



Solar Education Training

Overview

- ▶ About BWL
- ▶ About solar arrays
- ▶ About shopping for solar arrays
- ▶ The solar experience - utility billing and maintenance
- ▶ Third party resources
- ▶ Quiz Questions

About BWL

- ▶ A municipal utility
 - ▶ BWL is governed by our Board of Commissioners, which are voted on by the citizens of Lansing.
 - ▶ BWL is non-profit utility, all proceeds are either invested back into the utility, or are given to local governments
- ▶ The largest public utility in Michigan
 - ▶ BWL serves approximate 100,000 electric customers and 58,000 water customers
 - ▶ Steam and chilled water utilities in downtown Lansing
 - ▶ BWL's mission is to provide a safe, reliable and affordable utility experience, through public ownership, climate consciousness, and innovative strategies.

BWL's commitment to sustainability

▶ Energy Efficiency

- ▶ BWL strongly recommends making a home as efficient as possible before installing solar. We offer energy efficiency programs to assist customers with upgrades of lighting and appliances that can reduce the size of the solar array you need overall - [link to energy efficiency programs](#).

▶ Solar Rebate

- ▶ After you install your array and have received permission to operate in writing from BWL, be sure to apply for BWL's solar rebate - [link to solar rebate form](#).

▶ Electric Vehicles

- ▶ BWL also offers a rebate and time of use rate for those who have purchased an electric vehicle. For more information on incentives and to find a list of local installers for level 2 chargers, [visit our Plug-in EV webpage](#).

▶ GreenWise Renewable Energy Purchasing

- ▶ If you discover that installing solar at your home or business isn't quite right for you, BWL offers customers the chance to source their energy directly from Michigan-based renewable energy sources. For more information, [visit our GreenWise webpage](#).

BWL Solar Services

Services offered by BWL

Provide basic education and guidance for customers thinking about installing solar

Enforce program and interconnection rules

Offer rebate and a market based rate for energy buy-back

Provide a monthly bill for each solar customer

Services not offered by BWL

Install solar systems

Sell solar panels or inverters

Provide maintenance on solar systems

Active solar systems

The solar installation process

Step 1 - Make your home as energy efficient as possible, as usage impacts payback for an array.



Step 2 - Take BWL's solar online education class - code provided after passing quiz at end of class



Step 3 - Get at least 3 bids from contractors - compare prices and contractor quality

Step 4 - contractor submits documents to BWL, BWL approves application for install



Step 5 - contractor constructs array, schedules permit inspections with local authorities



Step 6 - BWL starts billing, tests disconnect and provides notice to contractor to energize array.

Solar Basics - Definitions

- ▶ **Kilowatt hour** - The unit used by BWL to bill residential customers, a kilowatt hour is equal to 1000 watts in one hour.
- ▶ **Kilowatt** - a standard unit of power. Most appliances are rated in watts. For example, an LED lightbulb might have a wattage of 6W (six watts). The lightbulb would use 6Wh, or 0.006 kWh if used for 60 minutes. A 1000W window AC unit would use 1 kWh if used for 60 minutes.
 - ▶ Solar arrays are rated in Kilowatts. Each panel's individual wattage is added together for a DC kilowatt value, while inverters or microinverters have an AC kilowatt value.
- ▶ **Panel/Module** - typically made of silicon, panels are the part of an array that actually create the energy in any array. A module is a panel with integrated wiring.
- ▶ **Inverter** - the electrical component of a solar array that converts the DC energy produced by the panels into AC energy that can be used in your home or sent back to BWL's grid.

