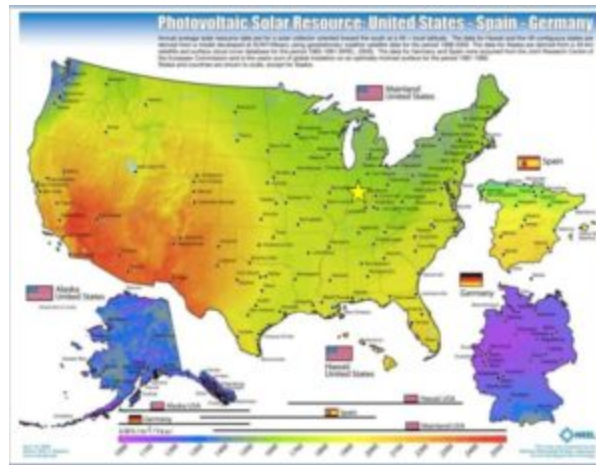


Get up to speed quickly on the basic concepts and the value proposition of solar and renewable energy. [CLICK HERE FOR A PRINTABLE PDF.](#)

Solar Basics

Are solar panels and solar water heating systems a viable renewable energy source in Indiana?

Absolutely! Indiana gets as many direct sun hours as many parts of Florida, and 50 percent more than Germany, a world leader in solar power. Our region has approximately 4.5 direct sun hours daily on average. This is plenty to provide electricity or hot water for the energy conscious household. Take a look at this map:



The Indianapolis airport has installed 76,000 solar panels on 150 acres, generating 31 million kilowatt hours annually. It is the largest solar farm on any airport in the world.

What can I expect for battery performance and cost?

Batteries are expensive, and most would-be purchasers start by looking at cost, but the question about cost is not always as simple as running a price-check online.

You can design a solar system to include a battery from the start, or install a battery-ready inverter but delay the purchase of a battery, or integrate a battery into an existing system. These options come at different price points, even though the same battery may be used in all three cases and result in the same performance profile. Also, your installer probably has a relationship with a distributor for a particular battery manufacturer and will be able to give you a better price on products within that line than for products from a different manufacturer.

This excellent [in-depth review of the Tesla Powerwall](#) takes all such factors into consideration, explains how the battery works, and briefly compares it with other leading solar batteries on the market as of the publication date in June 2023.

As we identify other useful, impartial reviews of competing battery products, we will add them here.

How to Go Solar, Step by Step

How do we get solar energy? The primary barrier to having more distributed on-site renewable energy is the lack of knowledge regarding how to proceed. Organizations with an interest in renewable energy usually begin their climate action plans with the assistance of someone who is an advocate, maybe a solar owner with personal experience. Typically an energetic person will encourage others to form a green team or join an existing group. The initiative can begin from the top down, starting with leadership or a board of directors. The likelihood of a favorable outcome will be increased by support from a manager, pastor or school principal. Participation of finance and property committees will allow their concerns to be addressed early in the process. The advocates in a family may be children who convince their parents to consider other sources of energy for their home.

The first step for beginning a solar project is to contact the electric utility company (maybe via their website) and determine what their policy is for compensating customer-owned renewable energy generation. Energy produced and used on site is generally valued at retail. The variable in policies is what value they assign to energy sent to the grid.

Solar energy is seasonal, with lower output in winter months and most production occurring during eight months of spring, summer and fall. An array producing enough energy to offset total annual usage will send many of its electrons to the power grid on long sunny days. Your neighbors will pay the utility company for energy you have produced.

Example A: With net metering, sizing can match energy usage because all of the energy produced has full retail value and seasonal excess energy is credited to offset usage in winter months.

Example B: If your annual energy usage is 10,000 kWh and the solar array produces 10,000 kWh, less than half of the energy produced will be used on site. If net metering is not available (as is currently the case in Indiana), you will be paid near wholesale value for most of the energy produced. The excess will be sent to the grid for use by a neighbor who pays the retail price for energy you produced.

Example C: If your annual energy usage is 10,000 kWh and the solar array produces 5,000 kWh, most of the energy produced will be used on site, thereby avoiding retail charges. You will be paid near wholesale value for any excess that is sent to the grid for use by a neighbor who pays retail for energy you produced.

The next step is to review electric bills for the previous one or two years with a focus on energy usage measured in kilowatt hours (kWh). It's about learning how much energy is being used rather than its cost. Average homes use about 12,000 kWh annually. A church might use between 50,000 and 200,000 kWh annually. Energy usage by businesses or schools may be greater. Seasonal variation will indicate how much energy is used for heating and air conditioning. An energy audit, offered by many utility companies, can identify affordable actions to reduce energy usage, such as attic insulation, LED lighting and programmable thermostats.

Anticipate future plans – Addition of a room, garage, swimming pool or hot tub will require additional energy. An electric vehicle uses about 1,000 kWh for driving 4,000 miles. Utility companies allow solar production beyond past usage if explained. Utility companies expect your array to produce nearly the same

amount of energy as your typical annual usage. To get their permission to connect a larger array, you may need to explain your anticipated future usage.

Overcoming an absence of state incentives – Indiana is an example of what is possible in a state with minimal incentives for renewable energy. In 2017 a law to phase out net metering by 2022 was narrowly passed in the state legislature, supported only by the electric utility companies against widespread opposition. Yet Indiana now has thousands of residential solar owners, hundreds of solar school and commercial sites, and more than 50 solar churches served by REMC member cooperatives, municipal owned utilities and the five investor owned utilities.

Actions by the public are indicative of an attitude that the increasing urgency of cumulative effects of climate change doesn't allow time to wait for support from politicians. Indiana energy sources are largely fossil fuel based, contributing to serious adverse environmental and health conditions. The state is one of the worst for air and water pollution, and ranks in the bottom quartile nationally for some metrics of health and wellness (see references below).

The growth of Indiana renewable energy prior to 2023 has been partly due to conversion of farmland to massive centralized solar projects as utility companies have begun a transition from coal to renewables. The Indiana experience is in contrast to that of Germany's consistent government support of renewable energy as a world leader for many years in spite of Germany's having low solar potential, similar to Alaska's. European priorities place a high value on agricultural land and encourage locating renewable energy sources where the land is unsuitable for growing food.

The German people are resourceful and determined. Likewise, other midwestern states with consumer-friendly energy policies, such as Illinois and Minnesota, are seeing higher growth rates for adoption of renewable energy accompanied by emergence of a robust solar industry.

Cities and states are beginning to adopt regulations requiring solar water heating and electric heat pumps but some homeowner associations have restrictive covenants that have not been updated since the last century. Such covenants can usually be changed by a majority vote of owners.

Location, location, location – Another initial step is to consider where there is a suitable space on the property with good sun exposure, whether on a rooftop, on the ground or parking canopies. Rooftop sites may be less expensive to install initially but more expensive overall when factoring in the cost of system removal and replacement when shingles reach their end of service life, usually in less than 20 years. Shingles more than ten years old should be replaced before the system is installed. The service life of metal roofs, a half century or beyond, is similar to that of solar arrays. Solar output after 25 years is expected to be more than eighty percent of its original performance.

Ground arrays have an advantage of site optimization, as they can be placed facing south where there is little or no shading. Orientation east or west, if that is what the roof dictates or shading allows, will result in about 15 percent less energy production as compared with south-facing orientation. Solar parking canopies offer added benefits as shelter for vehicles. Midwest locations may consider the SolarCam patented design for increasing annual energy output with manual tilt adjustment, flatter in the spring and higher in the fall. Single axis adjustable tilting can increase performance by twenty percent or more and its cost is similar to that of rooftop arrays.

How large is enough – Array size is determined by the smallest of three factors: annual energy usage, available space, and the project budget. Utility company renewable energy policies can also have an effect on size. Where net metering is available, sizing can match energy usage because all of the energy produced has full retail value and seasonal excess energy is credited to offset usage in winter months. Smaller arrays producing half or less of energy used may be preferable in utility service territories where excess energy produced has less than retail value.

AC/DC, batteries and generators – Solar cells convert photons of light into direct current (DC) electricity that is changed to alternating current (AC) by an inverter. Some of the DC energy can be stored in batteries and used at night. Having batteries and generators is like having a single-premium insurance policy where the total premium is paid at the beginning and benefits are received over time. Batteries must be replaced every 10 to 15 years and their cost is increasing. A home using 1,000 kWh monthly averages about 30 kWh each day but solar batteries don't have much capacity, typically less than fifteen kWh for a single battery. A propane or natural gas generator can provide backup power if you have frequent outages.

