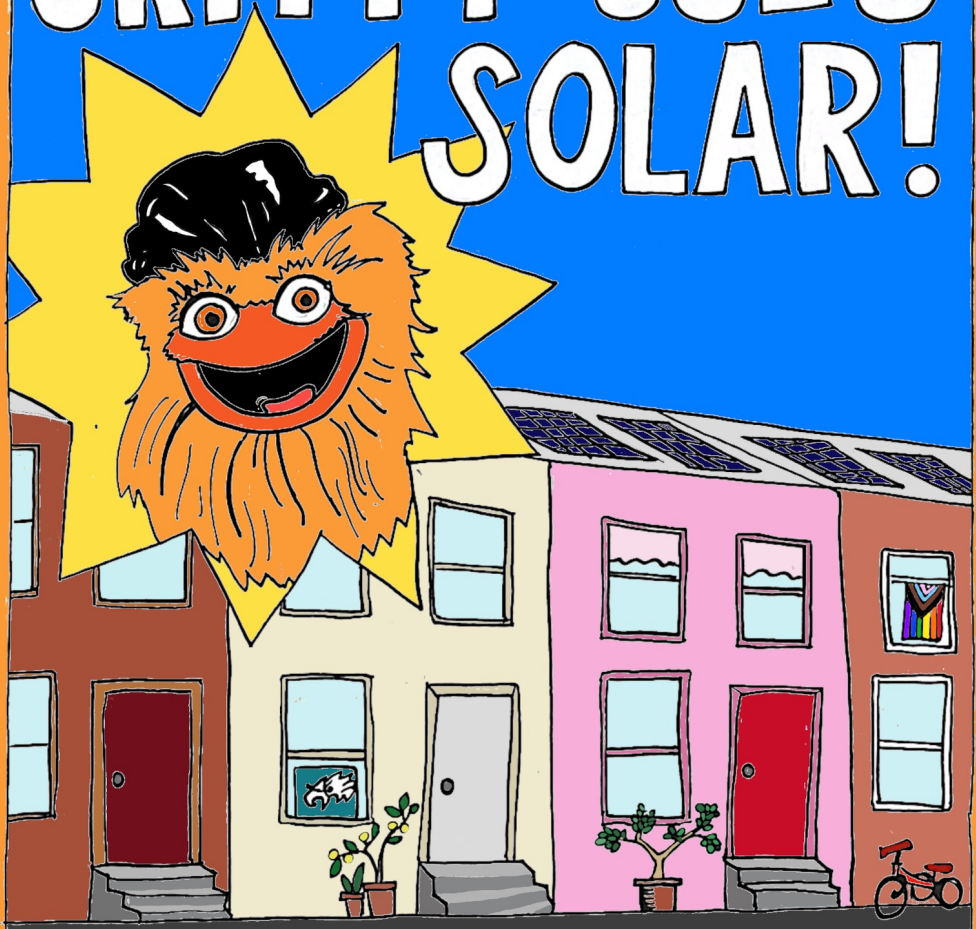
GRITTY GOES SOLAR!



A PHILLY GUIDE TO SHOPPING FOR RESIDENTIAL SOLAR

HOLOBIONT LAB

Table of contents

Going Solar Flowchart * pg 1

Hello! (An Introduction) * pg 2

Checklist * pg 4

Talking to Salespeople * pg 5

Leasing vs Owning * pg 11

Your Household's Solar Priorities * pg 18

Types of Residential Solar Setups * pg 20

Getting a Sense of Your Power Needs * pg 26

The Bigger Picture (Energy Democracy Now!) * pg 29

Resources * pg 35

Local Organizing * pg 36

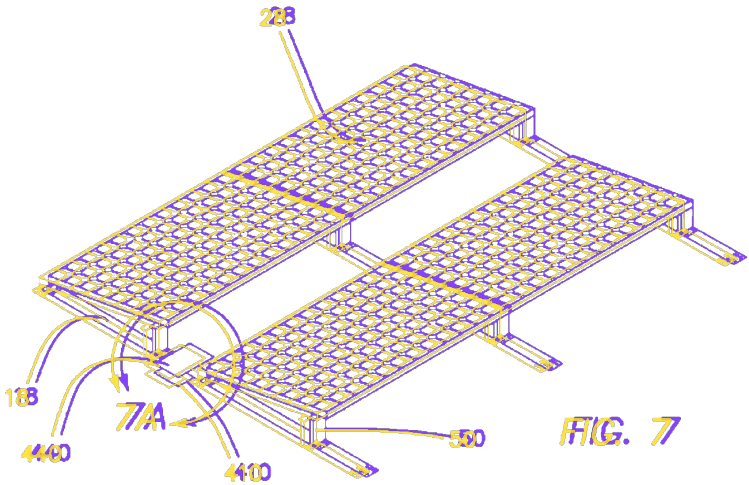
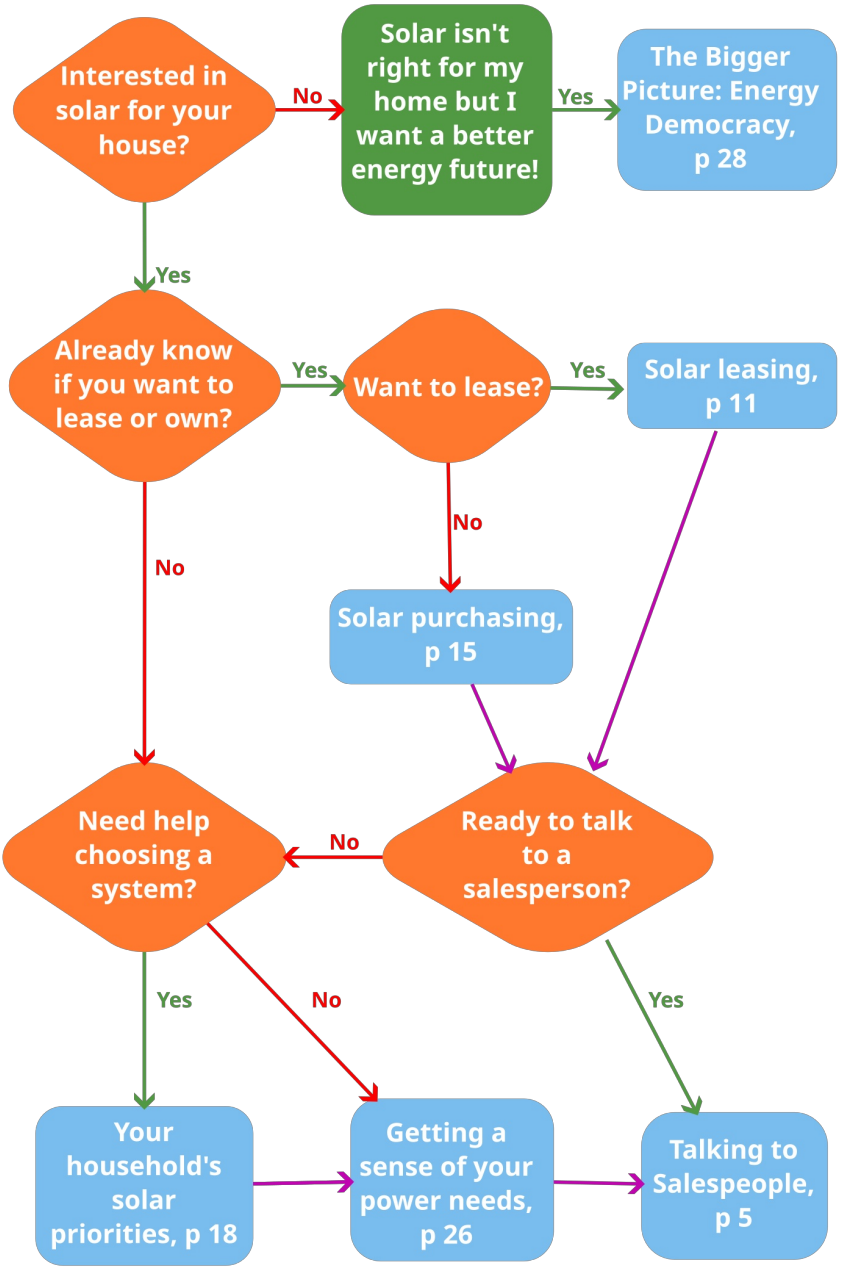


FIG. 7


Interested in solar for your house?
No
Solar isn't right for my home but I want a better energy future!
Yes
The Bigger Picture: Energy Democracy, p 28
Yes
Already know if you want to lease or own?
Yes
Want to lease?
Yes
Solar leasing, p 11
No
No
Solar purchasing, p 15
Need help choosing a system?
No
Ready to talk to a salesperson?
Yes
No
Yes
Your household's solar priorities, p 18
Getting a sense of your power needs, p 26
Talking to Salespeople, p 5

hi!

