Whether you are an eco-cognizant carbon warrior, or someone who does not know the difference between a carbon footprint and a criminal fingerprint, you'll be glad to know installing solar equipment on your property lessens the detrimental impact you have on our environment.

There are some curmudgeons out there that will argue the carbon cost of producing the panels outstrips the advantage of them, but they are flatly wrong. According to the folks at the National

Renewable Energy Laboratory, who do complex carbon footprint calculations for a living, those panels have a net-zero carbon footprint after only 1-4 years on your roof, and that number is decreasing with new production methods. After that, you'll be consuming significantly less energy produced by processes which release CO<sub>2</sub> into the atmosphere, thereby doing your part to ameliorate our global warming and pollution problems. Go you!

### **Solar power provides clean energy for the next generation**

Your home or business will probably be around for some years to come; even after you pass on to whatever you believe lies ahead. The equipment you install now has long-term warranties on it—many solar panel companies provide insurance-backed warranties of up to 25 years. There are solar panels installed 50 years ago that still produce. The people who inhabit your home or work in your buildings in 2050 will be thankful you installed this equipment.

And won't somebody think of the children!? You might be interested in solar because you realize that the past few generations have made a big, dirty, industrial-polluted mess of things, and you want to do something to change it. The incentives are out there to help you realize that dream, and you can make quite a few bucks on the deal, too.

By conserving and installing solar power, you provide a model for others in your community to follow. You will be AMAZED at how much more receptive people are to solar when someone on their block has panels on their roof. It's also a great way to teach your children or those in the neighborhood about energy, electrical engineering, and the awesome power of the sun.