Vehicle to grid (V2G) – An emerging best practice that will become more prevalent is to use a bidirectional charger for electric vehicles (EV) with vehicle-to-grid capability when newer EV batteries with 50 kWh or more will soon be able to provide energy to a home or office. Your vehicle with an EV battery may also include features such as heated seats, navigation assist and adaptive cruise control. Although the batteries are larger than solar batteries, a downside of using an EV to power your home or office is that you won't have the backup energy for a power outage when the vehicle is not there.

EV charging – Electric vehicles can go about 4 or 5 miles for each kWh in the battery. Roughly 1,000 kWh is needed to drive 4,000 miles. Level 3 fast chargers located near interstate highways provide a full charge in less than an hour. Frequent Level 3 charging can shorten battery life due to overheating. Level 2 chargers typically available in parking garages provide 20 to 30 miles range in an hour.

Level 1 chargers plugged into a standard 120 volt wall outlet provide about 5 miles driving range in an hour. Some solar inverters are capable of charging an EV battery with solar energy, bypassing the DC/AC/DC conversion that consumes a small part of the energy. When the vehicle is connected and solar electricity is being generated, the current is never inverted. It sends the DC straight to the car and thus the inefficiency of conversion never happens.

Get proposals – After approximate cost, location and size has been determined you can request proposals from a few solar installers within 50 to 100 miles. You can either ask for a percentage reduction of your energy usage, suggest how many modules you are considering, or specify a target budget. You can ask about the cost of installing replacement parts under warranty. Some companies charge a mileage fee for traveling more than a few miles. An extended warranty for the inverter is usually affordable. Micro inverters for each module reduce the adverse effect of a failure to loss of production by a single module rather than a complete array.

Preliminary proposals can be provided using online aerial images of the property. Some companies offer batteries and generators that can be integrated with the solar system. Several Indiana companies are at <https://www.sirensolar.org/contractors/>

Do you want apples or oranges? – Direct comparison of proposals may be challenging when companies have different products. Performance and cost may be similar but, like Ford and Chrysler,, they are not the

same. Equipment made in the USA may qualify for an additional ten percent federal tax credit in addition to the baseline 30 percent credit.

A good metric is cost per watt, calculated by dividing total cost by array size. For example, \$30,000 for ten kilowatts (10,000 watts) would be \$3 per watt. Solar modules are rated by watts (usually between 350 and 500 watts) under controlled laboratory conditions. One solar kilowatt (kw) is 1,000 watts. Three modules each rated for 335 watts is approximately one kw; thirty modules would be ten kw.

Although you are paying for rated watts under controlled conditions, you actually get the kWh energy produced which reduces the amount of kWh purchased from the utility company. However, attempting to compare performance is subjective. Typical unshaded 10 kilowatt arrays facing south and tilted between 25 and 35 degrees might produce about 12,000 kWh annually, depending on weather conditions and the growth rate of nearby trees. Performance degrades slowly over time. Performance warranties anticipate annual output reduction of about fifteen percent after 25 years panels may continue producing seventy percent of original output after 50 years. Future solar production will be reduced further as our weather continues trending to frequent extreme events with more clouds, rain and snow.

PVwatts, an online performance simulator provided by the National Renewable Energy Laboratory in Colorado, gives a monthly estimate of kWh for your location when you enter your zip code and the size and orientation of your planned array.

Financing – Project funding for nonprofits can come from multiple sources including donations, annual budget, memorials, bequests, endowment, grants and bank loans. Transfer of federal tax credits to a tax paying entity may become a source of funds for nonprofits in mid 2023 after U.S. Treasury regulations are published. Tax equity investor LLCs with a nonprofit partner allow the investor's return on investment to benefit from depreciation.

Many residential projects are financed with an equity line of credit that is actually a mortgage, sometimes with a variable interest rate. The **Clean Energy Credit Union** offers an alternative of fixed rate loans secured by the project equipment that's installed, not by the equity in your home.

Communities with a climate action plan may offer rebates or grants to qualifying applicants. Some states with renewable energy portfolio standards, such as Illinois and Ohio, have programs for solar renewable energy credits (SRECs) that provide payment to the owner for each 1,000 kWh produced. Indiana residents are allowed to participate in the Ohio SREC program because both states share the midwestern energy grid.

A contract is signed when the size and location of the project has been approved and funding sources are identified. The contract covers materials, labor, permits and interconnection agreements in all all-inclusive cost-per-watt charge. Work on site can be completed in a few days after waiting weeks or months for product delivery.

Attitude Shift – A heightened awareness of how energy is being used is common among solar owners. Annual usage reduction of between ten and twenty percent is not unusual. Appliances with compressors or electric resistance heaters are high consumers. Energy monitors for checking appliances can be purchased for under \$50 and are available for checkout from some public libraries. Whole house energy monitors with connections to your electric circuit box will show real time energy consumption by each appliance. Some inverters include

an integrated energy monitor connected to the electrical panel. Production data from inverters can be accessed and displayed on a cell phone or a monitor for viewing.

References

Online performance calculator <https://pvwatts.nrel.gov/>

Clean Energy Credit Union <https://www.cleanenergycu.org/home/loans/solar-electric-systems>

List of Indiana solar contractors <https://www.sirensolar.org/contractors/>

List of Indiana solar congregations <https://hoosieripl.org/indianas-solar-congregations/>

Indiana net metering report (solar and wind)

<https://www.in.gov/iurc/files/2022-Q2-Net-Metering-Quarterly-Reporting-Summary.pdf>

Public health rankings <https://www.usnews.com/news/best-states/rankings/health-care/public-health>

States ranked by air pollution <https://www.fatherly.com/news/states-that-have-the-most-least-pollution-list>

State rankings for solar energy <https://www.chooseenergy.com/solar-energy/best-and-worst-ranked-states-for-solar-industry-growth/>

State solar incentives <https://www.ecowatch.com/solar/incentives>

Nonprofit multi-state resource <https://www.solarunitedneighbors.org/>

Volunteer nonprofit help desk for questions: send an email to contact@sirensolar.org

Should I clean snow off my solar panels?

Best practice is to wait for snow to melt in warmer weather.

It's tempting to take action when your solar array is covered by snow and ice. If you consider an insurance agent's advice to reduce risk of injury or property damage, an exercise in patience is preferable. Before reaching for gloves, parka and ladder, think about this ...

What's the risk? Most rooftop arrays are not easily accessible from the ground. A man died recently after falling from a ladder while working on outdoor lights. After finishing a job, missing the bottom rung of the ladder and injuring his neck, a past roofer is paralyzed. Medical bills can be expensive.

What property damage? The manufacturer warranty can be voided by owner negligence. Although solar modules are protected from hail by tempered glass, the vulnerable part of the system is the interface between materials around the edge with sealant to prevent water intrusion that could corrode the electrical components. The sealant is susceptible to being cracked when frozen, if during snow removal it is struck by a scraper or brush,

What's the value? Most solar energy is produced in the summer. The cost for a week of solar snow and ice is maybe \$10 to \$20, depending on array size and electric rates.

Only six percent of annual energy is produced in January when days are short with few hours of blue skies; that's about 400 kwh, averaging 13 kwh daily, for a five kilowatt array. Loss of solar energy, thereby increasing consumption of grid energy valued at about \$0.12 per kwh, would be \$1.50 per day.

This is why net metering is important for customers of Duke, IPL, I&M, NIPSCO and Vectren. Solar energy produced in summer is credited on your bill and carried forward to offset lower production in the winter.

Better to stay inside, enjoy a cup of coffee or tea while not spending your cash at Starbucks.

How can I figure out how much electricity my appliances use?

There are two easy ways. First, you can get a plug-in energy monitor such as the Kill-a-Watt or TrickleStar. These devices plug into a wall socket and then you plug the appliance cord into the monitor. You can see how much power (in watts) the appliance is drawing on a display screen. Most brands of plug-in monitor allow you to display the energy consumption in terms of watts, dollar cost, and the CO2 equivalent for the full period that the monitor is in use or for a projected period.

Plug-in monitors are available from hardware stores or online. If you live in Monroe County, Indiana, or nearby cities such as Nashville or Spencer you can borrow one from the public library, along with an instruction sheet. SIREN donated approximately a dozen to the Monroe County Public Library as an extension of its educational program. The REMC electric cooperatives have provided them to other local libraries.

Secondly, if you are considering a move or building a new home, you might want to use this [online usage calculator](#). It provides average energy consumption values for kitchen appliances, domestic well pumps, entertainment devices, other household equipment, and heating equipment. You can tally the projected monthly kilowatt usage for all relevant items and estimate your monthly electric bill.

Do you need to replace your roof before installing solar?