We made this zine for people who are thinking about installing solar at their home or community space and have questions about the options available or don't know where to start!

Too frequently, the primary information that people have access to regarding solar comes from for-profit solar installation companies. Often it's a salesperson at the door, offering little by way of comparison and using confusing financing terms. We have repeatedly found ourselves wishing we had a guide to hand folks that could provide a basic overview of what solar is and isn't; provide a summary of key questions to ask; and offer some pointers on what to look out for. We also wanted something that would explain the potential pros and cons of leasing versus owning.

This zine was created by Holobiont Laboratory (holobiontlab.org), a working class, collaborative project formed in response to climate change and its many impacts on our communities. Based in Southwest Philly, we use a combination of practical strategies, wild experimentation, affordable tools, and creative interventions to enhance community sustainability and local resilience to the climate crisis.

Every week we get questions from friends and neighbors who are trying to make decisions that can lower their impact on the planet -- and lower their bills-- within their limited means. These Philly residents frequently find themselves confused, overwhelmed, and/or distrustful of the array of materials and information they are receiving, particularly as it relates to home solar systems.

Through every community project Holobiont Lab works on, we are constantly learning (about renewable energy, about rain harvesting, about battery care, you name it!) and we do our best to be a trusted resource that is not motivated by an aim of trying to sell you anything!

We are grateful for the support of a grant from the Early Action Fund that paid for the initial print run of this zine. We are also grateful to Charles Lanier from the Hunting Park Neighborhood Energy Center and Joline Price from the Community Legal Services Energy Unit who

shared their valuable time and insights regarding some of the issues and confusions that they've seen Philly residents encounter during the solar installation process. Great thanks also to Jenna Peters-Golden for original sketches, and Molly Fischer for giving them color and making them print-ready.

We first started working on this zine in 2024 -- before the most recent presidential election. A lot of things in the clean energy landscape have changed tremendously since then and are still very much in flux. It will take an enormous amount of people power and public pressure to change them again.

At the same time, and despite new federal obstacles, people across the world are adopting solar power systems in record numbers and the necessity for a global shift away from fossil fuel production has never been clearer.

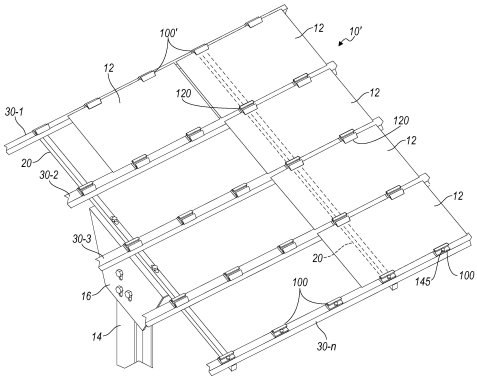
Inevitably, this zine will require updates in the months and years to come. We welcome your feedback on what was most helpful, where we could have explained things better, and what we could add in the future!

Our hope is to continue to update this resource on a yearly basis, based on new resources and the feedback we receive, so feel free to reach out! You can contact us at symbiont@holobiontlab.org.

Thanks for reading!



Holobiont Lab installing solar at the Open Kitchen Sculpture



GOING SOLAR CHECKLIST

☑ Self education!

You're already on your way by reading this!

☐ Figure out your power usage.

See page 26 to learn how.

☐ Research your local installers.

Some salespeople may screw you. See page 5 for more.

☐ Gather a handful of price quotes.

Call around! Your 1st quote may not be the best.

☐ Carefully pick the best one and get a contract signed.

Or DIY it if you have some basic electrical skills.

☐ Get solar installed!

Your installer should handle the rest.

Talking to Solar Salespeople



Art by Jenna Peters-Golden

The Scenario: You get approached by a solar salesperson. They're at your door or on the phone and they have you excited. You've wanted solar for a while and now it all seems possible. In fact, they make it seem easy -- it's in your budget and so much more accessible than you thought. According to the salesperson, you just need to sign to get the process started.

This is where you need to be careful.

Solar salespeople (all salespeople really) have one job. That job is to get you on board and signed into a contract, ideally (for them) with the highest company profit earnings that they can get away with. While just rolling with it and signing feels easy in the moment, you could save yourself thousands of dollars and many future headaches by taking a handful of precautionary measures.

Essential precautions to take:

- Don't just sign a contract without understanding it.
- Vet the installer/company.

- Don't get a single quote. Be sure to have several to compare.
- Actually read the contract.

Look up the installers' reputations

You never want to get so bogged down in the research around contractors or rebates, etc, that you're overwhelmed or paralyzed. But you also don't want to skip a couple quick internet searches that could help you filter out the worst actors.

Ask the salesperson for materials on the company. Once you have their info, look them up. Read reviews and check their rating with the Better Business Bureau. You will want to know if they are a dependable company and if their own customers will vouch for them. A company with consistently bad reviews which appear genuine is a bad sign.

A great local resource is our Solarize Philly program. This city program is run by the Philadelphia Energy Authority, not PECO. It vets installers, does bulk purchases, and connects Philly homeowners with approved installers. However, even with Solarize Philly, it will help if you do some of your own background work!

Finding an Installer checklist

☐ Look up contractors on review sites like Yelp.

☐ Are they listed at the Better Business Bureau? Here is where customers will also leave reviews.

☐ Do you have friends / acquaintances in your area you can ask about their solar install?

☐ How many years has the company been in business? The longer, the better.

Even if a company hasn't been in business for long, some unknown or newer companies can be great.

Here are some things to ask:

- Do they offer financing? Can they give you the details and terms?
- Can they give you a timeline for install in the contract?
- When do they start billing? (They should start after PECO grants PTO, or Permission To Operate, which happens after the installation is

complete. The system can not legally be activated until after PTO, which can take weeks or months to obtain. If the company starts billing at installation time instead of PTO, they could be charging you for time when your system is not active and saving you money.)

- Do they sell your personal data to third parties?
- Does the company offer or handle the warranties on work or equipment?
- Do they have their own installers? If not, they are a sales company that contracts out jobs. Try finding a company with their own installers, tools, etc.
- To get a connection to the grid and relevant permits, the installer will need a licensed electrician on board. Can they provide assurance that they can get you permits for a PECO interconnect?
- What does their contract say about what happens to the system if the company closes? Who owns, maintains, and monitors the system?
- What does their contract say about what happens to the system if you sell the house or the owner passes away?
- Are they available for maintenance, expansion, roof work, etc.? If the system stops working or sustains damage, like from animals or a storm, who pays for the repairs? Who performs them? The company themselves or someone else?

Are they offering an appropriate solution for you?

Some companies may be trying to get the biggest possible sale out of you, regardless of your actual needs. So make sure you get something that matches your needs.

Be ready ahead of time by figuring out what makes sense for your house. Start by looking up our section on different types of installs/ houses on page 20.

Be aware of your power consumption and needs before talking to a salesperson (see page 26). You'll need to sort through this early in the process. Come away from this assessment of your household usage with a rough idea of your daily energy consumption.

Other considerations at the sales stage

Will they handle or help you get tax credits or available rebates? While the federal tax credits for residential solar installations expired at the end of 2025, new incentives may become available in the future, especially if we demand them. As of February 2026, PECO's $500 rebate for Philly homeowners who install solar is still active.

Will the company give you direct access to monitoring your solar? This is important if the company folds. More often than not, the account that monitored your own install shuts down with the company unless you have confirmed that you will retain access.

The money part

How much will the entire project cost? Does it match your own ballpark? What will your monthly commitment be?