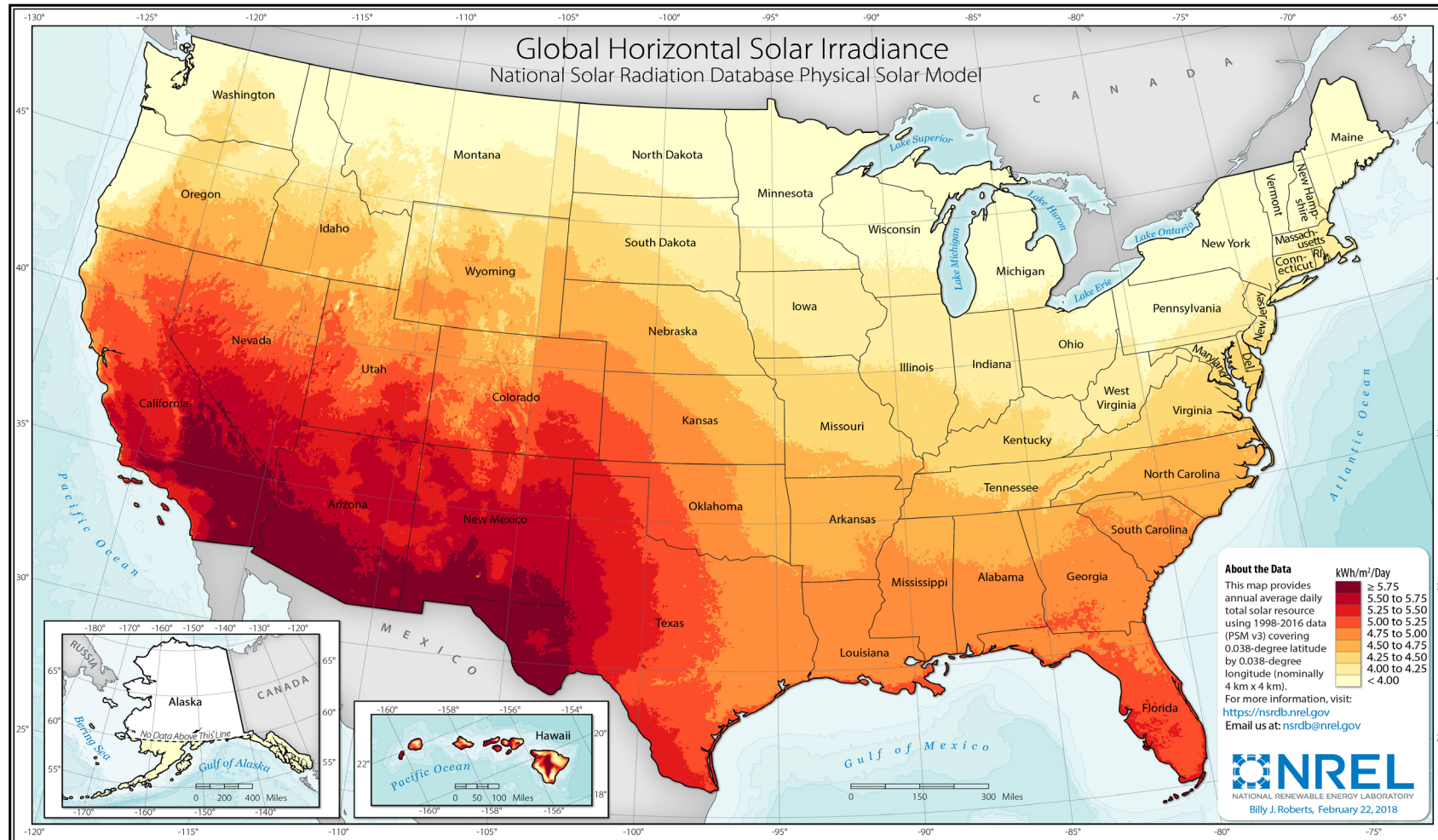
Solar Basics - Items to Consider

- ▶ Solar panels are often installed on a roof, though customers with available land may opt to install them on ground mounts.
- ▶ Solar panels are rated to last 20-30 years. Customers should make sure their roof is also rated to last that long. Removing solar panels in order to do a roof replacement is a very costly ordeal and something that is not offered by many solar installers or roofing contractors.
- ▶ Inverter lifespan is one of the biggest questions regarding solar systems to date. Be sure to ask your contractor what the estimated lifespan of the inverter you are planning to install is. It is possible you will have to pay to replace an inverter before your panels' lifespan is over.
- ▶ Solar arrays provide energy to the home and the grid by connecting to the home's existing electrical service panel. Some customers may need to upgrade their existing electrical panels before a solar array can be successfully connected, which is an additional cost.
- ▶ Solar arrays work when the sun shines on the panels. If panels are shaded by trees, neighboring buildings, clouds or snow, they will not function or will function less efficiently. Shading reports should be included in every bid for work, and homes that have low Total Solar Resource Factors (TSRFs) should reconsider installing an array.