Once installed, your solar system will operate for decades. If your roofing deck or shingles are halfway or more through their expected service life, it is a good idea to replace them before installing a solar system. Ordinary three-tab asphalt shingles may last only 15 years; dimensional or architectural asphalt shingles warranted for

25 years may last closer to 20 years. Metal roofing is increasingly popular because it lasts for 50 years or more, thus avoiding having to replace a shingled roof two or three times.

Additionally, a light-colored metal roof can save about 25% of the building's energy costs, by reflecting sunlight away, compared to a dark asphalt shingle which absorbs heat, according to building industry sources. This makes a metal roof an ideal accompaniment to rooftop solar. The best type of metal roofing for solar is standing-seam panels, because it doesn't require any penetrations (holes) to be made into the roofing material for mounting the solar panels. It looks like this:



There are other types of metal roofing (corrugated, CF panel, AP panel, U-panel, R-panel, metal shingles, etc.) available, but attachment bolts must penetrate through the metal roofing which undermines the roofing material. By choosing a standing seam metal roof instead, the solar panels can simply be attached with clips (see image below or [installation video](#)), thereby eliminating the chance of leaks, and reducing the amount of solar mounting hardware.



What is the cost/benefit explanation of “high efficiency” solar panels over standard efficiency panels?

At any given point, PV panels range from what's standard at the time to what's considered premium because of its performance characteristics. A few years ago, 250 watts per panel was considered standard and 280 watts commanded a premium. Currently 275 watts per panel is standard and 325 watts is premium. The outer frames of both panels are probably sized within an inch of each other, so the difference is in their **efficiency**, which is the term used to state the amount of output for a given physical area. In other words the premium high-efficiency panel produces more watts per square foot than the standard one.

When using standard panels would not allow you to achieve your electricity production goals because you are limited by your roof space or by shading rather than by your budget, high efficiency panels may be recommended. The high performance design produces more electricity per square foot than standard. These panels are appropriate for homeowners who are seeking a system that 1) can provide a greater percentage of household requirements from a small roof or 2) leaves room on a small roof for a future expansion of the system.

Let's look at specific examples of two ways to provide 5,000 kWh annually from solar.

First, to generate 5,000 kilowatt hours of electricity per year from a system composed of standard 275 watt panels, you will need room for 14 panels. In the second example, you could produce approximately the same output using only 12 high efficiency 325 watt panels.

Assuming that they are both in full sun, the high efficiency panel will produce about 19 watts per square foot while the standard panel will produce about 15.5 watts per square foot. In other words, the energy output of the high efficiency panel is 22% greater than that of the standard panel per square foot of roof area.

When you have the space, buying standard panels saves you money. If you cannot meet your annual 5,000 kilowatt hour goal within the available roof area, you may want to consider high efficiency panels. You will pay a premium for them but you will buy less of them, along with less mounting hardware and labor (by two panels).

For purposes of illustration, let's say that installing a system with 14 standard panels costs \$10,000. Installing a system with 12 high efficiency panels will cost about \$1,700 more.

Both will provide you with about 5,000 kilowatt hours per year of electricity on average.

Remember, annual output varies slightly depending on the amount of sunshine from year to year. Sunny skies make more electricity than cloudy ones.

What are the typical solar renewable energy systems available to a home owner?

Images of these common solar systems types are displayed in our [Media Gallery](#).

Grid-tied photovoltaic (PV) systems use solar panels to generate electricity first for your home with any excess reversing back to the grid. This system is economical because the grid acts as a battery when excess electricity not used during peak season goes back onto the grid and is credited to the homeowner. A grid-tied system automatically disconnects from the electric grid during outages and reconnects after the grid again becomes operational.

Battery or stand-alone PV systems are off grid and will provide electricity from batteries or a generator during power outages. Unlike grid-tied systems which are virtually maintenance-free, battery PV systems require

considerable maintenance by the owner. See **chart of decreased battery capacity** and increased battery life at lower temperatures. Batteries for backup power when grid power is not available should be in a temperature controlled location, such as an insulated container. The leading edge of the industry is in battery storage for grid-tied systems, such as Tesla's newly introduced **Powerwall** units.

Hybrid PV systems are grid-tied with a generator or battery backup for outages.

Solar hot water heating is an economical way to heat water from water tanks to pools to radiant heated flooring. Water heating is the second biggest use of energy in most homes after space heating and cooling demands. If your home is all electric, consider a hybrid heat pump water heater using about 1/3 to 1/2 the energy as compared to an electric resistance water heater. There are also supplemental heat pump units that can be added on to an existing storage tank water heater.

Solar PV-therm (PVT) systems combine solar hot water and PV technologies. Solar cells on the front of the panel convert solar to electricity while a closed-loop glycol heat exchanger on the back of the panel draw heat way from the solar cells, improving PV efficiency while heating water.

Solar air heating heats air and transfers it into the home with a small fan and thermostat separate from the primary furnace or heat pump. A cost effective heater may be **homemade** or **purchased commercially**.

Where can I install solar panels besides my roof? Will they work on a flat roof?

Solar photovoltaic (PV) panels, used to produce electricity, may be installed on roofs with south, west, or east facing exposure, in yards as a pole mount or ground mount, or as an architectural feature such as an awning, pergola, or carport. Panels can be installed on a flat roof when supported by racking mounted at an angle and typically grounded with ballast weights to avoid penetrating the roof. Installers can analyze the distribution of ballast weights to satisfy wind ratings and dead weight maximums. See the image Gallery on this site to see some of the ways that local residential, commercial, and institutional solar owners have installed panels. Solar thermal panels, used to heat water, should be installed directly above the water tank or as close to the tank as possible. Solar air furnaces should be installed on a south-facing wall and vented to an inside room with good air circulation.

On the subject of roofs, people often ask if the age of their shingles matter. It is probably best to replace shingles before installing solar panel if the shingles are near the end of their life. (Covering shingles less than halfway through their expected life may extend their life.)

Where do I start saving energy in my home?

First you can try to reduce your electrical use. The biggest and cheapest source of renewable energy is the energy you don't use. The more energy you save, the less you need to generate. Major users of power are electric resistance heaters – in roughly decreasing order of use: the auxiliary setting on a heat pump, clothes dryer, dishwasher drying cycle, oven, toaster, toaster oven, hair dryer – and anything with a compressor, such as refrigerators, freezers, air conditioner, heat pump, and dehumidifier.

See Green America's list of [“The 10 easiest ways to cut your energy use in half”](#) for more suggestions. For other creative ways to reduce your use of electricity, see [Build it Solar](#), or consult the Unity Home Group's [checklists](#) for energy conservation tips.

How do I plan for solar on my home?

SIREN frequently offers free Going Solar presentations to community groups. These programs are intended as a public outreach and basic education offerings to community members. Attendees may ask one of the SIREN volunteers at the event about how to arrange for this free service. Additionally, solar site pre-assessments using aerial map views on the internet are available for more distant locations. If you are interested, [contact us](#) with your phone number, address, name of your electric utility company, and how many kilowatt hours (kWh), to the nearest thousand, you use in 12 or 24 months. Also tell us if you have an electric water heater or heat pump, and how much of your electric usage you think you might be able to reduce. We attempt to assess energy demand, solar site potential, and recommend an appropriate size for renewable energy systems.

More comprehensive reports are available from solar contractors and MREA (Midwest Renewable Energy Association) certified site assessors. See the [Solar Contractors](#) listing for more information.

Wait, this is confusing. What's the difference between kilowatts and kilowatt hours?

A full explanation is [here](#) but to boil it down, they measure different things. The kilowatt (kW) is a unit of power – 1,000 watts. It measures the rate at which electrical energy is generated or consumed. Solar panel manufacturers rate the capacity of panels in watts to indicate the output of a panel in full sun. Commonly available panels range from 250 to 300 watts rated capacity. Solar contractors rate a full PV array in watts or kilowatts (number of panels multiplied by number of watts per panel).

On the other hand, the kilowatt hour (kWh) is a unit of energy – 1,000 watts of electricity running for one hour. It is also the billing unit on residential electric bills. You can use it to determine how much you can reduce that bill. On average, an unshaded 250 watt panel produces 300 kWh a year in Indiana.

I am interested in possibly installing my own PV system. Where can I find DIY information, including module ratings and product reviews?

Some big-box retailers and online solar design firms now sell DIY solar panel kits, including inverters or microinverters. To avoid buying low-quality products, it is wise to do your research up front. The [Solar Design Tool](#) compares solar panel specifications and provides manufacturer's installation guides. [Go Solar California](#), [Principal Solar Institute](#) and [PHOTON Laboratory](#) both publish test results and ratings of PV modules. PHOTON also tests and rates solar inverters. [Home Power](#) magazine provides both instruction and product reviews for DIY solar electricity and solar water heating.