If there is financing involved in the project, it should be clearly included within the project quote.

This quote should include the down payment, interest rate, cost, and number of monthly installments.

Many quotes also offer a breakdown of the power produced by your solar array and your monthly cost moving forward, including your savings and what your PECO bill may look like.

While many quotes will include a rough timeline, exact dates usually appear in the final contract and not in the quote.

Are installers overcharging?

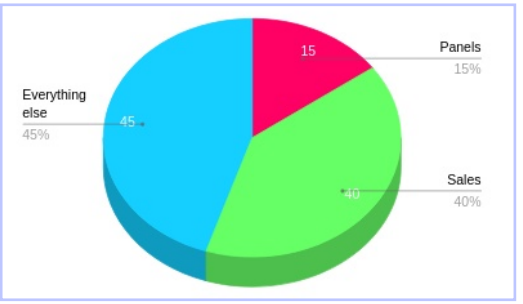
Some companies will charge three times or more than competitors, and do well just by the power of their sales department. So doing a round of phone calls before agreeing to anything could save you thousands of dollars.

To get a ballpark of what costs are in your area, you can look up Energysage's guide: https://www.energysage.com/local-data/solar-panel-cost/#how-much-does-solar-cost-in-your-state

In late 2025, the average cost per Watt installed in PA was $2.70. This

will fluctuate as tariffs and incentives sway the industry, but knowing roughly the average cost will help keep inflated estimates at bay.

Solar panels themselves only account for about 12-15% of the total cost of a solar installation. Expect to pay around 40% for sales, overhead and company profits. The remaining 45% is everything else: wages for the installers and electricians, permitting, wiring, racking and related equipment like inverters, electrical panel, etc.



Looking at a solar installation quote

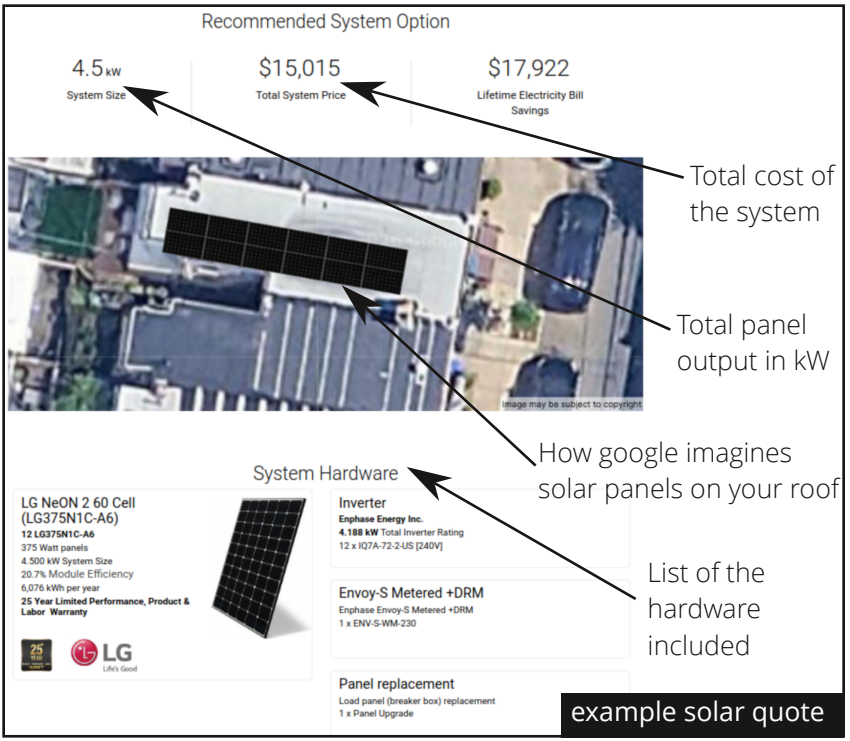
A good solar quote will help you understand exactly what you will be getting. It will be laid out clearly with language that is straightforward and unambiguous. The main things you'll want to see immediately are:



Art by Jenna Peters-Golden

- The kWs (kilowatts) of power they will install: eg: 5kW. (This number will typically be the max output of the whole solar installation.)
- The number and type of panels.
- The type of solar installation and electrical equipment (see page 20).
- A workmanship warranty that is clearly labelled and ideally states who is in charge of handling it.

There's a great online tool for getting a quick idea if you're being overcharged: https://solarbreakdown.com/



FREE SOLAR?

Be wary of the "Free Solar" offers you may have come across on Youtube or social media. Though there are still some government incentives and sometimes deferred costs, solar is rarely free. Many of these ads use deceptive wording to encourage potential solar customers to share their email address or other information for marketers to add to their own databases which they then sell.

Unfortunately the federal tax incentives for residential solar installations that offered a 30% tax incentive expired in December 2025. The incentives for non-profits will last through 2026. So far we haven't seen anything that legitimately offers 100% free solar.

Again, reading the contract carefully is well worth the trouble.



Note: In the US, the Federal Trade Commission has a mandated a 3 day cool-off period in which you can cancel a contract that you signed.

Leasing a Solar System

Homeowners can buy or lease a solar array, and each option has its pros and cons. In some ways, it's not unlike the differences between renting an apartment versus buying a home. Leasing has the advantage of lower upfront costs and less ongoing responsibility for the safety and maintenance of the system, while buying has the advantage of accruing greater value over time and having more autonomy over the choices you make regarding the system.

Leases and power purchase agreements (PPAs)

A household can use a lease or power purchase agreement (PPA) to benefit from lower electricity costs without the large upfront price of buying your own solar system. Leases and PPAs are very similar from the consumer's perspective, in that the system is owned by a company but the homeowner gets a reduced and consistent electricity bill.

The technical difference is subtle. In a lease agreement, the homeowner leases the solar equipment installed on their roof, and in a PPA, the homeowner pays for the electricity generated from the system installed on their roof. So the distinction is between paying a monthly bill for the ***equipment*** (lease) versus the ***energy*** that the equipment produces (PPA). Both should result in lower monthly electricity bills and protection from rate increases by the utility company.

One of the things that people ask us about most here in Philly is the pros and cons of leasing versus owning your solar system. For many Philly residents who are struggling to meet existing bills and who are unable to take on any new debt (in the form of green financing loans, etc), leasing a solar system may be the only near term option.

A lease or PPA can be a great choice for a homeowner who wants to save money and support clean energy, but whose homeowner's insurance is insufficient or absent. It can also be a good choice for

homes whose title of ownership isn't clear or whose ownership is muddled for other reasons, including complex inheritance.

It is very likely that after a 25 year lease term, you will have cumulatively paid more for your solar system than if you had purchased it outright; however, those payments will be spread out over a much longer time frame and a good lease should require the company to be responsible for maintenance and damage.



Art by Jenna Peters-Golden

When it comes to leasing a solar system, it is critical to carefully read the language of any solar leasing contract you sign! In most cases, you will be agreeing to purchase power from this company for 20+ years! That's a long commitment. But there are trustworthy people who can help you read the contract and make sense of it. You can find some of them in the Resources section at the back of this zine! (pg 35)

Solar should reduce your electric bills!

In most cases, if you've signed a lease contract, once your system is operational you will begin receiving two monthly bills: one from the solar company and one from your electricity provider (i.e. PECO). Since you'll be getting two bills, you want to make sure the solar system that's installed is large enough that, even with the additional bill, you end up paying the same or less than before.

A good rule of thumb is to make sure you only sign a contract if the monthly bill from the solar company is half or less of what you're paying now for electricity.

For example, if your average monthly bill is $200, ideally your new monthly solar lease should cost less than $100 per month, with the expectation that the solar will reduce the amount of electricity you have to buy from PECO. At the end of the day, you want the system to SAVE you money across the year, not cost you more.

Make sure to find out:

- Who is responsible for roof leaks and/or a new roof if damage occurs after the panels are installed? Who will pay for the panels to be removed for repair work (you or the company)? How much?
- Are you guaranteed a certain amount of savings from your current utility bills and if so, what is that savings? What is the remedy if you don't see that savings?
- If the company doesn't guarantee savings, can you make sure you won't be paying more?
- Are energy efficiency improvements to your home included as part of the contract, and if so, who is required to pay for them? What happens if other structural issues are uncovered in the course of that energy efficiency work?
- What happens if you move or sell your home and the new buyer DOES NOT want the solar panels?
- What happens if you move or sell your home and the new buyer DOES want the solar panels?

