







Solar Energy 4U – Making Solar Make Sense

An Alternative Source of Energy

*Please feel free to distribute links to this downloadable ebook to friends and family that may be interested in solar energy. By spreading the facts we hope to encourage a wider understanding and adoption of solar power generation:

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Introduction

Solar energy is one of the most important resources with most industries relying upon it heavily. For a second, just imagine how life would be like without the sun. How would it be without the solar power and the heat energy that is derived from it? In fact, life itself would not be possible. Solar power is what makes our world run the way it does; without it, we would eventually lose all the resources that help us to grow and prosper in a constantly changing world.

Many people have a vague concept about solar power and its uses. If you have never thought about upgrading your domestic power systems, then this book is going to be great for you; it will dissect the concept of solar power and help you to understand what it is and how it runs.

In addition, this book will focus on solar energy and it can be used in our everyday lives. The book will aim to provide answers to specific questions, including what solar power really, is, how it is derived, and how we can achieve it. The later section of the book will help you to understand how to use and preserve solar energy.

Furthermore, the book will also highlight several major benefits offered by solar energy and why it may be the best option for you. Most people usually discard the idea of using solar power, assuming that it might cost them more than they can afford. This book aims to eradicate any confusion regarding solar panels and their costs. We will also be looking at the detailed process of installation of solar panels in homes.

This book is designed for all people who are interested in learning more about solar energy and solar panels. So, whether you are a worker at WalMart or a certified engineer, this book will serve as your ultimate guide to solar energy and solar-powered panels.

SolarEnergy4U has much more in store for you; to learn more about the organization and its resources, visit solarenergy4u.org.







Solar Energy

Solar energy is a natural resource that is used for countless industrial and domestic purposes. In other words, solar energy brings more than just Vitamin D for the body. Solar energy is a form of energy that is delivered to the earth in the form of the sun's light and heat. The heat and light are then harnessed by specific devices in order to utilize them into usable heat energy. In this section, we will learn about what solar energy is and how it is harnessed.

What is solar energy?

As mentioned above, solar energy is the heat source from the sun that is utilized for industrial and domestic purposes. Without heat energy, life on earth would cease to exist. Solar energy is utilized after it is converted into a usable energy with the help of numerous technological devices, such as solar photovoltaic and architecture.

Solar energy is a renewable source of energy with various technologies that are characterized as active and passive solar energy. Both types of solar power generators are responsible for converting electromagnetic energy into usable solar energy. Active solar energy techniques, such as photovoltaic system and, solar water heating systems, are used to harness solar energy. On the other hand, passive methods include selecting materials that have constructive thermal mass and building home or office areas with a natural air circulation and maximum exposure to the sun.

How much solar energy is there?

It would not be wrong to say that there is an abundance of solar energy at our disposal. According to research, more than 174 petawatts (PW) of solar energy reaches the earth; out of this, nearly 30 percent is reflected back into space while the rest is absorbed by the surface of the earth. Most solar energy that reaches the earth is absorbed by clouds, oceans and land.

Before we go any further, let's look at what happens when solar energy reaches the earth. Solar energy is responsible for raising the temperature of the earth's masses, including the oceans and the land. As the temperature rises, the air becomes warmer, which ultimately leads to evaporation. Evaporation then leads to convention or atmospheric circulation. The warm air converts into clouds when it reaches higher altitudes.

The total electromagnetic energy observed by the earth's surface and atmosphere is around 3,850,000 exajoules (EJ) per year. In the year 2002, more solar energy reached the earth than was required; the solar energy that reached the earth in one hour was equal to the amount of energy utilized by the world in one year. This shows that there is enough solar energy to last us a lifetime.

There are various methods to convert solar energy into electricity and other usable forms of energy in order to operate homes and factories. However, there is no solid strategy to save solar energy for the latter. In the next section, we will identify how solar energy works and what steps are involved in the conversion process.







How does solar energy work?

As we have discussed in the above section, solar energy is a renewable and sustainable energy resource that is available to us at a cheaper rate. Unless and until there's an apocalypse, we will never run out of solar energy. Apart from being free, the greatest benefit of solar energy is that it requires less maintenance and produces more energy — enough to sustain big factories and complex machine structures.

Once solar panels are installed and begin operating at their full capacity, they silently produce solar energy for the whole house. Below, we will discuss the process of how the sun's radiation is converted into useful solar energy.

The sun emits energy in the form of UV and UVA radiation, which is mostly delivered to the earth as electromagnetic radiation. This radiation is absorbed by the solar panel cells, after which a chemical process begins to convert the electromagnetic radiation into usable energy. During the process, the chemical reaction causes rapid electron movement. The electrons move in one direction, thus producing a direct current. The direct current is transferred to the inverter that converts it into an alternating current, which can then be utilized in homes and offices.

To have a better understanding of the subject, let's look at the process as a sequence.

- **Step 1:** The sunlight reaches the earth and the photovoltaic (PV) cells of the solar panel where it is converted into direct current.
- **Step 2:** The direct current is passed to the inverter that converts the direct current into an alternating current or electricity.
- **Step 3:** The alternating current is passed on from the inverter to the domestic electric panel that helps in spreading the electrical energy to various house appliances. The electrical panel is also known as the breaker box.
- **Step 4:** The solar energy distributed in the house with the help of the breaker box is calculated through utility meter. The utility meter measures the amount of solar energy being used in the house.

The above-mentioned steps portray the use of solar energy in a conventional manner. In industries and other sectors, solar energy is utilized in various ways. The solar energy is largely used to produce electricity and heat energy for factories and houses.

There are two main types of solar power systems that generate solar energy for households and factories: grid-connected systems and stand-alone systems. The grid-connected systems are connected to the commercial power structure, whereas the stand-alone systems operate on their own and provide electricity for immediate use.

A single solar photovoltaic (PV) panel generates around 250W of electricity. A group of panels can produce startling amounts of electricity. The solar panels continue to absorb heat even on a cloudy day and provide continuous solar energy. The solar panels are becoming increasingly popular in several countries due to their various benefits. The following section will discuss the uses of solar energy to give you a clear idea as to why solar energy has garnered so much attention in the past few years.







Why is solar energy used?

We have various forms of energy that can be utilized for numerous purposes, so why choose solar energy in particular? In this section, we will attempt to answer the common questions about why solar energy is used and why it has become so popular in the recent past. Once you understand the benefits of solar energy, you will be able to know why it is important for us to utilize solar energy instead of other forms of energy.