It's not only about product. Be aware that some states will not honor the tax rebates if the installation is not done by a certified professional. Also if you take the DIY approach, you will be responsible for all the permitting

requests, site inspections, and utility paperwork that a solar contractor usually does. Make sure you know what's required before you start. [Here](#), for example, are Duke Energy's requirements for connecting to the grid. If you plan to install a battery-backed system, check with your local government agencies to see what the electrical code requires.

Is there a public SIREN mailing list? How do I join/leave it?

Yes, we have a public mailing list / discussion forum that anyone can join using the instructions below. It is relatively low volume with ~1-3 emails per week with the occasional spike caused by a spirited discussion!

Joining/Subscribing to the mailing list: To subscribe, send an e-mail to forum+subscribe@sirensolar.org. (subject/content of the email can be blank).

Sending email to the mailing list: To communicate with the group, send your email to forum@sirensolar.org.

Leaving/Unsubscribing from mailing list: To unsubscribe, send an email to forum+unsubscribe@sirensolar.org. (subject/content of the email can be blank).

Setting Mail Delivery Preference: Members can adjust mail delivery preferences by visiting [the Google Groups Settings page](#), or by making a request to the SIREN Steering Group via [the Contact form](#).

How do I register for an event?

You can [RSVP](#) online for a SIREN Going Solar presentation. Occasionally our Events calendar contains notices of events offered by other organizations. In such cases, registration contacts are provided in the listing.

How do I request a free assessment of the potential for solar on my property?

SIREN frequently offers free Going Solar presentations to community groups. These programs are intended as a public outreach and basic education offerings to community members. Attendees may ask one of the SIREN volunteers at the event about how to arrange for this free service. Additionally, solar site pre-assessments using aerial map views on the internet are available for more distant locations.

If you are interested, [contact us](#) with your phone number, address, name of your electric utility company, and how many kilowatt hours (kWh), to the nearest thousand, you use in 12 or 24 months. Also tell us if you have an electric water heater or heat pump, and how much of your electric usage you think you might be able to reduce. We attempt to assess energy demand, solar site potential, and recommend an appropriate size for renewable energy systems.

More comprehensive reports are available from solar contractors and MREA (Midwest Renewable Energy Association) certified site assessors. See the [Solar Contractors](#) listing for more information.

How can I get a “Powered by the Sun” sign for my yard?

If you have a solar energy system in your home then all you have to do is ask! A donation is suggested to cover materials and mailing costs, but it is optional. **Contact us** with your name and contact information. Use the **Donate button** if you are so inclined. Please allow two weeks to receive your sign by mail. If you want it more quickly, please indicate that on the contact form as well and a volunteer will contact you by phone to make other arrangements.



How can I get involved personally in this work?

Come to a Going Solar presentation and talk with a SIREN volunteer about your interest and aims. We will share what we know about opportunities to participate in renewable energy efforts of various sorts. Networking is a big part of what we do. If you would rather contact us by email, use the Contact form at the bottom of every page of this website.

Financial Issues

What is the value of solar after net metering ends?

Net metering is a renewable energy incentive available in various forms to owners of solar and wind-powered systems in about 40 states (in Indiana, for arrays up to one megawatt). It was adopted in Indiana in 2005 and expanded in 2011 for the five investor owned utilities. REMCs and municipally owned utilities typically don't offer net metering.

In 2017 the Indiana legislature, influenced by the investor-owned utilities, passed into law Senate Enrolled Act (SEA) 309 which began to phase it out over the following 5 years. Renewable energy systems put in place any time on or before December 31, 2017 were granted net metering until July 1, 2047. Similarly, systems installed between January 1, 2018 and June 30, 2022 are eligible for net metering until July 1, 2032. The status is transferable to successor owners with an updated interconnection agreement with the electric company. Customers who add solar systems after June 30, 2022 will be subject to a different billing system and rate,

called Excess Distributed Generation (EDG). This same rate will apply to solar customers when they reach the end of their respective net metering eligibility in 2032 or 2047.

Under net metering, a kilowatt hour (kWh) of customer-generated energy and a kWh of utility-provided energy each have the same financial value, equivalent to the retail rate of that electric company for that class of customer. For residential customers, the rate is usually between \$0.10 and \$0.20 per kWh. Larger commercial accounts pay less than \$0.08 per kWh.

At the end of the monthly billing period, the net amount – the difference between the kWh of grid energy used on site and the kWh of customer-generated energy exported to the grid – determines whether the customer receives a financial charge, or a bookkeeping credit. Credits can accumulate month after month; charges are paid when incurred. For systems designed to offset 100% of annual usage, production averaged out over the course of the year, can result in excess energy from Spring & Fall production (with less heating and cooling) that typically offsets the consumption of grid energy in winter, on rainy days and at night.

As of March 2022, utility companies have petitioned the Indiana Utility Regulatory Commission for rate changes. Litigation is proceeding through the courts to address how the new rates will be applied and how excess generation is defined. There are some uncertainties as to what will happen when net metering expires. The greatest uncertainty is whether the rate will continue to be applied on a monthly netting basis (i.e., treated as a kWh difference) or will convert to “instantaneous billing” treated (as a difference in monetary values between exports and inflows of energy, with the clock running continuously on both). Some utility companies have already begun converting from kWh to monetary credits. (See the [FAQ](#) on this topic for definitions.)

Solar owners with net metering interconnection agreements approved before July 2022 will continue receiving the benefits of net metering until 2032 or 2047 as stipulated in SEA 309.

To the best of our knowledge, with the court’s decision being an unknown, here is what will likely happen for new solar arrays not eligible for net metering after June 2022. The financial value of exported solar power for new arrays after June 2022 (or earlier for CenterPoint customers) will be calculated with the EDG rate, typically in the range of 2 to 5 cents per kilowatt hour (about 15% to 40% of retail rates). Each company will have a different EDG rate which will be variable, changing up or down annually.

Energy exported to some utility companies can now be measured by smart meters on a second-by-second basis – and so can energy that the customer consumes from the grid. At the end of the monthly billing period, the assigned cash value of the exported energy will be deducted from the full retail price of the energy the customer consumes from the grid. Because the EDG rate is less than the retail rate, this billing mechanism will typically result in reducing the energy savings for customers, and consequently the return on their investment.

The impact of EDG rates on the financial benefits of solar arrays can be estimated by comparing the ratio of the solar annual production kilowatt hours (kWh), to the annual total electrical consumption in kWh. For example, a solar array designed to produce 80% to 100% of the building’s total annual electrical usage will typically export a large amount of produced power to the grid in the peak solar generating spring/summer/fall months, resulting in a large number of kWh being valued at the reduced EDG rate.

How can the value of solar be optimized for new owners under EDG rates?

There are ways to compensate. If the solar array total production is 40% to 50% of the total annual usage, then a smaller amount of power will be exported during peak months, resulting in an improved financial benefit. For arrays sized to produce about 50% or less of total annual usage, the financial impact of EDG rates is less because more of the solar power has retail value when it is consumed on the property as it is being produced.

The ratio of exported energy can be reduced by adding daytime loads to use or store electricity as it is produced by solar. For example, an electric vehicle that is driven 10,000 miles per year consumes between 2,000 and 3,000 kWh annually. Appliances can be converted from natural gas to efficiently use electricity, for example an electric heat pump clothes dryer (500 kWh annually) or hybrid electric heat pump water heater (1,000 kWh annually). Appliances can be remotely operated or put on a timer so that they consume energy during daytime hours. Another option is installing batteries to store peak power instead of exporting it; discharging the battery at night can power the house and reduce the amount of energy used from the grid. All the strategies mentioned in this paragraph will help mitigate the impact of instantaneous billing; they will not make a significant difference if monthly netting is allowed to continue.

An array sized to produce a smaller portion of energy used (e.g., under 50% of total annual usage) should see less adverse impact from the changeover to EDG rates. Likewise, commercial projects using greater amounts of energy will consume all of their solar power, resulting in a direct reduction in their electricity bills which typically have lower rates because of volume discounts.

Several studies have shown that the cost to build and operate utility scale wind turbines and solar arrays is less than the cost of using existing coal or gas power plants to produce grid energy. Economics is driving utility companies to invest in renewable energy around the world.

What is the value of an investment in solar energy?