Solar can increase the value of a home, and most companies will simply transfer the solar contract from homeowner to homeowner. But check your contract to make sure the transition will be smooth.

"What if I want to buy the system I originally leased?"

That depends on the contract that was originally signed. Some companies give homeowners the option to buy out a system in a year or two, others require five years or more. Still others don't open up the option to buy until 20 years in, at which point you will have reached or be nearing the end of all equipment warranties and you'll want to carefully think through the costs and benefits.



Art by Jenna Peters-Golden and Molly Fischer

Here are two examples of language from different solar lease agreements

Notice how in Lease #1, the customer is responsible for all costs associated with changes in ownership, roof maintenance, or removal of the system. In contrast, in Lease #2, there are several options provided for what can happen to the equipment if a home is sold, and the company assumes responsibility for any impacts on the integrity of the roof as a result of installation.

Example 1:

*"If the property is sold, **the lease must be assigned to the new property owner**. Until [company name] receives an executed assignment document found in Exhibit E of the lease, you will be responsible for all remaining payments. By signing the lease agreement, **the customer is representing the roof will last for the 25-year life agreement** and not need to be replaced. **The customer is responsible for the cost of removing and replacing the solar system** in the event the roof must be repaired or replaced unless it is determined the installation of the solar system created the condition requiring the repair."*

Example 2:

*"If you sell your home, **you have the following options** with respect to the Solar Equipment: (i) **the purchaser of your home can assume** all of your rights and obligations under this Agreement; (ii) **we can relocate the Solar Equipment** to your new home if it is assessed feasible for solar and is located in the State; (iii) **we will cancel your lease and remove the Solar Equipment**. In the event of removal pursuant to this section, you agree to pay our reasonable out-of-pocket costs for removing, storing, and, if applicable, reinstalling the Solar Equipment. In the event of removal pursuant to section (iii) of this paragraph, **we will return the roof as close as is reasonably possible to its original condition** before the Solar Equipment was installed (e.g. ordinary wear and tear and color variances due to changes over time are expected). We will seal the installation points to ensure that they are waterproof and will warrant the waterproofing for one (1) year after removal."*

Purchasing Your Own Solar System

A household can also purchase a system outright or take out a loan to buy it. The upfront cost or downpayment can be a barrier, but it can also carry long-term financial benefits like tax credits (before the Trump administration killed them) and energy credits. For many homeowners, it makes sense to finance the purchase of the solar array, and most installers will have a financing company that they recommend or already work with. Homeowners can also use a home equity loan or other independent financing to pay for the system. Most solar installers will aim to offer a deal in which the owner's monthly payment for the loan is close to their previous monthly electricity bill. Salespeople sometimes call this a "bill swap."

If you're taking out a loan for the upfront costs, it is important to read the terms of that loan very carefully and to make sure you understand them, the same as we noted for the lease agreements. A high interest rate and/or undisclosed loan fees can quickly turn what initially seemed like a "good deal" into "financial exploitation." Watch out especially for hidden lender/dealer fees.

Prior to the Trump administration, there were two notable financial benefits to purchasing a system, both of which accrued to the owner of the solar array, whether that was the homeowner or the company that leased a system to the homeowner. These benefits still apply to systems installed before December 31, 2025, and continue through

Utility Incentive

For Philadelphians, PECO offers its customers a $500 rebate on purchasing and installing solar, whether you lease or buy.

www.peco.com/ways-to-save/for-your-home/rebates-discounts/solar-rebates

2026 for non-profits.

The first was **investment tax credits,** or **ITCs.** Under the Biden administration's Inflation Reduction Act (IRA), consumers could get a tax credit of 30% of the total cost of a solar array. This was not an automatic rebate, but a discount on the homeowner's taxes for the year the system was purchased. So the savings were significant, but the homeowner would see the benefit on a delay: when they next filed taxes, not when they purchased the system. If a low-income homeowner's tax bill was lower than the tax credit, the credit would be spread over multiple years. Unfortunately, under the Trump administration, these ITCs for residential solar ended in December 2025. If you're reading this and you had your solar system installed in 2025, make sure you fill out Form 5695 when you file your 2025 taxes! This will be your last chance to do so for the foreseeable future.

As of this writing, the ITCs for non-profit organizations who install solar will continue to exist up through December 2026. However, given how quickly the Trump administration has been dismantling any and all environment regulations and incentives, we highly recommend that folks confirm these calendar deadlines before building out a financing plan that relies on receiving this discount.

The second benefit is **solar renewable energy credits (SRECs),** as they are referred to here in Pennsylvania. These are tradable certificates that represent a megawatt hour of electricity generated by renewable sources. They are kind of like carbon credits, in that they capture the value of generating clean energy by creating a market to trade it.

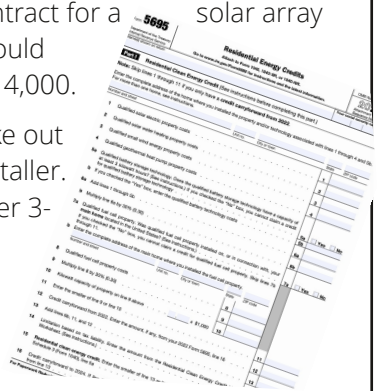
The REC market is complex, regulated state by state, and quickly descends into "weird money stuff" territory, but what's important for owners to know is that the sales and payments are usually handled by a third party broker or the utility. Each state with such a program has its own market and procedures, and REC markets fluctuate over time like any other market. For details about REC income potential, your best bet is to ask your installer to point you to the relevant information for your state. A friend of ours who has solar on her West Philly rowhome earns about $80-$100/year in SRECs, and it takes her about a minute per month to file the info.

I heard my electric meter can run backwards and the utility can pay me for energy. Is that true?

Kind of. If your solar array generates more energy than your house uses, the excess is fed back to the power grid. If you produce more than you consume over a year, some utilities (including PECO) will pay you for the excess generated. This practice of measuring and paying for excess energy produced by a household, is called "**net metering".** To keep the upfront costs down, most systems are sized to meet--but not exceed--the energy needs of a household. So these payments, where available, are modest.

As to whether an electric meter can literally spin backwards, older mechanical ones can! These days, the utility installs a "bidirectional meter" to measure energy exported back to the grid. It's included in the installation but can take a while if the utility is backed up.

Claiming Tax Incentives (until 2025)



Start of contract: Say you sign a contract for a solar array costing $20,000. The 30% tax credit would cover $6000, making your total cost $14,000.

Year one: In year one, you pay (or take out a loan) for $20,000 to pay the solar installer. You start saving on your energy bill after 3-6 months when the permitting, installation, inspections, and commissioning are complete.

Year two: In year two when you file taxes for year one, you ask the IRS for a credit of $6000 toward your tax bill. But your income is such that you only owe $2000 in taxes. So do you lose $4000 of the benefit? No, you can carry it over to future years.

Year three: In year three, you ask for the next $2000 of the tax credit.

Year four: In year four, you ask for the last $2000 of the tax credit, and the transaction is complete.

https://www.irs.gov/credits-deductions/residential-clean-energy-credit

Three Different Households:

Identifying the Specific Priorities and Constraints of Your Household!

If your household is thinking of going solar, it's useful to start by considering what your top priorities and constraints are. This will help you decide on the type of system you're getting, the size of the system, who will do the work, and under what terms. Having one dominant priority doesn't mean that other factors don't matter, but it may mean that certain things will be more important for you than they are for others. Here are some examples.

Household #1: Preppers

The members of this house are particularly concerned with having access to back-up power in the case of a grid outage/power failure. They want to be personally prepared for unforeseen disasters and to be a potential energy asset/access point to their neighbors. This means that they are committed to installing a system that includes battery storage. At the moment, given current battery technology and material costs, this may nearly double the cost of their system, but having energy storage capacity is important to them. Having battery storage also means that their utility bills are likely to be more dramatically reduced, since they can draw power from the batteries at night or on cloudy days, when other households without battery storage can only draw from the grid.