Solar Basics - Geography of Michigan

- ▶ According to the Energy Information Agency, a typical capacity factor for a solar array in Michigan is 17%. This means that of all 8760 hours in a year, a solar array will be producing 17% of the time, or about 1500 hours in a year. At all other times, customers will be drawing energy from BWL's electric grid.
- ▶ Because Michigan is in the northern hemisphere, the sun always shines in the southern part of the sky. This means that panels installed on the northern side of a tilted roof will only produce about 60% of the energy as the same panels installed on the southern side of the same tilted roof would.
 - ▶ **Any proposal that includes panels on the north side of the roof should be questioned thoroughly before signing a contract with that contractor.**
- ▶ Panels installed on the eastern or western side of a tilted roof will produce about 90% of a panel installed on the south side of the same tilted roof.
- ▶ Panels covered by snow in the winter have the ability self-shed snow, though this requires a bit of sun to do. Panels covered by snow will produce no energy.

Solar arrays installed in Michigan receive less sunlight than arrays installed in most other states



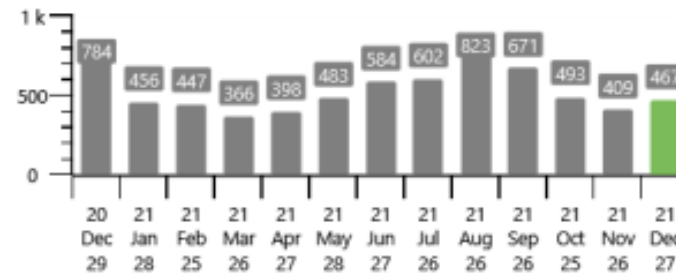
How to Select a Contractor

- ▶ [Link to full PDF document on BWL's website](#)
- ▶ Seek at least three bids from three different contractors
- ▶ Beware of \$0-out-of-pocket offers.
- ▶ Perform an energy audit of your home first to look for ways to reduce your energy usage that may require less up front capital and/or investment.
- ▶ Check for warranty information on panels and inverters
- ▶ Be sure you are working with licensed and insured contractors any time you are having someone do work on or at your home.
- ▶ Ask for references from a contractor for other homes in the Mid-Michigan area that they have worked with.

Sizing a Solar System

- ▶ Customers should be aware of their annual electricity usage and how monthly changes impact their energy use.
- ▶ Calculating your annual usage is as easy as counting your last twelve months of kWh usage from the graph on your BWL bill and adding it together.
- ▶ Beware contractors who try and sell you systems that have an annual production that exceeds your usage by more than 125%- you could be paying for panels you don't need
- ▶ BWL will credit customers back for all energy sent back to the grid, but the credit will never be in the form of a check, only a bill credit.

Begin Date:	Begin Read:	End Date:	End Read:	Mult.	Usage:	Type:
11/26/21	11114	12/27/21	11581	1	467	kWh
11/26/21		12/27/21		1	6.748	kW
11/26/21	1678	12/27/21	1703	1	25	kVARh



Current Usage 467 kWh	Avg Cost per day \$2.62	Avg kWh per day 15 kWh
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Battery Storage and Islanding

- ▶ Customers who install solar without a battery backup will be without power whenever there is a local outage.
- ▶ In the event of an outage, your inverter will automatically shut off. This is in order to protect workers who are fixing the local distribution grid. Any active solar arrays during outages will be subject to penalty to BWL and customers are responsible for any injuries that occur if energy generated by a solar array during an outage injures an electrical worker or other bystander.
- ▶ If you are interested in installing a battery backup system, speak with a contractor about proper sizing to ensure you can have power during an outage. Be sure to ask them for appropriately sized backup systems that can support the powering of an air conditioning unit or refrigerator/freezer.

Additional Items to Consider

- ▶ Warranty - What is the initial warranty on the panels/inverters? If it is below 20 years, consider higher quality panels. For inverters the average warranty lifespan is only 10 years. Consider budgeting to replace your inverter after 10 years.
- ▶ Extended Manufacturer Warranty - Does the panel manufacturer offer a warranty for you to buy after the panels' initial warranty expires?
- ▶ Performance at 25 years - What percentage efficiency does the manufacturer expect the panels to perform at after 25 years? If it is below 80%, consider looking at higher quality panels.
- ▶ Transferability - If you buy a home with these panels already installed, do you get the new warranty? Some manufacturers will automatically transfer the warranty to a new owner, while others make you jump through hoops. Some do not offer it at all.
- ▶ Company lifespan - Is the manufacturer of the solar panels you are purchasing a reputable company? Have they been in business for longer than 5 years? What kind of reviews do their panels or inverters have online?