Studies of the value of distributed solar (arrays located near where the energy is used) prepared by different authors at different times have different results. Reports sponsored by utility companies show lower value because their calculation is limited to the avoided cost of purchasing energy from other sources. Reports not sponsored by utility companies show higher value of distributed solar because other factors such as decreasing air and water pollution, improving public health, and mitigating climate change are included as benefits. No studies on the value of solar have been commissioned or planned by the Indiana Utility Regulatory Commission or the Indiana legislature.

Many solar owners place a high personal value on the intangible benefit of knowing their energy is produced without combustion of coal, gas or oil that contributes to global warming. Generating electricity without burning fossil fuel reduces pollution, improves health and increases life expectancy. Additionally, sunshine and wind are free and inexhaustible fuel sources.

Some people spend more on travel than the cost of a typical solar array, but the enjoyment of travel is relatively brief in its duration. A solar system today costs less than half of what it did a few years ago and it will continue operating for decades. Enjoyment of residential solar energy transfers from the buyer to successor owners who usually will pay a premium for a solar home.

Although the cost of home remodeling projects can be partly recovered when the property is sold, most of their value is provided as added pleasure for owners. Unlike solar systems, an updated bathroom or kitchen will not

provide a continuing reduction of utility costs.

The value of automobiles, furnaces, air conditioners and other appliances decreases with time until they cease to operate and are replaced. Their benefit is the service provided by their function. Solar systems are appreciating assets that will continue operating for decades. Their value will go up as electric rates increase. Their benefit is the service provided by their function of making energy with no fuel cost.

Performance of solar panels after 25 years is expected to be 80% to 90% of their original rated power. Value of solar grows if performance reduction is less than one percent annually and electric rates increase more than one percent. How much have electric rates increased in recent years?

How does a solar home buyer get net metering rights transferred?

Indiana has dozens of electric utility companies. REMCs and municipal owned utilities have more autonomy from state regulation as compared with the larger investor owned utilities, Centerpoint (formerly Vectren), Duke Energy, Indiana-Michigan Power, Indianapolis Power & Light and Northern Indiana Public Service Company.

Under a 2017 Indiana state law known as Senate Enrolled Act 309, if you are a net metering customer of one of the five investor owned utility companies, the person who buys your house also acquires the right to net metering – until 2047 if the system was installed before December 31, 2017, or until 2032 if the system is installed between January 1, 2018 and June 30, 2022. These rights are valuable, so please explain them to the realtor and prospective buyers.

Because net metering rights attach to the property, the buyer will get the same deal as you did: each kilowatt hour is valued at the same retail rate until the applicable grandfathering date regardless of where it comes from, whether from the grid or your own system. However, the meter will be set to zero for the new account and the previous owner will not be paid for kilowatt hour credits that are in effect transferred to the utility company.

The buyer must request a new interconnection agreement for net metered billing from the utility company when they set up their own account at the house address, citing – and if possible showing – the original interconnection agreement. If not, sharing your account number with your buyer should enable the utility customer service representative to verify the entitlement. The home buyer can usually coordinate with the solar installer to handle the new interconnection agreement for a small fee, if this is preferred. Making arrangements well in advance of moving day will allow time to minimize possible delay.

The confirmation letter you received from your utility company, along with your signed interconnection agreement, make it clear that your house is grandfathered in to net metering. That does not mean that the first utility employee that your buyer speaks to when they go to open an account will be familiar with the issue.

Net metering customers are still only a small percentage of the total customer base. As with all exception handling, you have to find the person who understands how to handle the exception.

For Duke Energy customers, the buyer should contact the Duke Renewables Service Center via email at CustomerOwnedGeneration@duke-energy.com or by phone at 866-233-2290.

How does having solar affect the selling price of my house?

Nationally and locally, [homebuyers are paying a premium for solar](#). “Research from the real estate site Zillow shows that putting solar on your roof can boost the value of your home—sometimes significantly. In a comparative study, Zillow found that homes with solar energy systems [sold for 4.1 percent more on average](#) in 2019 than comparable homes without them. This means that the median-valued home in the country (\$226,300) was worth an additional [\\$9,274](#) just because of those magical panels.”

Buyers are willing to pay that premium in return for reducing or eliminating their electric bills, along with any future rate increases, for as long as they own the house. There are two associated financial benefits to consider. First is a cash flow issue. By not having to factor the utility bill into fixed monthly costs, the buyer looks better to the mortgage company and can afford a bigger mortgage.

Second is a tax issue. [Energy Sage explains](#): “For any new solar PV system installed in Indiana, the assessed value of the system is [exempt from your property taxes](#). That means that, even though your solar installation adds value to your property, the added value can’t be counted when property is being assessed for taxes.” You establish the assessed value of the system by presenting the county assessor with a copy of the contract showing the price you paid the installer.

Last but not least, more people every year want clean energy. A national survey by the Pew Research Center in June 2020 found that 79% of Americans think that the US should prioritize developing renewable energy sources. What do you think that means when it comes to buying a home? Solar homes sell faster because there are fewer on the market but more motivated buyers are looking for them.

Who can use tax equity financing for solar projects?

SIREN is familiar with two churches who have used tax equity financing to fund their solar systems. In this form of financing, a nonprofit (and therefore tax-exempt) organization partners with a qualified investor who has passive income to invest. Together they form a limited liability company or other contractual agreement; the company purchases the system and claims the federal renewable energy income tax credit plus any other associated benefits (e.g., business depreciation). Ownership of the system reverts to the nonprofit under terms decided by the partners.

The renewable energy tax credit is one of a handful of tax equity financing mechanisms. For more information on the rules governing each type and for discussion of how related policy might develop, see [Tax Equity](#)

Financing: An Introduction and Policy Considerations, a comprehensive report on the subject prepared by the Congressional Research Service

I hear that with an interest-only home equity loan, the loan payments for solar cost less than my current electric bill. How does that work?

As with any financial plan, the outcome depends on the underlying assumptions. Here are the ones used in the calculations below.

- The loan has a 4% interest rate. Your itemized federal income taxes put you in the 15 percent bracket, and you owe taxes.
- You pay \$3 per watt for solar, and the total cost of your system is \$10,000 before a \$3,000 tax credit for a 3.3 kilowatt solar array. It faces south with no shading and produces 4,200 kilowatt hours (kWh) per year.
- Duke charges 11 cents/kwh for usage above 300 kWh/month (14 cents below 300 kWh) in year 2017.
- In following years, the variable interest rate changes are comparable to electric rate increases.

Here are the calculations for year one:

4,200 kWh reduces electric bills by \$462 annually or \$38.50 monthly.

The value of the electricity generated exceeds the \$400 annual interest on \$10,000 principal or \$33.33 monthly. The difference reduces the loan principal by \$62 annually or \$5.17 monthly. $\$33.33 + \$5.17 = \$38.50$ for loan payment

Income tax is reduced by \$60 (15% of \$400 home equity/mortgage deduction) = an additional \$5/month to apply to reducing the principal.

Net interest cost after taxes = \$340 or \$28.33 monthly plus \$10.17 monthly principal reduction = \$38.50 loan payment

$\$10.17 \times 12 \text{ months} = \122 first year loan principal reduction

Loan principal is reduced by \$3,000 income tax credit in year one.

Here are the calculations for year two:

In year two, \$272 annual interest on \$6,800 average principal or \$22.67 monthly plus \$15.83 monthly principal reduction = \$38.50 loan payment

$\$15.83 \times 12 \text{ months} = \190 second year loan principal reduction

Adjustments that can be applied to principal loan reduction:

- \$40 annual SREC income @ 4 x \$10 for 4,000 kWh > a monthly loan payment
- \$40.80 income tax reduction (15% of \$272) > a monthly loan payment

Repeat this calculation for each year until the loan is paid off at closing. A buyer can afford to pay more for mortgage payments because of lower monthly electric bills.

What does solar cost?

You can get a ball park estimate sufficient to create a realistic budget and set realistic payback expectations by using online calculators. These calculators enable you to enter your own data (for example, panel size and cost per watt) or to use the default values typical for your location.

The National Renewable Energy Lab (NREL) **PVWatts** calculator estimates the amount of energy production and dollar value of energy produced for grid-tied PV systems of specified size and orientation to the sun. The **Solar & Wind Estimator** provides a thorough financial analysis for solar water heating, pool or spa heating, and space heating/cooling systems in addition to PV systems. This analysis is based on energy bill savings and net system cost, after tax credits and other incentives are applied. The Solar & Wind Estimator also calculates the impact of loans if you intend to finance your system that way. It displays cash flow and your break-even point in graphical form.