Household #2: Climate Upgrade

The members of this household live in a classic Philadelphia rowhome, built in the 1920s, whose current systems for water, space heating, and cooking are all gas-powered. However, they are committed to gradually shifting away from gas and toward electric appliances as individual pieces of equipment in their house give out and need to be replaced. For this reason, while most households will

want to size their system based on their current electrical power use, this household has decided to up-size their system based on the electrical power use they predict they will have in the future. Given that their solar system should be operable for 25 years or more, they want to have capacity to gradually acquire an electric induction stove, a heat pump water heater, and electric mini-splits for cooling and heating. It's worth it to them to get a solar system that is larger than they need now so they are prepared for the changes they know they will be making to their energy usage across the 2-7 years to come. See page 27 for examples.

Household #3: Budget Solar

This household is very committed to going solar now, but they do not have the capacity to take on any new debt or assemble the necessary funds to pay for the upfront costs of the solar system outright. As a result, they're focused on obtaining either a solar leasing contract or power purchase agreement (see page 11) with reasonable terms that don't risk leaving them high and dry in the long term. This arrangement should guarantee moderate monthly savings on their electrical/utility bills once the system is fully up and running, while also allowing them to contribute to the transition away from fossil fuels and toward renewable energy.

What do all 3 households need to do, regardless of their distinct priorities?

1. Prioritize your roof

Regardless of their distinct priorities, members of all three households should first check out what shape the roof of their house is in and determine if it needs any major repairs or resealing, etc. If it does, roof repair should be their first priority. It will be a much more expensive and difficult job to try to do roof work once a dozen solar panels and all their wiring are installed on top of it!

2. Calculate your electrical load

Each household should familiarize themselves with their electrical load (i.e. the amount of energy they use on a daily basis). They should pay special attention to the winter and summer months, when energy consumption for heating and/or cooling tend to be highest.

3. Plan for the future

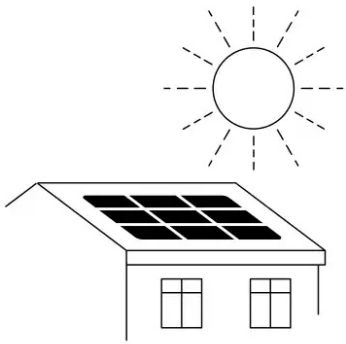
Finally, if the household is planning on adding new electrical appliances in the coming years (i.e. an induction stove, an EV charger, a heat pump water heater, etc.) they should factor that into their calculations of power needs (see page 26). However, if cost or other factors make this prohibitive, it is always possible to add additional solar capacity further down the line. It just may be easier and a bit cheaper in the long run to account for this as part of the initial install.

Different types of residential solar setups

The fundamentals of solar are the same in every installation: photons from the sun excite a silicon film and free electrons from it, which move down a wire to a place where they can be converted to energy that we can use in our homes. But there are many ways to install solar panels and use the energy they generate. Let's talk about 5 topics to help you decide what kind of system would work best for your needs and circumstances: mounting, conversion from DC to AC current, connecting to your local utility (or not), energy storage, and where to start if you are an intrepid do-it-yourselfer.

Mounting

Roof mounted



Here in Philly, we have tons of rowhomes with flat roofs, so most solar is pretty straightforward to install. It's important to install on a roof that's already in good shape, otherwise the installation could cause leaks. If the roof needs to be repaired or replaced later, the panels will need

to be uninstalled and re-installed, incurring extra cost and hassle.

On a flat roof, you can choose to use special feet that get drilled into the wood decking of the roof. These feet have a layer of gooey stuff that smushes around the screw to make it watertight, and the screws have rubber washers for the same reason. The rest of the mounting system is built on top of those feet. On pitched roofs, there are many styles of feet that can integrate with shingles or metal roofing.

You can also use ballasts on a flat roof, which are metal frames that you weigh down with cinder blocks or pavers. This avoids drilling into the roof, but adds significant weight.

We also have some friends in Puerto Rico who joke that their systems are "gravity mounted", i.e., they just lay them on their roofs. But make no mistake, Boricuas are hurricane-savvy and remove their panels before big storms. Solar panels can act as big sails and you don't want them to fly off and hurt someone. So unless you're up for personally moving your solar panels on and off your roof in heavy winds or storms, we don't recommend this method! And you should definitely never hire a contractor or solar installation company that uses this method!

Last, some manufacturers are experimenting with magnetic mounting hardware. Pretty neat!

Ground mounted

In places with enough space, some people choose to mount their systems on poles anchored in the ground. That's called ground mount. The panels don't sit right on the ground, but are high enough to not get covered with snow, to mow around, and to allow for maintenance under the system. Ground mount systems are installed at an angle meant to get the best sunshine throughout the year. Some people even use motors to change the angle of the panels to maximize production as the seasons change, or manually change the angle twice a year from a summer tilt to a winter tilt. These days it's generally cheaper to add a couple more panels to your system to increase its power, rather than buying a motorized system to adjust the tilt.

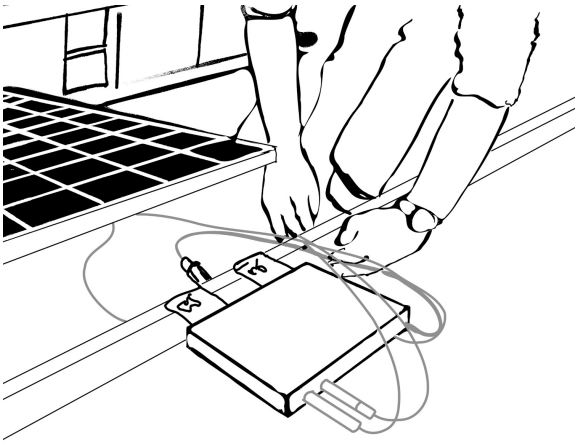
Sunlight to Outlet:

Converting from DC to AC with inverters, microinverters and optimizers

Solar panels generate direct current, DC, like batteries. Our houses use alternating current, AC, like outlets. So a transition from DC to AC has to occur somewhere between a solar array and our main electrical panel.

The device that does that is called an inverter. Some systems use a big inverter mounted on the side of a house that changes the DC energy from a solar array into AC before it goes to the electrical panel. Some systems do that conversion at each solar panel with a little device called a microinverter.

Microinverters



Each panel gets their own tiny inverter and connects directly to your breaker box. This is a relatively straightforward installation and great for "grid tie setups" (in other words, solar installations that are connected to the electric grid). Some of the key features of microinverters are:

- Since each panel has its own inverter, microinverters are great if you have partial shading on your solar array as they can adjust to different outputs from each panel.
- Monitoring includes tracking of individual panel's performance making it quick to identify issues when they arise.
- Makes it easy to add more panels in the future.
- Produces slightly less power than the panel rating.

String inverters

Unlike with microinverters, with string inverters the panels are all connected in a series and the power generated feeds into a single inverter.

Some of the key features of string inverters are:

• Inverters are easy to access physically, typically located on the side of a house (as opposed to the roof).

• The whole array is treated as a monolith. If one panel is shaded or broken, the whole string of panels will be affected. You cannot isolate and monitor the performance of individual panels.

• If you start with an inverter that's the right size for a certain wattage, adding more wattage (more panels or new panels with higher output per panel) can exceed the inverter's capacity and you'll need to add a second inverter.

• A few manufacturers use solar optimizers. In this case, one optimizer is installed per solar panel, just like microinverters, but they connect to a string inverter. It's a way to use an inverter system, but also have granular monitoring of each panel, and avoid low production of an entire string of panels when just one of them is shaded, dirty, or underperforming.

Battery backups

In order to store power from the sun, we use batteries. Battery storage will provide you with power if there is a blackout or you are disconnected from PECO service, or if your system is off the grid. Your home can also draw upon stored battery power at night when the sun is no longer shining or on overcast days.

Benefits:

• Less reliant on PECO.

• Blackout resistant.

• The battery equipment tends to be too heavy to steal.

Watch out for:

• Costs: Battery systems can dramatically increase your costs when

installed professionally.