Here are some of the most common benefits of solar energy:

An abundant energy source

Unlike other forms of energy, solar energy is available in abundance. Sunlight, no matter how dim, can still provide ample heat energy to run industries and technological devices. Solar energy is also available in the winter, which is why it is highly unlikely that we will ever run out of it.

A free energy source

We do not pay for sunlight, which makes it a free source of energy. This is the biggest advantage of sunlight; you do not have to pay a single penny to receive it. The only money that you have to pay is the initial costs of setting up solar panels.

A long-term solution

Solar energy is a great way to secure a part of your future. The energy costs are escalating daily and, with these rising costs, solar energy is the only cheap option. As mentioned above, sunlight is free and the its systems last for nearly a decade.

No pollution problems

Solar energy can be derived without causing any environmental harm. Unlike fossil fuels and petroleum, solar energy produces zero harmful emissions, which makes it an environmentally friendly and healthy energy source for both industry and domestic use. In addition, solar energy also does not produce any noise during the conversion process. Therefore, it would not be wrong to say that solar energy is the cheapest and safest form of energy.

Availability in remote areas

Solar energy is accessible anywhere. Electricity, on the other hand, cannot reach remote areas. Solar panels can bring the energy required to run factories and houses in remote and rural areas.

Maintenance-free systems

Most solar energy systems are maintenance-free, which means that they do not require fine-tuning every now and then, unlike the other energy systems and generators. The solar panels and the photovoltaic arrays do not require yearly maintenance and can last up to ten years. This helps to reduce the annual repair costs. In addition, solar panels can easily be added to current systems without much cost.







Solar Installation

As we have discussed in the above section, installation of the solar panels is the only thing that costs money. There are a few solar promoting alliances that allow customers to have a thorough understanding of the solar panels and their installation costs. solar-engry4u.org is one such organization. The cost of solar panels depends on the size of the panel and your household needs.

Installing a solar panel: Where to start?

If you have decided to install a solar panel on your rooftop, be assured that this is not going to be simple. Any solar company will take care of all the installation tasks, but you will have to decide about other important things, such as the size and the type of solar panel. Below is a comprehensive list of the steps that must be taken before installing home-based solar panels.

- Research: The most important step is to research the available options on the market. There
 is a lot of useful information available on the Internet, such as <u>solarenergy4u.org</u>, where you
 can find local, screened experts to guide you through the options. In addition to searching
 on the web, you can also ask a friend or anybody with experience of solar panel installations.
- 2. **Solar electric vs. solar thermal:** There are usually two types of solar panels: solar electric panels and solar thermal panels. Solar energy can be used to provide hot water (thermal) and to produce electricity (solar electric). Decide about the solar panel according to your household needs. If you are not certain about what type of solar panel to get, <u>consult your local solar panel service provider</u> before reaching a decision.
- 3. Check the suitability of your house: Solar panels should be installed according to the location of a house and the roof size. Check if your roof is strong enough to hold the weight of the solar panels. As the solar panels need to be in a sunny spot, make sure that your roof comes under direct sunlight and is not overshadowed by trees or other neighboring buildings.
- **4.** Check if your house is connected to the national grid: As the title suggests, check if your house is connected to the national grid. If so, you can easily sell your excess electricity to the grid. If your house is in a remote area, you will need to get a stand-alone system.
- 5. Decide about the size: Size is extremely important when it comes to the installation of solar panels. You will need to calculate the size of your roof and the size of the PV system that you want for your roof. The most common sizes of PV systems include 2kWp and 4kWp. The size of the solar panel depends on your energy requirements. You can utilize tools like Google Earth Ruler to measure the size of your roof. Any decent solar panel service provider can also help to gauge the size of the roof and the PV system that would be best for the roof.
- **6. Find a supplier:** Collect free quotes before installing the solar panels; different companies offer different rates that may vary in different locations. Therefore, if you are residing in a remote area, chances are that you will see many price differences.
- 7. Take care of legal and technical aspects: Make sure that you handle all the legal and technical aspects of installing a solar panel. Your local solar panel company would be able to help you with these factors. Just ensure that you have understood the size requirements and have bought the right size according to your roof.







8. Inspection and monitoring: If you are installing a solar panel for the first time, it is very likely that you will find it challenging. Ask your service provider to help you understand the system and its usage.

It will not take more than one or two weeks to grasp the system functionality. It is important to remember that attention to detail is most crucial when it comes to installing a solar panel in your home. You can use general system sizing calculator to help you determine the size according to exact specifications. The calculator will determine the size requirements according to the following points:

- Type of system
- Amount of electricity used each day
- Amount of power needed each day
- Sun hours each day







Grants and Incentives

Many governmental and private organizations offer numerous residential and industrial incentives for alternative heating systems. Below, we will look at the grants and incentives provided by different states in detail.

Alabama

Utility Rebate Program

• Central Alabama Electric Cooperative - Residential Energy Efficiency Rebate Program

State Loan Programs

- Alabama SAVES Revolving Loan Program
- Local Government Energy Loan Program

Utility Loan Program

- South Alabama Electric Cooperative Residential Energy Efficiency Loan Program
- TVA Partner Utilities Energy Right Heat Pump Program

Performance-Based Incentive

- TVA Green Power Providers:
- TVA Mid-Sized Renewable Standard Offer Program:
- TVA Solar Solutions Initiative

Alaska

Property Tax Incentive

Local Option - Property Tax Exemption for Renewable Energy Systems

State Grant Program

• Renewable Energy Grant Program

State Loan Program

- Alternative Energy Conservation Loan Fund
- Power Project Loan Fund
- Small Building Material Loan







Performance-Based Incentive

• Golden Valley Electric Association - Sustainable Natural Alternative Power (SNAP) Program

Arizona

Personal Deduction

Qualifying Wood Stove Deduction

Personal Tax Credit

- Non-Residential Solar & Wind Tax Credit (Personal)
- Renewable Energy Production Tax Credit (Personal)
- Renewable Energy Tax Credit for Manufacturers (Personal)
- Residential Solar and Wind Energy Systems Tax Credit

Corporate Tax Credit

- Non-Residential Solar & Wind Tax Credit (Corporate)
- Renewable Energy Production Tax Credit (Corporate)
- Renewable Energy Tax Credit for Manufacturers (Corporate)