Small changes in energy consumption habits can reduce the cost of renewable energy. For example, reducing household energy use by only 100 kilowatt hours a month has the same effect as buying 3-4 solar panels that produce 1,200 kWh annually, yet it costs nothing. Many PV owners began by replacing half the energy they use from the grid with solar power; then they reduce the other half with energy conservation. PV systems can be installed in stages to spread cost over several years.

Solar PV electricity is an appreciating asset. The value of your system will increase as future electric rates continue to rise. This investment will raise your home's value, reduce peak loading on the grid, and support the local economy. PV prices have fallen by 70% over the last six years due to technological innovation and new financing models so the investment is more affordable than ever.

Does a renewable energy system pay for itself?

Yes. The payback period – the length of time it takes for your savings from lower utility bills to equal the initial cost of the system – varies widely, based on the size and type of system you buy, the amount of energy you use or conserve, and how quickly your utility's billing rate increases. Most projected payback periods for residential PV are in the 10-15 year range, based on 2015 prices, which is 10-15 years shorter than the warranty period. Once you get to the break-even point, you will pay nothing and nobody for the electricity your panels generate – and by then, utility rates will be higher than they are now.

The projected payback periods for solar thermal, solar attic fans and other devices are generally shorter, but otherwise the same logic applies.

Here is another way to think about your investment in solar. Residential PV systems cost between \$5,000 and \$10,000 after the federal tax credit. That's less than cost of a used car. A car is a depreciating asset. Most of the value of a car is lost after 10 years, and meanwhile you are buying gas, insurance, license and repairs. Solar PV is an appreciating asset. Solar fuel costs nothing and solar systems require little or no maintenance. In addition, an investment in renewable energy will raise your home's value, reduce peak loading on the grid, and support the local economy.

What's the deal with the tax credit?

Congress extended the renewable energy tax credits that were originally set to expire at the end of 2016.

A **30 percent federal renewable energy investment tax credit** is available until December 31, 2019 to individual taxpayers who install solar PV or solar hot water on property they own and use as a residence. For example, a \$10,000 system would cost \$7,000 after the tax credit. The amount of the tax credit will step down to 26% for systems placed in service after 12/31/2019 and before 01/01/2021, and down to 22% for systems placed in service after 12/31/2020 and before 01/01/2022.

The rules describing the **residential tax credit** state, "Expenditures include labor costs for on-site preparation, assembly or original system installation, and for piping or wiring to interconnect a system to the home. If the federal tax credit exceeds tax liability, the excess amount may be carried forward to the succeeding taxable year." See Energy.gov for all relevant terms and conditions for solar and other renewable technologies (fuel cell, wind and geothermal). **Form 5695** is used to claim the residential tax credit.

The **corporate tax credit** applies to a somewhat different set of solar technologies: PV, Solar Water Heating, Solar Space Heating/Cooling, Solar Process Heat. The credit starts at 30% for systems placed in service before 12/31/2019, steps down to 26% for 2020, 22% for 2021, and 10% for 2022 and future years. The business tax credit for Hybrid Solar Lighting, Fuel Cells, Small Wind as well as Geothermal Heat Pumps, Microturbines, Combine Heat and Power (CHP) Systems expired as of 12/31/2016. A 10% tax credit is available for Geothermal Electric for the foreseeable future. The tax credit for Large Wind steps down annually from 24% in 2017, 18% in 2018, and 12% in 2019; it expires at the end of 2019.

Eligible purchases can be depreciated like any other equipment acquired for business use, following standard Modified Accelerated Cost Recovery System (MACRS) accounting rules. Both the business tax credit and a substantial portion of the depreciation allowance can be taken in the first year, making renewable technologies very affordable.

What are Solar Renewable Energy Credits (SRECs)?

You can get paid for the renewable attributes of your grid-tied PV energy source by registering with a broker such as **SRECTrade** or **Sol Systems**. Participating utility companies purchase renewable energy credits to meet state required renewable portfolio quotas. Indiana has no such requirements; Ohio and Illinois do, and they buy credits from Indiana solar owners. As the actual energy producers, solar owners receive a check for market

value solar production credited to the utilities. One SREC is awarded for each 1,000 kWh (kilowatt hours) of solar energy produced. This benefit is separate from the reduction in electric bills resulting from the energy value of your solar array.

Midwestern market values for SRECs have been trending down as laws change and renewable energy becomes more of a commodity. As of July 2018, Ohio SREC values are about \$7 per 1,000 kilowatt hour of solar energy produced (one SREC). A home producing 10,000 kWh per year with solar PV would earn \$70 annually at \$7/SREC.

Can I get a grant or other funding to help pay for a solar or other renewable energy system?

For both individuals and organizations, the best place to start is [DSIRE \(Database of State Incentives for Renewables and Efficiency\)](#). It is the most comprehensive source of information on this topic in the United States. It includes financial incentives including loans, grants, tax breaks and utility rebate programs.

Noteworthy non-residential programs that work with specific groups include:

- The Indiana Office of Energy Development offers grants under the [Community Conservation Challenge](#) to community organizations and government entities, including schools.
- [Hoosier Interfaith Power & Light \(H-IPL\)](#) offers free advisory services and occasional grants to faith communities.
- Solar Uniting Neighbors (SUN) grant program awards grants to diverse group of businesses and organizations in northern Indiana, made available through the Indiana Association for Community Economic Development .
- The USDA's [Rural Energy for America Program \(REAP\)](#) provides financial assistance, including grants, to agricultural producers and rural small businesses.
- The [S. Department of Energy](#) supports a number of grant, loan and financing programs for businesses and for state, local and tribal governments.

Can I finance a solar energy system?

Many people finance with a bank home equity line of credit. The minimum monthly interest payment can be less than your savings from electric bills. Talk with your local credit union or bank for financing options. Another avenue to check is the Clean Energy Credit Union at www.cleanenergycu.org. It makes solar loans.

Can I lease a PV system?

Leasing is an option for homeowners in many states but not currently in Indiana. The closest thing to it is the community solar option available from [Tipmont REMC](#), Indiana's first community, remote solar program. The REMC owns and operates an array of 240 panels on its land. Customers can purchase electricity generated from one or more panels and receive a monthly credit on their bill.

How does solar PV or other renewable technologies affect my property tax and property value?

Indiana offers a **property tax exemption** for the assessed value of most renewable energy systems, typically based on the actual cost of components and labor. Effectively this means that you can increase the value of your home without paying tax on the increased value. Commercial and industrial property owners may also claim this exemption.

The few home sales to date that have involved rooftop solar in Indiana do show it to be an advantage, not only in commanding a higher price but also resulting in less time on the market. A **national study** found that home buyers are willing to pay more for houses with rooftop solar systems. Data on properties with other renewable technologies is scattered, but suggestive of the same advantage.

What does it cost to charge an electric plug-in vehicle with solar energy?

Solar owners are more likely to drive hybrid or electric vehicles (EV). The savings for using solar to charge an electrical vehicle is better than for using solar energy in the home.

The pre-owned Chevrolet Volt or Nissan Leaf can be purchased in 2021 for under \$10,000.

From a Leaf owner: "In two years we have averaged driving about 8,000 miles per year on our all electric Nissan Leaf. Newer models have a range of 150 to 200 miles. Charging the car battery uses about 2,000 kilowatt hours annually. That's 4 cents/mile at 15 cents per kWh for electricity compared to \$0.10 per mile at 30 mpg when gasoline costs \$3.00 per gallon. Our \$0.06 per mile savings for not buying gasoline is about \$500 annually. If the cost of a 1.6 kilowatt solar array (to generate 2,000 kWh annually) is \$3,000 after the federal tax credit, our solar investment will be recovered in about six years (or sooner if gasoline prices increase)."

An added bonus to the all electric Leaf is that there are no other expenses: no oil changes, spark plugs, air filter, belts, tailpipe or muffler, no noise and no exhaust pollution. Maintenance is mostly limited to tires, brakes, suspension and windshield wipers. The car and its batteries are made in Tennessee.

The Chevrolet Volt uses about 1,200 kWh to drive 3,400 miles (85 trips of up to 40 miles in all electric mode before switching to its gas engine). The avoided cost of gasoline is \$340 (assuming \$0.10 per mile with 30 mpg and \$3.00 per gallon gas cost). If the cost of a one kilowatt solar array (to generate 1200 kWh annually) is \$2,000 after the federal tax credit, then the ROI for solar energy will be 12 percent (\$340 savings annually vs. \$2,000 cost) and the initial cost will be recovered in about six years depending on future cost of gasoline.