- Many battery storage systems are undersized for day to day use. You will need to pay close attention to your consumption when completely off grid. (Don't worry. Your system will train you on this by running out of juice!)
- Some installers dramatically inflate the cost of already expensive battery systems.

Connection to the grid

Grid-tie

In this system, the power you generate from your solar panels will both power your home and feed back to the grid where others can use the energy you generate. This is the most common way people currently have solar installed in the United States.

Grid-connected systems:

- Typically use microinverters or grid tie inverters (*Enphase* or *SolarEdge* are common brands)..
- Are generally the cheapest way to go.
- Require cooperation and permitting with PECO.
- Can include battery storage but don't have to.
- Rely on a grid connection to work, and won't provide power during blackouts unless there is battery backup, which is more expensive.

Off Grid System

This is typically a battery-based system which does not connect to the grid. It should be sized to meet all your critical power needs, even during cloudy weather or short days. It's not legal everywhere, so check with your municipality.

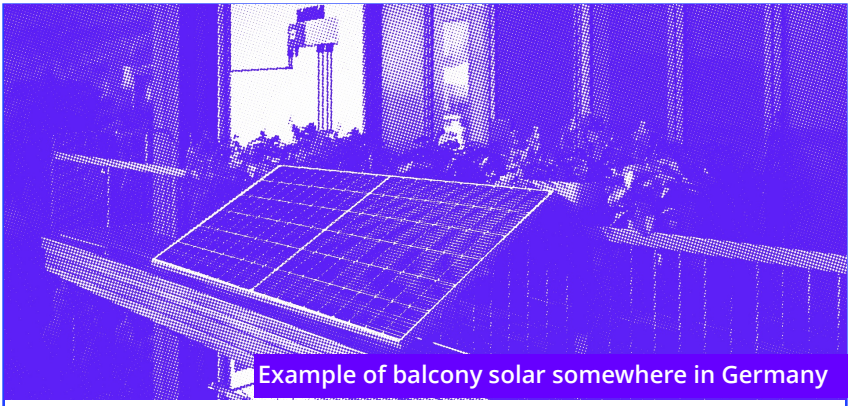
Off Grid Systems:

- Have battery backup that provides power during blackouts.
- Are a good way to go if you're DIYing it.
- The battery part of the system can be costly (but prices are dropping).

DIY installations

You could install your own solar if you're an electrician (of sorts); have a good grasp of safety, electrical code and wiring; and have more time than money. This can be a great way to save tons of money. But because doing so requires a fair amount of specialized knowledge, lets place that topic as outside the scope of this publication.

A good place to start educating yourself on installing your own solar is https://www.mobile-solarpower.com. You can find more resources on page 35.



Example of balcony solar somewhere in Germany

BALCONY SOLAR

What if you could go to a store, pick up a solar panel, plug it into a wall outlet and immediately reduce your electric bill? Small plug-in systems like this, often called balcony solar, are already popular in Germany. They were recently legalized in Utah (by unanimous vote!), and are in stock at Costco. Plug-in solar is a powerful way to introduce solar to any household without the cost and planning that goes into installing a large rooftop system. It's an easy way for people to be part of the solution to our dire environmental needs and a fresh, hopeful vision of the future, all while saving money. Our friends at Solar United Neighbors are campaigning to make it legal in Pennsylvania and several other states this year. It's very cool, and if you want to see it in your local stores, you can write to your state representatives or go to https://solarunitedneighbors.org/resources/what-to-know-about-plug-in-solar/ to learn more.

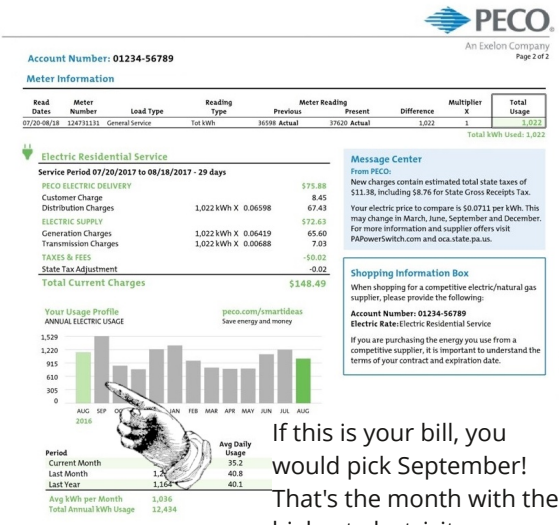
Getting a Sense of Your Power Needs

The first step in understanding what size of system you'll need is to figure out how much power you actually use. If you want your solar installation to actually cover your needs, it has to be big enough to generate the amount of power you use. Figuring that out is easy and it helps you get a step ahead of salespeople who may try to sell you a bigger setup than you need.

Looking at your PECO bill (or electric company bill if outside of Philly) will be the easiest way to do this.

On the second page of your bill you will find a graph and table that outline your energy use in kilowatt hours, listed as kWh for short.

Find the month in your graph with the highest usage.


PECO
An Exelon Company
Page 2 of 2

Account Number: 01234-56789

Meter Information

Read Dates	Meter Number	Load Type	Reading Type	Meter Reading Previous	Meter Reading Present	Difference	Multiplier X	Total Usage
07/20-08/18	124731131	General Service	Tot kWh	36598 Actual	37620 Actual	1,022	1	1,022

Total kWh Used: 1,022

Electric Residential Service

Service Period 07/20/2017 to 08/18/2017 - 29 days

PECO ELECTRIC DELIVERY		$75.88
Customer Charge		8.45
Distribution Charges	1,022 kWh X 0.06598	67.43
ELECTRIC SUPPLY		$72.63
Generation Charges	1,022 kWh X 0.06419	65.60
Transmission Charges	1,022 kWh X 0.00688	7.03
TAXES & FEES		-$0.02
State Tax Adjustment		-0.02
Total Current Charges		$148.49

Message Center
From PECO:
New charges contain estimated total state taxes of $11.38, including $8.76 for State Gross Receipts Tax.

Your electric price to compare is $0.0711 per kWh. This may change in March, June, September and December. For more information and supplier offers visit PAPowerSwitch.com and oca.state.pa.us.

Shopping Information Box
When shopping for a competitive electric/natural gas supplier, please provide the following:
Account Number: 01234-56789
Electric Rate: Electric Residential Service

If you are purchasing the energy you use from a competitive supplier, it is important to understand the terms of your contract and expiration date.

Your Usage Profile
ANNUAL ELECTRIC USAGE

peco.com/smartideas
Save energy and money

1,529
1,220
915
610
305
0

AUG SEP OCT JAN FEB MAR APR MAY JUN JUL AUG
2016

Period		Avg Daily Usage
Current Month		35.2
Last Month	1,1	40.8
Last Year	1,164	40.1
Avg kWh per Month	1,036	
Total Annual kWh Usage	12,434	

If this is your bill, you would pick September! That's the month with the highest electricity use.

Chances are that will be January (if you heat with electricity) or August (for AC use). Take the number in that column and divide it by 30. That will be your daily average for the highest use month of the year.

In order to meet all your year-round needs, you'll want to get as close to this number as you can when you get solar installed.

If you plan to electrify a major household appliance, you may want to

oversize your system. For example, if you heat your house with an old gas boiler that you plan to replace with electric heat pumps, you will want to try to account for this future load as best you can. The same would be true if you're about to purchase an electric vehicle that you plan to charge at home, etc.

You can also take the long route and calculate all your power consumption in a spreadsheet appliance by appliance. To do it this way, make a list of absolutely everything you plan to plug into your house and take a look at its rated power (look for amps or watts on a label somewhere on the device). Add each device to a row on the spreadsheet with its corresponding amps.

What you ultimately need to calculate are the Watt hours. So first you need the Watts. This is done by multiplying Amps by Volts. So in another column multiply your amps by 120 (the standard domestic voltage in the US). For appliances that use 240v, multiply by 240 instead of 120.

If this all sounds completely new or unfamiliar, a shortcut is that your larger appliances are most likely to be 240v (think stove, clothes dryer, heat pump, etc.). They should say so somewhere on the label.

Then, add an estimate of the maximum hours you think you'll be using that particular device in a day. So if you use your blow dryer twice a day for an hour each time (yeah that's probably a lot), put 2 hours in that column.