Sales Tax Incentive

• Solar and Wind Equipment Sales Tax Exemption

Property Tax Incentive

- Energy Equipment Property Tax Exemption
- Property Tax Assessment for Renewable Energy Equipment

Utility Rebate Program

- APS Renewable Energy Incentive Program
- Duncan Valley Electric Cooperative SunWatts Rebate Program
- Electric District No. 3 Solar Rebate Program
- Mohave Electric Cooperative Renewable Energy Incentive Program
- SRP Solar Electric Program
- Sulphur Springs Valley EC SunWatts Rebate Program







- TEP Residential Solar Water Heating Incentive
- Trico Electric Cooperative SunWatts Incentive Program
- UES Renewable Energy Credit Purchase Program

Utility Loan Program

• Sulphur Springs Valley EC - SunWatts Loan Program

<u>Arkansas</u>

Utility Rebate Program

• AEP SWEPCO - Commercial and Industrial Energy Efficiency Rebate Programs

Utility Loan Program

• First Electric Cooperative - Home Improvement Loans

California

Sales Tax Incentive

• Partial Sales and Use Tax Exemption for Agricultural Solar Power Facilities

Property Tax Incentive

• Property Tax Exclusion for Solar Energy Systems

State Rebate Program

- California Solar Initiative Low-Income Solar Water Heating Rebate Program
- California Solar Initiative Multi-Family Affordable Solar Housing (MASH) Program
- California Solar Initiative PV Incentives
- California Solar Initiative Single-Family Affordable Solar Housing (SASH) Program
- California Solar Initiative Solar Thermal Program
- CEC New Solar Homes Partnership

Utility Rebate Program

- Anaheim Public Utilities PV Buydown Program
- Azusa Light & Water Solar Partnership Program
- Bear Valley Electric Service Solar Initiative Program







- Burbank Water and Power Residential and Commercial Solar Support Program
- Burbank Water and Power Solar Water Heater Rebate Program
- City of Palo Alto Utilities Solar Water Heating Program
- City of Shasta Lake Electric Utility PV Rebate Program
- Corona Department of Water & Power Solar Partnership Rebate Program
- Glendale Water and Power Solar Solutions Program
- LADWP Solar Incentive Program
- Lodi Electric Utility PV Rebate Program
- Merced Irrigation District PV Buydown Program
- Modesto Irrigation District Photovoltaic Rebate Program
- Moreno Valley Electric Utility Solar Electric Incentive Program
- Pasadena Water and Power Solar Power Installation Rebate
- Redding Electric Residential and Commercial Energy Efficiency Rebate Program
- Riverside Public Utilities Non-Residential PV Incentive Program
- Riverside Public Utilities Residential PV Incentive Program
- Roseville Electric Residential New Construction Rebate Program
- Roseville Electric Solar Rebate Program
- Silicon Valley Power Solar Electric Buy Down Program
- SMUD Non-Residential PV Incentive Program
- SMUD PV Residential Retrofit Buy-Down
- SMUD Solar Water Heater Rebate Program

Local Rebate Program

• City of San Francisco - Solar Energy Incentive Program

Performance-Based Incentive

• City of Palo Alto Utilities - Palo Alto CLEAN (Clean Local Energy Accessible Now)

Performance-Based Incentive







• Marin Clean Energy - Feed-In Tariff

Colorado

- Sales Tax Incentive
- Local Option Sales and Use Tax Exemption for Renewable Energy Systems
- Sales and Use Tax Exemption for Renewable Energy Equipment

Sales Tax Incentive

• City of Boulder - Solar Sales and Use Tax Rebate

Property Tax Incentive

- Local Option Property Tax Exemption for Renewable Energy Systems
- Property Tax Exemption for Community Solar Gardens
- Property Tax Exemption for Residential Renewable Energy Equipment
- Renewable Energy Property Tax Assessment

Utility Rebate Program

- Black Hills Energy (Electric) Commercial Energy Efficiency Program
- Black Hills Energy (Electric) Residential Energy Efficiency Program
- Colorado Springs Utilities Renewable Energy Rebate Program
- Delta-Montrose Electric Association Residential Energy Efficiency Rebate Program
- Empire Electric Association Commercial Energy Efficiency Credit Program

Local Grant Program

• City of Boulder - Solar Grant Program

State Loan Program

• Energy Savings Mortgage Incentive for Existing Homes

Utility Loan Program

• Fort Collins Utilities - Home Efficiency Loan Program

Performance-Based Incentive

• Black Hills Energy - Solar Power Program







- Xcel Energy Solar*Rewards Community Program
- Xcel Energy Solar*Rewards Program

Connecticut

Sales Tax Incentive

• Sales and Use Tax Exemption for Solar and Geothermal Systems

Property Tax Incentive

- Local Option Property Tax Exemption for Renewable Energy Systems
- Property Tax Exemption for Renewable Energy Systems

State Rebate Program

• Solar Thermal Incentive Program

State Grant Program

• Commercial Solar Thermal Incentive Program

State Loan Program

• Combined Heat and Power Loan Program

State Loan Program

• Energy Efficiency Fund (Electric and Gas) - Residential Energy Efficiency Financing

Industry Recruitment/Support

• Sales and Use Taxes for Items Used in Renewable Energy Industries

Performance-Based Incentive

• Performance based incentive for Combined Heat and Power Program

Delaware

State Rebate Program

• Green Grant- Solar Hot Water and Geothermal program

State Loan Program

• Sustainable Energy Utility (SEU) - Revolving Loan Fund

Performance-Based Incentive







Solar Renewable Energy Credits (SRECs) Spot Market Program

<u>Florida</u>

Sales Tax Incentive

• Solar and CHP Sales Tax Exemption

Property Tax Incentive

• Property Tax Exclusion for Residential Renewable Energy Property

Utility Rebate Program

- Beaches Energy Services Solar Water Heating Rebate Program
- City of Tallahassee Utilities Solar Water Heating Rebate
- Clay Electric Cooperative, Inc Energy Smart Solar Water Heater Rebate Program
- Duke Energy Florida SunSense Commercial PV Incentive Program
- Duke Energy Florida SunSense Solar PV Rebate Program
- Duke Energy Florida SunSense Solar Water Heating with EnergyWise
- Florida Power and Light Solar Rebate Program
- Fort Pierce Utilities Authority Solar Water Heating Rebate
- Gulf Power Solar PV Program
- Gulf Power Solar Thermal Water Heating Program
- JEA Solar Incentive Program
- Ocala Utility Services Solar Hot Water Heating Rebate Program
- Orlando Utilities Commission Residential Solar Water Heater Rebate Program
- Tampa Electric Solar Rebate Program