Paying for your Solar System

- ▶ Typically arrays are priced in \$/W installed. You should never take into account a tax credit, rebate or discount before calculating your price.
- ▶ Be sure to consider price when comparing proposals.
- ▶ Price per watt in the Lansing area is typically around \$3/W. Larger commercial arrays should be able to achieve a cheaper price due to economies of scale.
- ▶ $price\ per\ watt = \frac{dollars\ spent\ on\ array}{number\ of\ watts\ installed}$
- ▶ There are financing options available for solar arrays. Michigan Saves is non-profit option for all kinds of energy efficiency and solar upgrades.
- ▶ Beware of financing options with very high annual percentage rates (APRs), or “no money down” offers.
- ▶ Leased or third party owned solar systems are not eligible for federal tax credits.
- ▶ There is a solar tax credit available - please visit this [link to the department of energy website](#)

BWL Billing For Solar Systems

- ▶ All customers installing an array will be entered into BWL's distributed generation (DG) program that pays customers a variable, market rate for energy sent back to BWL.
- ▶ Customers can reduce their bills by using energy from their own solar arrays during the time that the arrays are producing energy- energy sent back to the grid receives the variable, market rate in the form of a bill credit
- ▶ Customers will always send back less energy to BWL's grid than their array produces overall because their house or building will always be using some energy that comes from the solar array.
- ▶ Customers who want to perfectly calculate a payback from a solar array would have to have a 100% accurate picture of their own usage and production from their solar array for each hour of the day.
- ▶ The value for energy returned to BWL changes monthly, and so the bill credit issued will likely change monthly as well.

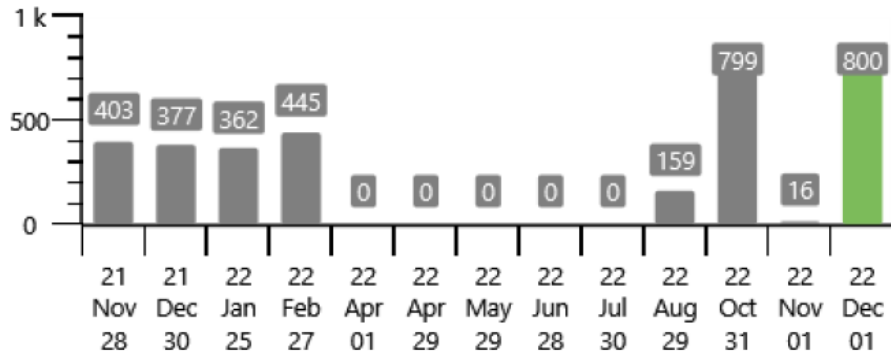
Distributed Generation Billing Example

Electric Usage

Meter Number: 27514210

Begin Date:	Begin Read:	End Date:	End Read:	Mult.	Usage:	Type:
11/01/22	9699	E 12/01/22	10499	1	800 kWh	
11/01/22	4635	E 12/01/22	4785	1	150 kWh Rc	
11/01/22		12/01/22		1	4.792 kW	
11/01/22	1741	E 12/01/22	1891	1	150 kVARh	

Note: E means Estimated Read.



Electric Service

Electric rate no. 1 residential service (Meter # 27514210)