Appliance name	**Watts**	**Hours**	**Watt hours**
Box fan	100	3	300
Toaster oven	1200	.5	600
Laptop	60	10	600
Blow dryer	900	2	1800
Phone charger	5	4	20
Lights front room	20	6	120
EV charger	3500	15	52500
Induction stove	1800	2	3600
Electric dryer	3000	.75	2250
Totals	**7885**	**43.25**	**61790**

You can also use one of these tools:



Killawatt

This super simple tool will let you plug in any device and it will tell you how many watts it uses. It can also measure Watt hours over time.

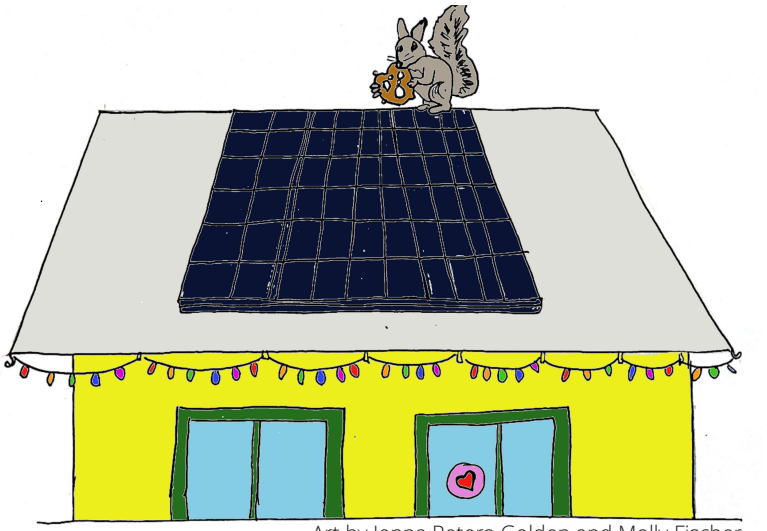
Online tools

https://holobiontlab.org/toolkit/loads -- this is the tool we made for calculating your electric load.

https://pvwatts.nrel.gov -- a government supported tool to help calculate basic energy production of a system. This can provide you with a basic estimate of what you can likely expect from your system. However, it's important to pay attention to whether your system is subject to shading from nearby buildings or trees across daylight hours. If it is, it will produce less power than a system elsewhere that is not obstructed by shade.



Note: A number of solar companies have load calculators on their site, but be wary of attached sales pitches, personal data or email collection.



Art by Jenna Peters-Golden and Molly Fischer

The Bigger Picture: Energy Democracy

Where our electricity in Pennsylvania currently comes from:

The electricity mix that Philadelphians currently receive, if they're tied to the electric grid, is made up of about 5-8% renewables. That includes wind power, hydroelectric power, and solar. Solar power makes up only .5% of our electric mix statewide, and power companies are unlikely to increase that portion unless they are legislatively required to do so. That number (.5%) comes from requirements in the current Pennsylvania Alternative Energy Portfolio Standards. The other ~93% of our energy sources fueling electric energy transmission in this state are gas, coal, and nuclear.

Many other state governments have higher required renewable energy standards and are doing more to accelerate the transition to renewable energy. In California for example, more than 60% of the energy on their electric grid is currently produced from renewable sources, and that percentage continues to increase yearly.



Art by Jenna Peters-Golden and Molly Fischer

It doesn't have to be this way in Pennsylvania. The Pennsylvania state legislature can and should join other states in creating incentives and mandates for a transition away from fossil fuels.

And you can help build public momentum for this change by

insisting that they do just that!

Here in Philadelphia, City Council does have the power to dictate the kind of energy the city buys and its sources. And the city can make countless other pledges to reduce its carbon emissions (thereby also reducing all the negative public health, safety, and climate impacts that come in tow with those emissions). In 2021, former Mayor Kenney and the Office of Sustainability announced an official city commitment to achieve carbon neutrality by 2050, which was accompanied by a resolution that passed City Council. However, not enough has been done since then to enforce and/or accelerate the city's progress toward this goal.

We think Philadelphia residents deserve more.

This isn't just about achieving a change in logos on our current PECO bills. People across the world are being faced with an ecological climate crisis of epic proportions that will have profound impacts on our daily lives. We've already seen entire communities flooded and washed away, heat deaths increasing, a drastic increase in forest fires, species extinctions, deadly storms, and more frequent hurricanes, etc. As the climate warms due to the continued (and currently increasing) use of fossil fuels, all of the above is predicted to increase in severity and frequency.

While those with greater personal wealth may be able to protect themselves as individuals or families, many of us won't have the resources to face and survive these catastrophes on our own. Our communities will need support not only when disaster hits, but also in order to make the kinds of structural changes that will help mitigate and reduce such disasters in the future. This includes support to install solar or switch our home appliances to electric power sources.

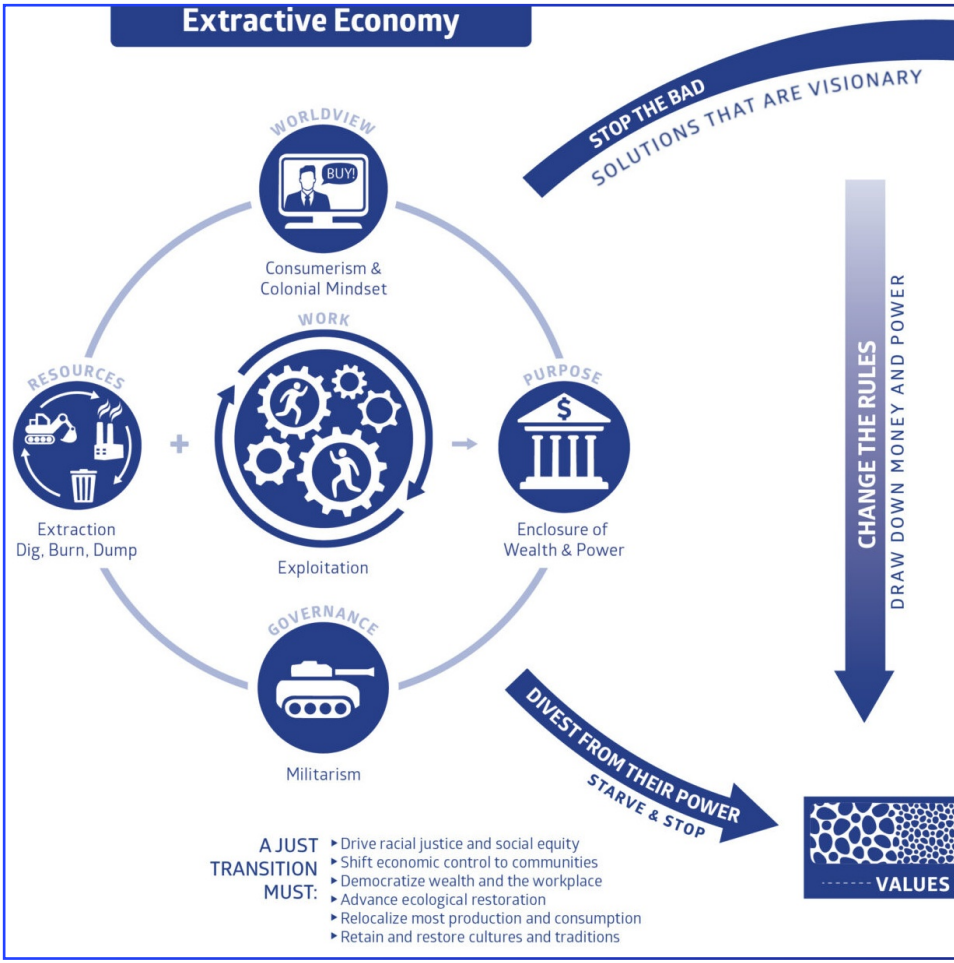
And while efforts by the U.S. government under the Biden administration (via the Inflation Reduction Act and other policy changes) attempted to take some necessary initial steps, there's a need for real infrastructural changes that not only shift our sources of power from fossil fuels to renewables, but also impact people's health, safety, and financial well-being.

Our power grid could look so much different.