Utility Loan Program

- City of Tallahassee Utilities Solar Loans
- Clay Electric Cooperative, Inc Solar Thermal Loans
- Orlando Utilities Commission Residential Solar Loan Program

Local Loan Program







• St. Lucie County - Solar and Energy Loan Fund (SELF)

Performance-Based Incentive

• Orlando Utilities Commission - Solar Programs

Georgia

Sales Tax Incentive

• Biomass Sales and Use Tax Exemption

Utility Rebate Program

- Central Georgia EMC Photovoltaic Rebate Program
- Coweta-Fayette EMC Residential Solar Water Heater Rebate Program
- Georgia Power Residential Solar and Heat Pump Water Heater Rebate
- GreyStone Power Photovoltaic Rebate Program
- GreyStone Power Solar Water Heating Program
- Jackson EMC Right Choice Sun Power Rebate Program
- Sawnee EMC Solar Photovoltaic Rebate Program

Non-Profit Grant Program

• Georgia Interfaith Power and Light - Energy Improvement Grants

Performance-Based Incentive

- TVA Solar Solutions Initiative
- Georgia Power Solar Buyback Program

Hawaii

Personal Tax Credit

Solar and Wind Energy Credit (Personal)

State Rebate Program

• Solar Water Heater Rebate

Utility Rebate Program

• KIUC - Solar Water Heating Rebate Program







State Loan Program

• GreenSun Hawaii

Local Loan Program

- City and County of Honolulu Solar Loan Program
- Maui County Solar Roofs Initiative Loan Program

Idaho

Property Tax Incentive

• Property Tax Exemption for Wind and Geothermal Energy Producers

Utility Rebate Program

Questar Gas - Residential Solar Assisted Water Heating Rebate Program

Non-Profit Grant Program

• BEF - Solar 4R Schools

State Loan Program

Low-Interest Energy Loan Programs

Illinois

Property Tax Incentive

• Special Assessment for Solar Energy Systems

State Rebate Program

• Solar and Wind Energy Rebate Program

Utility Rebate Program

- City Water Light and Power Solar Rewards Program
- Corn Belt Energy Coop Commercial Energy Efficiency Rebate Program
- Corn Belt Energy Coop Residential Energy Efficiency Rebate Program

State Grant Program

- Large-Distributed Solar and Wind Grant Program
- Biogas and Biomass to Energy Grant Program







Performance-Based Incentive

• Solar Renewable Energy Credits

Performance-Based Incentive

• Illinois Solar Energy Association - Renewable Energy Credit Aggregation Program

Indiana

Personal Deduction

• Income Tax Deduction for Solar-Powered Roof Vents or Fans

Utility Rebate Program

- Jay County REMC Geothermal and Air-Source Heat Pump Rebate Program
- Kosciusko REMC Residential Geothermal and Air-source Heat Pump Rebate Program
- Marshall County REMC Geothermal and Heat Pump Rebate Program
- Northeastern REMC Residential Energy Efficiency Rebate Program
- Wabash County REMC Residential Geothermal and Air-source Heat Pump Rebate Program
- White County REMC Residential Geothermal Heat Pump Rebate Program

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Personal Tax Credit

- Geothermal Tax Credit
- Renewable Energy Production Tax Credit (Personal)
- Solar Energy Systems Tax Credit (Personal)

Corporate Tax Credit

Solar Energy Systems Tax Credit (Corporate)

Sales Tax Incentive

Renewable Energy Equipment Exemption

Utility Rebate Program

• Linn County Rural Electric Cooperative - Solar Water Heater Rebate Program

Kansas







Property Tax Incentive

• Renewable Energy Property Tax Exemption

Utility Rebate Program

• Kansas City Board of Public Utilities - Commercial Energy Efficiency Rebate Program

Kentucky

Personal Tax Credit

• Renewable Energy Tax Credit (Personal)

Corporate Tax Credit

- Renewable Energy Tax Credit (Corporate)
- Tax Credits for Renewable Energy Facilities

State Loan Program

- Energy Efficiency Loans for State Government Agencies
- Energy Efficient Home Improvements Loan Program

Utility Loan Program

• TVA Partner Utilities - Energy Right Heat Pump Program

Local Loan Program

• Mountain Association for Community Economic Development - Energy Efficient Enterprise Loan Program

Local Loan Program

 Mountain Association for Community Economic Development - Solar Water Heater Loan Program

Industry Recruitment/Support

• Incentives for Energy Independence

Performance-Based Incentive

• TVA - Solar Solutions Initiative

Louisiana

Personal Tax Credit







• Tax Credit for Solar Energy Systems on Residential Property (Personal)

Corporate Tax Credit

• Tax Credit for Solar Energy Systems on Residential Property (Corporate)

Property Tax Incentive

• Solar Energy System Exemption

Utility Rebate Program

• Entergy New Orleans - Residential Solar Water Heating Program

State Loan Program

Home Energy Loan Program

Maine

Performance-Based Incentive

• Community Based Renewable Energy Production Incentive

Maryland

Sales Tax Incentive

- Sales and Use Tax Exemption for Renewable Energy Equipment
- Sales and Use Tax Exemption for Residential Solar and Wind Electricity Sales

Property Tax Incentive

- Local Option Property Tax Credit for Renewables and Energy Conservation Devices
- Property Tax Exemption for Solar and Wind Energy Systems

Property Tax Incentive

- Anne Arundel County Solar and Geothermal Equipment Property Tax Credits
- Baltimore County Property Tax Credit for Solar and Geothermal Devices
- Harford County Property Tax Credit for Solar and Geothermal Devices
- Prince George's County Solar and Geothermal Residential Property Tax Credit

State Rebate Program







• Geothermal Heat Pump Grant Program

State Grant Program

• Parking Lot Solar PV with EV Charger Grant Program

Performance-Based Incentive

Solar Renewable Energy Certificates (SRECs)