A similar analysis for someone without grid-tied solar net metering is a comparison between grid power and gasoline. The cost of 1,200 kWh from the grid could be \$180 (15 cents per kWh) to drive 3,400 miles. The ROI for purchase of the Volt is calculated as \$120 savings for each 3,400 miles (\$300 avoided cost of gasoline at \$3.00 per gallon, minus \$180 cost of electricity to charge the car battery).

The cost of grid power is usually between 10 and 20 cents per kWh. The value of electricity produced by a one kilowatt solar array (generating 1,200 kWh annually) is \$120 at 10 cents per kWh or \$180 at 15 cents per kWh.

However, the accuracy of any analysis depends on its assumptions. The incremental cost of electricity depends on your rate, which utility company and how many kWh you are using. The first 300 kWh per month with Duke Energy is more expensive, with additional discounts for usage above 300, 1000 and 2000 kWh.

To maximize battery life, Nissan recommends that Leaf owners **limit charging the car's battery to 80 percent.**

Under 30% charge is generally considered low and thus you should not let your EV sit at that low state of charge for an extended period. The general rule of thumb is to **plug in and charge whenever you can.**

Effective battery range of an EV rated for 200 miles at full charge would be about 100 miles (from 80% to 30%)

The typical average for local driving (8,000 miles annually) would be under 25 miles per day.

Newer Nissan EVs are capable of bi-directional energy transfer. Leafs sold in Japan can provide power to a home. Someday they will be available in other countries. Offices of the Nissan factory in Tennessee are powered by batteries in a fleet of corporate vehicles that are charged at night with low cost power from TVA.

Comments from an EV owner "Our 2015 Nissan Leaf purchased in 2018 at reasonable cost and with low miles has become the preferred local vehicle. It's a joy to drive and has no oil changes, no muffler, catalytic converter or emissions. Maintenance is tires, brakes, suspension, windshield wipers and light bulbs. Heated seats and steering wheel are a pleasure in winter months.

We average about 20 miles daily (7,000 miles annually) and charging is mostly with a 110V wall outlet. Free public chargers installed by the city at Switchyard Park have been appreciated. Energy usage from our Duke solar net metering is roughly 1,000 kWh for 4,000 miles. After adding a few more solar panels. our home and EV (electric vehicle) have been net zero from the grid for several years.

The original Leaf 24 kwh battery capacity is similar to a solar backup battery system. Newer Leaf battery sizes have increased to 30, 40 and 60 kWh with about 60 percent of the stored energy usable for driving. Battery life is extended by not fully charging or discharging. When the charge level is below 20 percent, warning lights are activated and the GPS screen shows locations of nearby public chargers. We normally charge to 70 or 80 percent of capacity. Batteries are sensitive to heat and cold; batteries get hot when charging.

Our 2016 Toyota Prius hybrid ICE (internal combustion engine) is used for travel, consistently providing mid 50s miles per gallon on the highway."

What is net metering?

According to the [Solar Energy Industries Association](#) , "Net metering is a billing mechanism that credits solar energy system owners for the electricity they add to the grid. For example, if a residential customer has a PV system on the home's rooftop, it may generate more electricity than the home uses during daylight hours. If the home is net-metered, the electricity meter will run backwards to provide a credit against what electricity is consumed at night or other periods where the home's electricity use exceeds the system's output. Customers

are only billed for their “net” energy use. On average, only 20-40 percent of a solar energy system’s output ever goes into the grid. Exported solar electricity serves nearby customers’ loads.”

Only investor-owned utilities with monopoly service territories were legally required to offer net metering to their customers. Different utilities have different net metering policies. Here is what [Duke Energy Indiana](#) says about [renewable generating options](#) and [net metering](#) in its territory.

Rural Electric Member Cooperatives (REMCs) and municipal utilities are not required to offer net metering. There are 38 REMCs in Indiana, each with its own renewable energy practices and policies. Drill down on this [REMC](#) map to see their websites for more information.

There is a power struggle (pun intended) over net metering as monopoly utilities and their supply chain partners try to keep marketplace control and consumers try to gain energy independence. The legal and regulatory situation changes frequently. For an annual overview of “The state of net metering in the United States,” see [Solar Reviews](#).

What are the benefits to the owner of installing a solar PV system?

The greatest benefit for the owner is creating a clean, renewable form of energy right at home. Eighty percent of Indiana’s electricity is generated from central coal-fired plants, which results in double the carbon emissions of a typical Indiana household compared to their natural gas or automobile use. The main financial benefit comes from locking in the cost of electricity for the next several decades and removing uncertainty about future rate increases. Locally, annual rate increases are forecast to be about three percent a year.

Solar systems produce electricity long after they’ve paid for themselves. [Solar panels manufactured in the 1970s still provide power](#). Solar assets appreciate in value if electric rates rise by more than one percent annually – the maximum rate at which cells in the panels degrade. Most PV panels carry a warranty guaranteeing that in year 25, the system will still generate at least 80 percent of what it did in the first year. The zero cost of fuel from the sun remains constant.

What are the support levels of tax-deductible donation to SIREN?

As a volunteer-run organization, SIREN is supported via tax-deductible contributions made by individuals and businesses in our community. If you are interested in supporting our work, you can [donate](#) at a level of support that fits you best.

- **Individual** \$25/year
- **Family** \$50/year
- **Sustainer** \$100/year
- **Business** \$250/year. Benefactors receive a SIREN certificate which can be proudly displayed in your place of business. They can also choose to be listed as a supporter on SIREN’s website.

- **Benefactor membership** – \$500/year. Benefactors can also choose to be listed as a supporter on SIREN's website.

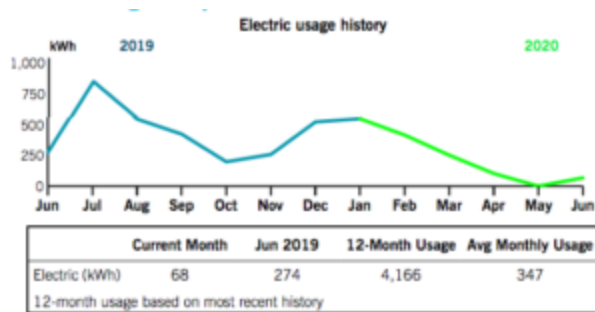
Utility Customers

How can I get my billing history from Duke so as to determine my monthly and annual consumption?

The quickest way is to register for an online account. If you are a Duke customer, as in the example shown, use your account number to register at <https://www.duke-energy.com/my-account/sign-in>. A paper bill will have both your account number and the Company's website address.

Once you register and/or sign in, go to the account summary or payment page. Click on **View Bill** for the most recent month.

When the bill image appears, it should display your electricity usage in kilowatt hours over the previous 12 months in both chart and numerical form. On a Duke bill, it looks like this (though your numbers may be higher or lower).



12-Month Usage is the information that you need to provide on the Solarize Site Info form (if you are participating in a Solarize group-buying program) or when requesting an estimate from a solar installer. If you want to see how much you paid for those 12 months, look at Payment History. SIREN, the Solarize organizer, is a nonprofit organization.

If you do not want to register online for some reason, you can obtain the same information by calling Duke or REMC customer service at the number listed on your paper bill.

Why is my Duke meter not reporting energy production?

Duke has seen net metering issues on a few meters. You should have a bi-directional meter that records energy going both directions. A one directional meter can charge your account for kWh from and to the grid. Their

meter crews are instructed to not install new “smart” meters with a communication feature that doesn’t process net metering.

Our bills show meter readings that go back to 0000, but never lower.

The Duke bi-directional meters measure energy sent to and received from the electric grid but the company’s billing system doesn’t report negative numbers. If your account has accumulated a kwh credit, the monthly bill will only show the highest previous reading. After consulting with your solar company, you can read the meter to learn actual kWh usage or contact the Duke Renewables Service Center for a billing report via email at CustomerOwnedGeneration@duke-energy.com or by phone at 866-233-2290

revised July 2021

What is Instantaneous Billing? How does it differ from Monthly Netting?

Every Hoosier deserves the right to benefit from rooftop solar. Years ago, in 2005 and again in 2017, Indiana law made it clear that when Hoosiers go solar, any excess electricity they generate gets credited back monthly.

In 2021, state regulators and utility companies have attempted to change that rule from its original intent in a way that will financially harm those who’ve already gone solar—and those who are considering it. A judicial ruling on legal challenges to the unprecedented action is expected in mid-2022. We need the state law to be respected.

At CenterPoint/Vectren’s request, Indiana’s utility regulators recently approved instantaneous netting instead of traditional monthly netting, which means solar customers will ultimately be reimbursed far less for the energy they send to their neighbors on the grid. That’s a disincentive to those who want to embrace energy freedom and receive a fair rate for the power they create. For more details, see [Monthly-Netting-No-Call-to-Action-Revised-January-2022-1](#) Solar advocates fought the decision and as of now – March 10, 2022 – the court decided against the utility. CenterPoint/Vectren (and the four other utilities preparing to make this change) are expected to appeal the decision.