With the rapid growth of solar and wind energy generation, much of the power we use could be generated in our own neighborhoods. Not only that, but it could be run by neighbors who could administer and maintain it. A democratic use of solar wrestled out of corporate control could help lift communities out of poverty and be powerful symbols of community pride.

The transition to clean power should be a tool that not only shifts the nature of our power sector, but helps strengthen economically neglected Black, Brown, Indigenous and poor communities.

Philly needs this on all levels!

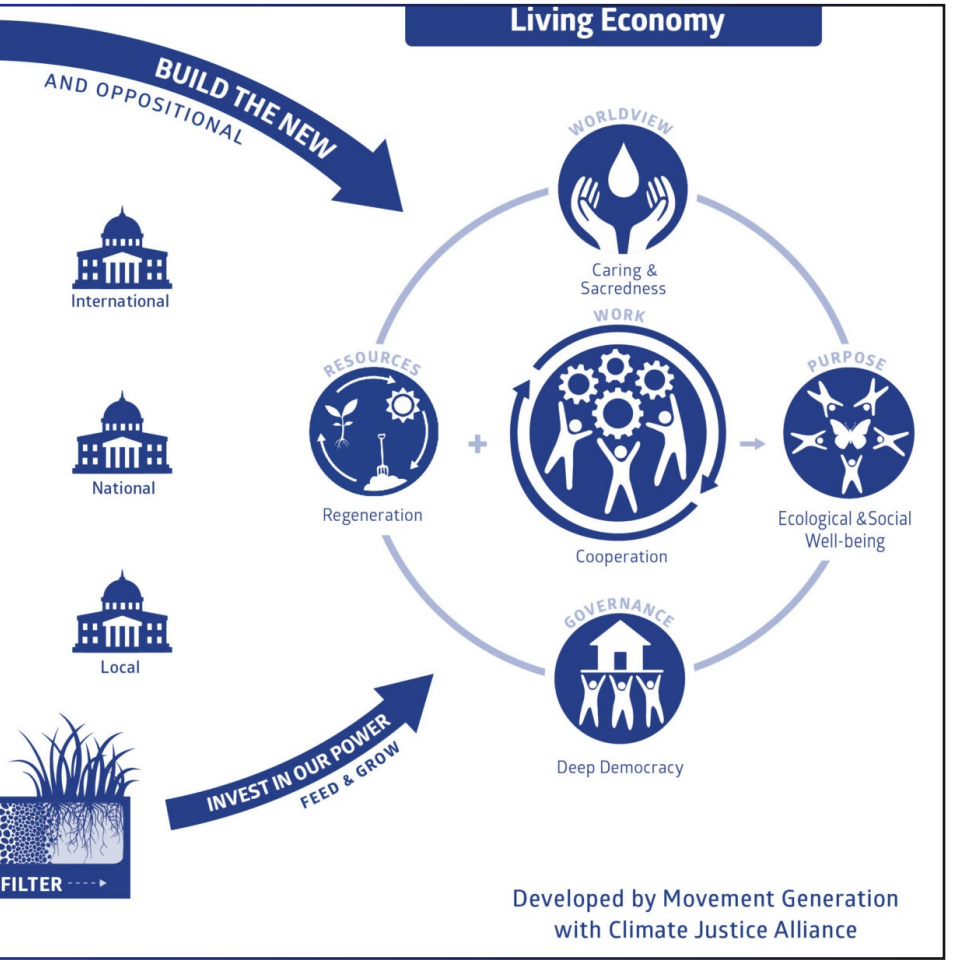


The future we want to see includes:

Solar that is community-owned and cooperatively governed.

Imagine neighborhood-level solar power plants spanning the rooftops of entire blocks or covering parking areas and empty lots. All owned, not by businesses, but by democratic organizations and worker cooperatives and unions who make decisions, maintain equipment, and use the profits to reinvest in community infrastructure.

For example, a community-controlled micro-grid could consist of several empty lots with a sizeable solar array. Community gardens



could incorporate "agrivoltaics", where solar panels shade seedlings or funnel rainwater while powering irrigation pumps. It could be overseen by a community governance structure or assembly made up of neighborhood residents who manage microgrid maintenance, finances, and conflicts, and ensure that the community shares in the benefits generated.

Solar worker/consumer cooperatives

Cooperatives like this already exist! In worker coops, instead of profits from solar installations leaving the community and going to corporations and overcompensated CEOs, the installers themselves earn higher incomes and control their work spaces democratically. Similarly, in a solar consumer co-op, the co-op members collectively determine the priorities of the project and are in control of decision making.

Energy decommodified

Access to electric power is a basic requirement to meet one's daily needs and operate in modern society. It shouldn't be treated as something to buy and sell. Along with water, housing, health care and the internet, electric power should not be on the market. Instead, as a society we should put resources into ensuring we can generate and distribute clean power that benefits everyone! This doesn't mean costs or earnings are never involved. But it does mean that they aren't solely generated for the profits of the already rich.

Energy transition and social transformation

Our economy under capitalism is designed to exploit every area of life (including ourselves) and extract as much profit as possible. In terms of energy, oil drilling and mining has enriched corporations while leaving ecological devastation, impoverishment and human rights abuses all along its path. Under the same logic, our own lives and our communities are squeezed for constantly increasing profits.

We want to see a transition away from this type of extractive logic not just in the world of generating electricity, but in all spheres of life.

In its place we want to see a regenerative, community-driven economy based on solidarity--one that prioritizes meeting human and ecological needs and empowering communities.

Here's to building that world together!

In solidarity, struggle, and hope,

The Holobiont Crew (Dave, Steph, and Emily)



Useful Additional Resources:

Solarize SE PA
https://solarizesoutheastpa.com/
Neighbors helping neighbors join the clean energy revolution in Southeastern PA.

Philadelphia Solar Energy Association
https://www.phillysolar.org/
Promotes the rapid adoption of solar energy across the state.

Pennsylvania Solar Center
https://pasolarcenter.org/
A non-profit committed to expanding solar to all Pennsylvanians. They have a good resource page on their site and also provide updated info on state solar legislation and programs.

Sol Smart
https://solsmart.org/
Helps municipalities and local governments
implement solar friendly policies.

Project Sunroof
https://sunroof.withgoogle.com/
An online tool to see if your roof is "sunny".

Solar United Neighbors
https://solarunitedneighbors.org/
National support for solar. Great resource if you are looking to get solar installed.

Holobiont Lab
https://holobiontlab.org
That's us! The abolitionist climate rebels that published this thing.

PA Consumer Protection Complaint Form
https://www.pa.gov/consumer-complaints

Solar Sales Checklist from Revision Energy
https://www.revisionenergy.com/solar-information/solar-resources/avoiding-shady-practices-guide-going-solar

PA Attorney General
http://www.attorneygeneral.gov/public-protection-division/bureau-consumer-protection/

PECO Solar Rebate
https://www.peco.com/ways-to-save/for-your-home/rebates-discounts/solar-rebates

Don't get overcharged
https://solarbreakdown.com/

DIY resources

DIY Solar Forum
https://diysolarforum.com/

Off-grid Solar Made Easy!
https://www.mobile-solarpower.com

Build it Solar:
https://www.builditsolar.com/
The go-to website for various DIY solar projects.

Local Organizing

Here are 4 organizing efforts focusing on solar and community solar in Pennsylvania:

Hunting Park Community Solar Initiative

A community solar project based in Philly's Hunting Park Neighborhood. They offer 10-week solar installation training courses in English and Spanish, 3-4 times/year. https://www.hpsolar.org/

Vote Solar

A non-profit policy advocacy organization with the mission of making solar more accessible and affordable across the United States. https://votesolar.org/usa/pennsylvania/

Our Solar PA

A community organizing effort focused on getting community solar legislation passed in PA. https://oursolarpa.org/

POWER campaign on distributed energy

POWER's Climate Justice and Jobs Team created the People's Energy Plan to challenge PECO and our state regulator, the Public Utility Commission (PUC) to make a rapid shift away from fossil fuels to affordable clean energy.

https://powerinterfaith.org/campaigns/climate-justice/

published by

Holobiont Lab

PO Box 23462

Philadelphia PA 19143

https://holobiontlab.org