Massachusetts

Personal Tax Credit

• Residential Renewable Energy Income Tax Credit

Corporate Deduction

Excise Tax Deduction for Solar- or Wind-Powered Systems

Corporate Exemption

• Excise Tax Exemption for Solar- or Wind-Powered Systems

Sales Tax Incentive

Renewable Energy Equipment Sales Tax Exemption

Property Tax Incentive

• Renewable Energy Property Tax Exemption

State Rebate Program

- Commonwealth Solar Hot Water Commercial Program
- Commonwealth Solar Hot Water Residential Program
- Commonwealth Solar II Rebates

Utility Rebate Program

- Chicopee Electric Light Residential Solar Rebate Program
- Concord Municipal Light Plant Solar Rebate Program
- Hudson Light & Power Photovoltaic Incentive Program
- Marblehead Municipal Light Department Solar Rebate Program
- Taunton Municipal Lighting Plant Residential PV Rebate Program







• Green Communities Grant Program

Industry Recruitment/Support

- Alternative Energy and Energy Conservation Patent Exemption (Corporate)
- Alternative Energy and Energy Conservation Patent Exemption (Personal)

Performance-Based Incentive

- Solar Renewable Energy Certificates (SREC-I)
- Solar Renewable Energy Certificates (SREC-II)

Michigan

Property Tax Incentive

• Biomass Gasification and Methane Digester Property Tax Exemption

Utility Rebate Program

• DTE Energy - Solar Currents Program

State Grant Program

• Renewable Energy Program Grants

State Loan Program

• Michigan Saves - Home Energy Loan Program

Industry Recruitment/Support

Performance-Based Incentive

• Consumers Energy - Experimental Advanced Renewable Program

Minnesota

Sales Tax Incentive

• Solar Energy Sales Tax Exemption

Property Tax Incentive

• Wind and Solar-Electric (PV) Systems Exemption

State Rebate Program







• Made in Minnesota Solar Thermal Rebate

Austin Utilities - Solar Rebate Program

Connexus Energy - Residential Efficient HVAC Rebate Program

Crow Wing Power - Residential Energy Efficiency Rebate Program

Marshall Municipal Utilities - Solar Thermal Water Heater Rebate Program

Minnesota Power - Solar-Electric (PV) Rebate Program

Minnesota Power - Solar-Thermal Water Heating Rebate Program

New Ulm Public Utilities - Solar Electric Rebate Program

Owatanna Public Utilities - Solar Rebate Program

Rochester Public Utilities - Solar Rebate Program

Utility Grant Program

• Xcel Energy - Renewable Development Fund Grants

Utility Loan Program

- Minnesota Valley Electric Cooperative -Residential Energy Resource Conservation Loan Program
- Otter Tail Power Company DollarSmart Energy Efficiency Loan Program

Performance-Based Incentive

- Made in Minnesota Solar Energy Production Incentive
- Renewable Energy Production Incentive

Performance-Based Incentive

• Xcel Energy - Solar*Rewards Program

Mississippi

Utility Rebate Program

- Mississippi Power -Residential Efficiency Rebate Program
- Pearl River Valley Electric Power Association Residential Energy Efficiency Rebate Program

State Loan Program

• Energy Investment Loan Program







Performance-Based Incentive

• TVA - Solar Solutions Initiative

Missouri

Property Tax Incentive

• Solar Property Tax Exemption

Utility Rebate Program

- Columbia Water & Light Solar Rebates
- Cuivre River Electric Energy Efficiency Rebate Programs

Montana

Personal Tax Credit

- Alternative Energy Investment Tax Credit (Personal)
- Residential Alternative Energy System Tax Credit
- Residential Geothermal Systems Credit

Corporate Tax Credit

• Alternative Energy Investment Tax Credit (Corporate)

Utility Rebate Program

- Black Hills Power Commercial Energy Efficiency Programs
- Black Hills Power Residential Customer Rebate Program
- Flathead Electric Cooperative Residential Energy Efficiency Rebate Program
- NorthWestern Energy USB Renewable Energy Fund

State Loan Program

• Alternative Energy Revolving Loan Program

Industry Recruitment/Support

• Alternative Energy Investment Tax Credit

Nebraska

Personal Tax Credit







• Renewable Energy Tax Credit (Personal)

Corporate Tax Credit

• Renewable Energy Tax Credit (Corporate)

Sales Tax Incentive

- Sales and Use Tax Exemption for Community Renewable Energy Projects
- Sales and Use Tax Exemption for Renewable Energy Property

Utility Rebate Program

- Lincoln Electric System (Residential) Sustainable Energy Program
- Lincoln Electric System Renewable Energy Rebate

State Loan Program

• Dollar and Energy Savings Loans

Nevada

Sales Tax Incentive

• Renewable Energy Sales and Use Tax Abatement

Property Tax Incentive

• Renewable Energy Systems Property Tax Exemption

Utility Rebate Program

• NV Energy Solar Hot Water Incentive Program

Utility Rebate Program

• NV Energy - SureBet Business Energy Efficiency Rebate Program (Southern Nevada)

New Hampshire

Property Tax Incentive

• Local Option - Property Tax Exemption for Renewable Energy

State Rebate Program

- Commercial & Industrial Solar Rebate Program
- Renewable Energy Rebate Program







Residential Solar Water Heating Rebates

Utility Rebate Program

- New Hampshire Electric Co-Op Residential Solar Photovoltaic Incentive Program
- New Hampshire Electric Co-Op Solar Hot Water Rebate Program

State Grant Program

- Commercial & Industrial Renewable Energy Grants
- Enterprise Energy Fund Grants

New Jersey

Sales Tax Incentive

• Solar Energy Sales Tax Exemption

Property Tax Incentive

• Property Tax Exemption for Renewable Energy Systems

State Rebate Program

• New Jersey Renewable Energy Incentive Program

State Grant Program

- Clean Energy Solutions Large Scale CHP and Fuel Cells Program
- Small Scale CHP and Fuel Cell Incentive Program

State Loan Program

Home Performance with ENERGY STAR Program

Industry Recruitment/Support

• Edison Innovation Green Growth Fund Loans

Performance-Based Incentive

• Solar Renewable Energy Certificates (SRECs)

New Mexico

Personal Tax Credit

• Geothermal Heat Pump Tax Credit (Personal)







• Solar Market Development Tax Credit

Corporate Tax Credit

• Geothermal Heat Pump Tax Credit (Corporate)