Changing the rules means Hoosiers who have gone or want to go solar could lose thousands of dollars of expected savings, and all Hoosiers will lose the benefits of increased solar energy. To learn more about the financial impact of these changes and about strategies to protect your investment in solar, click [here](#) for a related FAQ.

Lawmakers have an opportunity in the legislative session to ensure that Hoosiers who embrace solar are credited on a monthly basis—the way the state law was written—instead of instantaneous, which will cause them financial harm. Regrettably, several energy bills submitted in the 2022 Indiana state legislature have been refused a hearing by committee chair persons.

How do I verify that billing on my Duke Energy net metering account is accurate?

A series of changes has affected the billing process for Duke net metering customer accounts.

Some Duke legacy net metering customers had analog meters with dials and a spinning disc that went backwards when energy was exported to the grid. Those meters indicated the amount of kilowatt hours (kWh) credit. You could read your meter and keep a record of the seasonal kWh credits. The summer kWh credits would carry forward month to month and offset energy used from the grid in winter.

When “smart” AMI digital meters were approved by the IURC, the meters of Duke net metering customers were not initially replaced. Several commonly occurring errors were identified during 2021 when net metering customers received new AMI meters. Although some models of AMI meters did not properly register energy and some meters were programmed incorrectly, most of the identified issues have been resolved. Net metering customers are not eligible for the AMI opt-out program.

Digital displays on the new meters start at 000000 kilowatt hours (kWh). The cumulative kWh credits are not displayed. Likewise, your solar kWh production is not displayed. Numbers that are displayed by the meter in sequence are energy from the grid and energy sent to the grid. For example, if the numbers are 000500 from the grid and 000200 to the grid, your net monthly usage would be 300 kWh before adjusting for cumulative kWh credits.

The Duke incremental residential rates are highest for the first 300 kWh used each month. You get discounts for using more energy.

Another change (without explanation on the bill or on the company’s website) is conversion of the net metering adjustment to cash equivalents. This now occurs in a manner contrary to the easily understood language in the existing Duke net metering tariff. The tariff specifies, *If the kWh generated by the customer and delivered to Company exceeds the kWh supplied by the Company to customer during the billing period, the customer shall be credited in the next billing cycle for the kWh difference.* Instead, the current calculation of the “net metering adj” amount is not disclosed in sufficient detail to allow customers to replicate their billing for the month. The resulting calculated adjustment may show an amount payable than it would have been using the previous formula.

The company’s internal billing system keeps a record of monthly kWh credits, which can be provided to customers upon request. If you believe your billing is not correct after the meter replacement, you may contact the Duke Energy Renewable Service Center by phone (866 233-2290) or email to CustomerOwnedGeneration@duke-energy.com.

An email response may be forthcoming in days or weeks. You could be on the phone for hours until you contact someone who can answer your question. Repeated inquiries may be necessary. They will work with the billing and metering departments as needed to resolve the issue. You are entitled to a cash refund if your account has been overcharged.

Reviewing your electric bill monthly is advisable. Net metering accounts are processed by hand. Although customer accounts with overcharges have been adjusted in response to specific requests, some previous errors have been repeated in subsequent billing cycles. A new online Duke customer billing portal announced for introduction in 2022 may offer improvements including visibility of your cumulative kWh credits.

What is net metering?

According to the [Solar Energy Industries Association](#), “Net metering is a billing mechanism that credits solar energy system owners for the electricity they add to the grid. For example, if a residential customer has a PV system on the home’s rooftop, it may generate more electricity than the home uses during daylight hours. If the home is net-metered, the electricity meter will run backwards to provide a credit against what electricity is consumed at night or other periods where the home’s electricity use exceeds the system’s output. Customers are only billed for their “net” energy use. On average, only 20-40 percent of a solar energy system’s output ever goes into the grid. Exported solar electricity serves nearby customers’ loads.”

Only investor-owned utilities with monopoly service territories were legally required to offer net metering to their customers. Different utilities have different net metering policies. Here is what [Duke Energy Indiana](#) says about [renewable generating options](#) and [net metering](#) in its territory.

Rural Electric Member Cooperatives (REMCs) and municipal utilities are not required to offer net metering. There are 38 REMCs in Indiana, each with its own renewable energy practices and policies. Drill down on this [REMC](#) map to see their websites for more information.

There is a power struggle (pun intended) over net metering as monopoly utilities and their supply chain partners try to keep marketplace control and consumers try to gain energy independence. The legal and regulatory situation changes frequently. For an annual overview of “The state of net metering in the United States,” see [Solar Reviews](#).

How do the Duke Energy charges for base rate and riders affect net metering customers?

Grid-tied solar owners will pay Duke the monthly minimum connection fee, regardless of surplus production. The Duke rate tariff schedule charges less per unit as your electricity usage increases. The first 300 kWh monthly is the most expensive. Your monthly bill is reduced by power produced with renewable energy. For example, if you used 900 kWh and produced 500 kWh with solar PV, the net bill would be for 400 kWh from the grid. The first 300 kWh would cost about \$44 and the next 100 kWh would cost about \$11 for a net metering bill of approximately \$65 including the \$9.40 connection fee.

Your electricity usage is seasonal with the lowest bills in spring and fall when heating and cooling are not needed. Solar energy peak production is from March to October. A solar PV system sized to offset most or all of your power in April and September will have the greatest benefit by reducing your monthly kWh below 300.

DUKE ENERGY RATE ANALYSIS FOR INDIANA RESIDENTIAL (May 2014)

Monthly energy kWh usage	Under 300	301 – 1000	over 1,000

Base rate per kWh		0.092945	0.054178	0.037794	
Rider adjustment charges		0.045177	0.045177	0.045177	
Electric charges total		\$0.138122	\$0.099355	\$0.082971	
Sales tax 7%		\$0.008652	\$0.005938	\$0.005258	
Cost per kWh		0.147	0.105	0.088	

Cost per kilowatt hour (kWh), including Indiana sales tax, is near 15 cents, 11 cents and 9 cents for each residential kWh rate tier, including base rate and riders.

What are the rates for other Indiana utility companies?

Here are the rates as of 2014. Rates are set by the **IURC** for set periods; utility companies have to request rate changes. We will try to track rates changes and update the rate information on this page to the best our abilities.

I&M:

Service Charge: \$7.30 per month, Energy Charge: 8.634¢ per kWh

IPL:

Customer Charge for bills of 0-325 kWh per month: \$ 6.70 per month; for bills over 325 kWh per month: \$11.00 per month

Energy Charge: any part of the first 500 kWh per month: 6.70¢ net per kWh; over 500 kWh per month 4.40¢ net per kWh

With electric heating and/or water heating, over 1000 kWh per month: 3.18¢ net per kWh

NIPSCO:

Customer Charge: \$11.00 per month

Energy Charge: \$0.097836 per kWh

Adjustment for customers with electric space heating: \$0.077836 per kilowatt hour for all use in excess of 700 kilowatt hours during any billing period more than half of which is within any calendar month from October to April

VECTREN:

Customer Facilities Charge: \$11.00 per month

Energy Charge:

- Standard Customers \$0.09771 per kWh for all kWh used per month;
- Transitional Customers
 - \$0.07656 per kWh for the first 1,000 kWh used per month
 - \$0.05266 per kWh for all over 1,000 kWh used during the months of June through Sept
 - \$0.03899 per kWh for all over 1,000 kWh used during the months of October through May

REMCs, Hoosier Energy, WVPA, and municipally owned utilities:

Indiana has 38 **REMCs**, each with its own net metering or similar policies, rate structures and tariffs. See the **map** of their territories for more information. Many REMCs source their power from **Hoosier Energy**, which also provides solar thermal to some customers. In addition, Indiana has 60 **municipally owned utility** companies throughout the state and **Wabash Valley Power Authority** has service territories in northern Indiana as well as part of Illinois.

If you receive your electricity from one of these utilities, please consult the company for information on renewable energy options.

What are the benefits of rooftop solar to the utility company?

Private rooftop systems also benefit the utility. They are most productive at the same time that demand for electricity is greatest – on summer afternoons, often referred to as ‘peak load times.’ This means that solar owners supply their own needs and put any surplus energy they generate back out on the grid where it is used by their nearest neighbors. Solar owners relieve the peak load on the utility and do not incur line losses when electricity travels through the distribution system from the utility’s power plant.