Sales Tax Incentive

• Solar Energy Gross Receipts Tax Deduction

Property Tax Incentive

• Property Tax Exemption for Residential Solar Systems

Utility Rebate Program

• El Paso Electric Company - Residential Efficiency Program

State Bond Program

• Energy Efficiency & Renewable Energy Bond Program

Performance-Based Incentive

- El Paso Electric Company Small and Medium System Renewable Energy Certificate Purchase Program
- PNM Performance-Based Solar PV Program
- Xcel Energy Solar*Rewards Program

New York

Personal Tax Credit

Residential Solar Tax Credit

Corporate Tax Credit

Refundable Clean Heating Fuel Tax Credit (Corporate)

Sales Tax Incentive

- Local Option Solar Sales Tax Exemption
- Solar Sales Tax Exemption

Sales Tax Incentive

• New York City - Residential Solar Sales Tax Exemption

Property Tax Incentive







• Local Option - Solar, Wind & Biomass Energy Systems Exemption

Property Tax Incentive

• New York City - Property Tax Abatement for Photovoltaic (PV) Equipment Expenditures

State Rebate Program

- NY-Sun PV Incentive Program
- Solar Thermal Incentive Program

Utility Rebate Program

- Long Island Power Authority Residential Energy Efficiency Rebate Program
- Long Island Power Authority Residential Solar Water Heating Rebate Program

State Loan Program

• NY-Sun Loan Program

Performance-Based Incentive

- Fuel Cell Rebate and Performance Incentive
- NY-Sun Solar PV Competitive Program

Performance-Based Incentive

• PSEG Long Island - Solar Initiative Feed-in Tariff

North Carolina

Personal Tax Credit

Renewable Energy Tax Credit (Personal)

Corporate Tax Credit

• Renewable Energy Tax Credit (Corporate)

Property Tax Incentive

- Active Solar Heating and Cooling Systems Exemption
- Property Tax Abatement for Solar Electric Systems

Utility Rebate Program

• Lumbee River EMC - Solar Water Heating Rebate Program







- Piedmont EMC Solar Water Heating Rebate Program
- South River EMC Solar Water Heating Rebate Program

State Loan Program

• Local Option - Financing Program for Renewable Energy and Energy Efficiency

Utility Loan Program

- Lumbee River EMC Solar Water Heating Loan Program
- Piedmont EMC Residential Solar Loan Program

Performance-Based Incentive

• TVA - Solar Solutions Initiative

North Dakota

Personal Tax Credit

• Geothermal Tax Credit

Corporate Tax Credit

• Renewable Energy Tax Credit

Property Tax Incentive

• Renewable Energy Property Tax Exemption

Ohio

Sales Tax Incentive

• Energy Conversion and Thermal Efficiency Sales Tax Exemption

Utility Rebate Program

- AEP Ohio Commercial New Construction Energy Efficiency Rebate Program
- Consolidated Electric Cooperative Heat Pump and Water Heating Rebates

Non-Profit Rebate Program

• Green Energy Ohio - GEO Solar Thermal Rebate Program

State Loan Program

• Energy Conservation for Ohioans (ECO-Link) Program







Energy Loan Fund

Performance-Based Incentive

• Solar Renewable Energy Credits (SRECs)

Utility Rebate Program

Oklahoma Municipal Power Authority - Geothermal Heat Pump Rebate Program

Utility Loan Program

- Oklahoma Municipal Power Authority WISE Energy Efficiency Loan Program
- Red River Valley REA Heat Pump Loan Program

Local Loan Program

• Oklahoma City - Green Home Loan Program

Oklahoma

Personal Tax

• Residential Energy Tax Credit

Corporate Tax Credit

• Biomass Producer or Collector Tax Credit

Property Tax Incentive

- Local Option Rural Renewable Energy Development Zones
- Renewable Energy Systems Exemption

State Rebate Program

- Business Energy Efficiency Rebate for Existing Buildings
- New Homes Incentive Program
- Solar Electric Incentive Program

Utility Rebate Program

- Ashland Electric Utility Photovoltaic Rebate Program
- Central Lincoln People's Utility District Renewable Energy Incentive Program
- Consumers Power, Inc. Solar Energy System Rebate







- EWEB Solar Electric Program (Rebate)
- Salem Electric Photovoltaic Rebate Program
- Salem Electric Solar Water Heater Rebate

- Community Renewable Energy Feasibility Fund Program
- Custom Renewable Energy Projects
- Renewable Energy Development Grant Program

Non-Profit Grant Program

BEF - Solar 4R Schools

State Loan Program

• State Energy Loan Program

Utility Loan Program

- EWEB Residential Solar Water Heating Loan Program
- Lane Electric Cooperative Residential Energy Efficiency Loan Programs

Industry Recruitment/Support

• Tax Credit for Renewable Energy Equipment Manufacturers

Performance-Based Incentive

• Solar Volumetric Incentive and Payments Program

Performance-Based Incentive

• EWEB - Solar Electric Program (Performance-Based Incentive)

Personal Tax Credit

- Energy Conservation Tax Credits Competitively-Selected Projects (Personal)
- Energy Conservation Tax Credits Small Premium Projects (Personal)
- Residential Energy Tax Credit

Corporate Tax Credit

• Biomass Producer or Collector Tax Credit







- Energy Conservation Tax Credits Competitively-Selected Projects (Corporate)
- Energy Conservation Tax Credits Small Premium Projects (Corporate)

Property Tax Incentive

- Local Option Rural Renewable Energy Development Zones
- Renewable Energy Systems Exemption

State Rebate Program

- Business Energy Efficiency Rebate for Existing Buildings
- Solar Electric Incentive Program

Utility Rebate Program

- Ashland Electric Utility Bright Way to Heat Water Rebate
- Ashland Electric Utility Photovoltaic Rebate Program
- Consumers Power, Inc. Solar Energy System Rebate
- EWEB Energy Management Services Rebate
- EWEB Residential Energy Efficiency Rebate Programs
- EWEB Solar Electric Program (Rebate)
- OTEC Residential Photovoltaic Rebate Program
- Portland General Electric Heat Pump Rebate Program
- Salem Electric Photovoltaic Rebate Program
- Salem Electric Solar Water Heater Rebate

State Grant Program

- Community Renewable Energy Feasibility Fund Program
- Custom Renewable Energy Projects
- Renewable Energy Development Grant Program

Non-Profit Grant Program

• BEF - Solar 4R Schools

State Loan Program







• State Energy Loan Program

Utility Loan Program

- Ashland Electric Utility Residential Energy Efficiency Loan Program
- EWEB Energy Management Services Loan
- EWEB Residential Energy Efficiency Loan Programs
- EWEB Residential Solar Water Heating Loan Program

Industry Recruitment/Support

• Tax Credit for Renewable Energy Equipment Manufacturers

Performance-Based Incentive

• Solar Volumetric Incentive and Payments Program

Performance-Based Incentive

• EWEB - Solar Electric Program (Performance-Based Incentive)

Oregon

Corporate Tax Credit

- Biomass Producer or Collector Tax Credit
- Energy Conservation Tax Credits Competitively-Selected Projects (Corporate)
- Energy Conservation Tax Credits Small Premium Projects (Corporate)

Property Tax Incentive

- Local Option Rural Renewable Energy Development Zones
- Renewable Energy Systems Exemption

State Rebate Program

- Business Energy Efficiency Rebate for Existing Buildings
- Solar Electric Incentive Program

Utility Rebate Program

- Ashland Electric Utility Photovoltaic Rebate Program
- Consumers Power, Inc. Solar Energy System Rebate







- Salem Electric Photovoltaic Rebate Program
- Salem Electric Solar Water Heater Rebate

- Community Renewable Energy Feasibility Fund Program
- Custom Renewable Energy Projects
- Renewable Energy Development Grant Program

Non-Profit Grant Program

• BEF - Solar 4R Schools

State Loan Program

• State Energy Loan Program

Utility Loan Program

- Ashland Electric Utility Bright Way to Heat Water Loan
- Ashland Electric Utility Residential Energy Efficiency Loan Program
- EWEB Energy Management Services Loan

Industry Recruitment/Support

• Tax Credit for Renewable Energy Equipment Manufacturers

Performance-Based Incentive

• Solar Volumetric Incentive and Payments Program

Performance-Based Incentive

EWEB - Solar Electric Program (Performance-Based Incentive)

Pennsylvania

Utility Rebate Program

- Duquesne Light Company Residential Solar Water Heating Program
- First Energy (MetEdison, Penelec, Penn Power, West Penn Power) Residential Solar Water Heating Program
- PECO Energy (Electric) Non-Residential Energy Efficiency Rebate Program
- PECO Energy (Electric) Residential Energy Efficiency Rebate Program







- Alternative and Clean Energy Program
- High Performance Building Incentives Program
- High Performance Green Schools Planning Grants
- Small Business Advantage Grant Program
- Wind and Geothermal Incentives Program

Local Grant Program

Metropolitan Edison Company SEF Grants (FirstEnergy Territory)

State Loan Program

- Alternative and Clean Energy Program
- Energy Efficiency Loan Program

Local Loan Program

- Metropolitan Edison Company SEF Loans (FirstEnergy Territory)
- Sustainable Energy Fund (SEF) Loan Program (PPL Territory)
- West Penn Power SEF Commercial Loan Program

Industry Recruitment/Support

- Alternative and Clean Energy Program
- Wind and Geothermal Incentives Program

Performance-Based Incentive

Solar Alternative Energy Credits

Rhode Island

Personal Tax Credit

• Residential Renewable Energy System Tax Credit

Property Tax Incentive

- Local Option Property Tax Exemption for Renewable Energy Systems
- Residential Solar Energy Property Tax Exemption







- Commercial-Scale Renewable-Energy Grants
- Small-Scale Solar Grants

Performance-Based Incentive

- Distributed Generation Standard Contracts
- Renewable Energy Growth Program

South Carolina

Personal Tax Credit

- Biomass Energy Tax Credit (Personal)
- Solar Energy and Small Hydropower Tax Credit (Personal)

Corporate Tax Credit

- Biomass Energy Tax Credit (Corporate)
- Solar Energy and Small Hydropower Tax Credit (Corporate)

Sales Tax Incentive

Sales Tax Exemption for Hydrogen Fuel Cells

Utility Loan Program

- Berkeley Electric Cooperative HomeAdvantage Efficiency Loan Program
- Blue Ridge Electric Cooperative Heat Pump Loan Program
- Pee Dee Electric Cooperative Energy Efficient Home Improvement Loan Program
- Santee Cooper Renewable Energy Resource Loans

South Dakota

Sales Tax Incentive

Renewable Energy Facility Sales and Use Tax Reimbursement

Utility Rebate Program

- Black Hills Power Commercial Energy Efficiency Programs
- Black Hills Power Residential Customer Rebate Program







- MidAmerican Energy (Electric) Commercial EnergyAdvantage Rebate Program
- MidAmerican Energy (Electric) Residential Energy Efficiency Rebate Programs
- Otter Tail Power Company Commercial Energy Efficiency Rebate Program
- Otter Tail Power Company Residential Energy Efficiency Rebate Program
- Southeastern Electric Residential Energy Efficiency Rebate Program

Tennessee

Utility Rebate Program

• Middle Tennessee EMC - Residential Energy Efficiency Rebate Program

State Grant Program

• Energy Efficient Schools Initiative - Grants

State Loan Program

- Commercial Energy Efficiency Loan Program
- Energy Efficient Schools Initiative Loans

Utility Loan Program

• TVA Partner Utilities - Energy Right Heat Pump Program

Industry Recruitment/Support

- Green Energy Tax Credit
- Sales and Use Tax Credit for Emerging Clean Energy Industry

Performance-Based Incentive

• TVA - Solar Solutions Initiative

Texas

Corporate Deduction

Solar and Wind Energy Device Franchise Tax Deduction

Property Tax Incentive

Renewable Energy Systems Property Tax Exemption

Utility Rebate Program







- AEP Texas Central Company SMART Source Solar PV Rebate Program
- AEP Texas North Company SMART Source Solar PV Rebate Program
- Austin Energy Commercial Energy Management Rebate Program
- Austin Energy Residential Solar PV Rebate Program
- Austin Energy Solar Water Heating Rebate
- CoServ Solar Energy Rebate
- CPS Energy Commercial Energy Efficiency Rebates
- CPS Energy Solar Hot Water Rebate Program
- CPS Energy Solar PV Rebate Program
- Denton Municipal Electric GreenSense Solar Rebate Program
- El Paso Electric Company Solar PV Pilot Program
- Guadalupe Valley Electric Cooperative Renewable Energy Rebates
- New Braunfels Utilities Residential Solar Water Heater Rebate Program
- Oncor Electric Delivery Solar Photovoltaic Standard Offer Program
- Texas Gas Service Residential Solar Water Heating Rebate Program

Local Rebate Program

- City of Sunset Valley PV Rebate Program
- City of Sunset Valley Solar Water Heating Rebate Program

Utah

Personal Tax Credit

- Alternative Energy Development Incentive (Personal)
- Renewable Energy Systems Tax Credit (Personal)

Corporate Tax Credit

- Alternative Energy Development Incentive (Corporate)
- Renewable Energy Systems Tax Credit (Corporate)

Sales Tax Incentive







• Renewable Energy Sales Tax Exemption

Utility Rebate Program

• Rocky Mountain Power - Solar Incentive Program

Vermont

Sales Tax Incentive

• Renewable Energy Systems Sales Tax Exemption

Property Tax Incentive

• Uniform Capacity Tax and Exemption for Solar

State Rebate Program

• Small-Scale Renewable Energy Incentive Program

Performance-Based Incentive

• Green Mountain Power - Solar GMP

<u>Virginia</u>

Personal Deduction

• Income Tax Deduction for Energy-Efficient Products

Property Tax Incentive

• Commercial Solar Property Tax Exemption

State Loan Program

• Energy Project and Equipment Financing

Utility Loan Program

• TVA Partner Utilities - Energy Right Heat Pump Program

Industry Recruitment/Support

• Clean Energy Manufacturing Incentive Grant Program

Performance-Based Incentive

• TVA - Solar Solutions Initiative

Performance-Based Incentive







• Dominion Virginia Power - Solar Purchase Program

Washington

Sales Tax Incentive

• Renewable Energy Sales and Use Tax Exemption

Utility Rebate Program

- Clark Public Utilities Solar Water Heater Rebate
- Grays Harbor PUD Solar Water Heater Rebate
- Snohomish County PUD No 1 Solar Express Rebate Program

Non-Profit Grant Program

BEF - Solar 4R Schools

Utility Loan Program

- Clark Public Utilities Solar Energy Equipment Loan
- Grays Harbor PUD Residential Energy Efficiency Loan Program
- Grays Harbor PUD Solar Water Heater Loan
- Port Angeles Public Works & Utilities Solar Energy Loan Program

Industry Recruitment/Support

- Tax Abatement for Solar Manufacturers
- Tax Credit for Forest Derived Biomass

Performance-Based Incentive

• Renewable Energy Cost Recovery Incentive Payment Program

West Virginia

Utility Rebate Program

• AEP Appalachian Power - Non-Residential Prescriptive Rebate Program

Virgin Islands

State Rebate Program

• U.S. Virgin Islands - Solar Water Heater Rebate Program







Wisconsin

Property Tax Incentive

• Solar and Wind Energy Equipment Exemption

Local Loan Program

• City of Milwaukee - Milwaukee Shines Solar Financing

Performance-Based Incentive

• Madison Gas & Electric - Clean Power Partner Solar Buyback Program

Wyoming

Sales Tax Incentive

Renewable Energy Sales Tax Exemptions

Property Tax Incentive

• Solar and Wind Energy Equipment Exemption

State Rebate Program

• Renewable Rewards Program

Utility Rebate Program

- Cedarburg Light & Water Utility Residential Energy Efficiency Rebate Program
- Eau Claire Energy Cooperative Non-Residential Energy Efficiency Rebate Programs
- Eau Claire Energy Cooperative Residential Energy Efficiency Rebate Program
- Marshfield Utilities Heat Pump Rebate Program

State Grant Program

Renewable Energy Competitive Incentive Program

Local Loan Program

City of Milwaukee - Milwaukee Shines Solar Financing

Performance-Based Incentive

Madison Gas & Electric - Clean Power Partner Solar Buyback Program

District of Columbia







Property Tax Incentive

• Solar Energy System and Cogeneration System Personal Property Tax Credit

Performance-Based Incentive

• Solar Renewable Energy Credits

Utility Rebate Program

• Questar Gas - Residential Solar Assisted Water Heating Rebate Program

Puerto Rico

Personal Deduction

• Puerto Rico - Tax Deduction for Solar Energy Systems

Property Tax Incentive

Puerto Rico - Property Tax Exemption for Solar and Renewable Energy Equipment¹

For more information regarding the incentives and grants regarding solar energy in your state, visit www.dsireusa.org.







¹ http://www.dsireusa.org/

Conclusion

We hope by now you have a clear understanding of solar energy and its numerous uses. As we have discussed in the book, solar energy is the most efficient form of energy that can help us operate our industries and domestic day-to-day operations in a cost-effective manner. The greatest advantage of solar energy is that we do not have to pay for sunlight; not only is this a renewable energy source, it is also a free energy source that is powerful enough to keep us alive.

Some of the advantages of the solar energy include:

- Reduced electricity costs
- Increase in asset or property value
- Reduced carbon footprint
- Decreased future energy costs.

The only cost that you will incur is to have solar energy will be the cost of the solar panel system.

Before you make your decision about installing the solar panels in your house, office or workplace, make sure that you <u>thoroughly research</u> on the kind of panels available in the market. The initial cost is usually high, but you will receive free electricity for the rest of your life. Many people discard the idea of installing solar panels in their houses because they believe that the cost would be too much for them. What they do not understand is that this one-time cost can save them a lifetime of constantly-rising electricity bills.

Let's not forget that energy costs are escalating and it is quite possible that they will reach a higher number in the near future, which will become impossible to afford for many of us. Solar energy is our hope to reduce our energy costs and build upon a solid solution for future energy costs.

In addition, as we have discussed above, solar energy production produces no pollution whatsoever. The gravity of this statement is often greatly underrated. Most modern electricity production plants are one of the major sources of pollution; by adopting solar energy, you are contributing towards the greater good of all organisms on earth. When you spend on solar panels, you are spending on the longevity of your family and other humans around you, as well as every other living and breathing creature.

In other words, by installing solar panels in your house, you are not only getting the cheapest energy solution for your everyday household needs, you are also contributing towards the society in a positive way. At <u>solarenergy4u.org</u>, you will find ample information regarding the use of solar panels and their abundance of benefits. For more information about solar panels and solar panel installation, visit <u>solarenergy4u.org</u>.