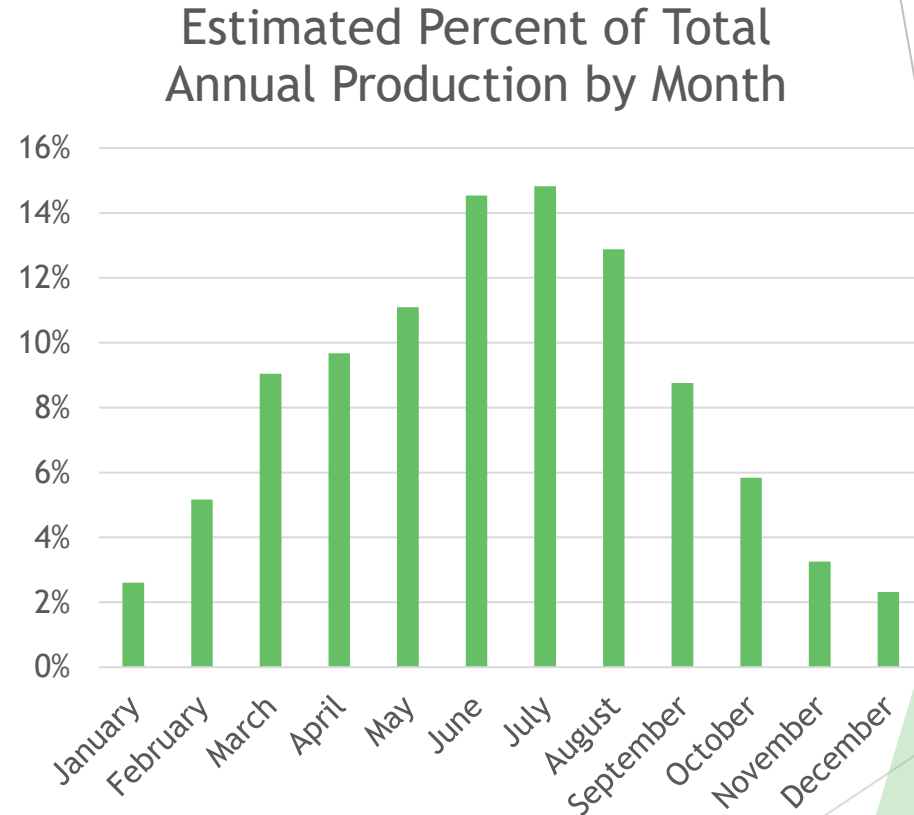
Basic Service Charge	1 Month x \$19.75	\$19.75
Commodity Charge - First 500 kWh - Winter	500 kWh x \$0.1295	\$64.75
Commodity Charge - Over 500 kWh - Winter	300 kWh x \$0.133	\$39.90
Distributed Generation Administration Cost	150 kWh x \$0.005	\$0.75
Distributed Generation Outflow Credit	150 kWh x -\$0.07	-\$10.50
Distributed Generation REC Credit	150 kWh x -\$0.013	-\$1.95
Power Supply Cost Recovery Adjustment	800 kWh x -\$0.014272	-\$11.42
Electric Environmental Charge	800 kWh x \$0.0006	\$0.48
Electric Renewable Energy Plan Surcharge	1 Month x \$0.00	\$0.00
City of East Lansing Franchise Fee	101.76 Dollars x 0.05	\$5.09
Michigan Sales Tax		\$4.27

Total Electric Charges

\$111.12

Solar Production

- ▶ *Estimated annual production = 8760 (hours in a year) * number of kW installed * 0.17 (17% Capacity factor)*
- ▶ Note that production for solar from November - February is negligible.
- ▶ Actual production in March may be higher than actual production in May.
- ▶ As previously noted, the amount of energy sent back to BWL will be different than the total generated from the solar array.



Market Rate Credit for Distributed Generation

- ▶ BWL will not be offering net metering to arrays activated after 11/01/2022.
- ▶ There are three parts that comprise the total price that BWL will pay its solar customers for the energy they send back to the grid.
 - ▶ Market LMP (Locational marginal price) - this is the local price that BWL would pay to purchase the energy from the market in MISO (Midwest Independent System Operator, the market for energy in all of Michigan)
 - ▶ The LMP is equal to the average on-peak (the average price for hours 8-23, Monday through Friday, excluding national holidays) LMP for the billing month (the month you're being billed for)
 - ▶ Capacity value will be equal to the MISO planning auction price for capacity for the planning year in Michigan (zone 7) multiplied by the capacity credit for the resource.
 - ▶ Until 05/23, this value will be \$0.032/kWh.
 - ▶ Optional Renewable Energy Credit Purchase - BWL will buy the official renewable attributes for your system and enter them in the State of Michigan database to use your solar system to achieve our sustainability goals.
 - ▶ BWL will pay \$0.013/kWh for customers who choose to sell their RECs back to BWL.

Solar Maintenance

- ▶ **Parallel Operating Agreements** - Your parallel operating agreement is a legally binding document that you agree to with BWL. Please print and save a copy of the agreement.
- ▶ **Tree Trimming** - Be sure to trim back any trees that might shade your solar array.
- ▶ **Snow** - Snow reduces solar production to zero. Most panels will self heat even in cold weather when the sun shines. Be careful when trying to remove snow from rooftop systems as a mass of falling snow likely contains ice as well, and can cause serious injury if striking someone when it is removed.
- ▶ **Monitoring** - most contractors provide a monitoring software to track production from your solar array. Be sure they install it, and be sure to check your system's production from time to time to verify it is producing energy.
- ▶ **Wiring** - be sure to inspect your system's wiring from time to time. Squirrels and birds are a major nuisance to electrical systems in Michigan.

Summary and Important Notes

- ▶ Please be sure to get at least three bids from licensed contractors or electricians before signing a contract or financing agreement.
- ▶ Make sure the roof of your home or property is not shaded and is unobstructed to the southern sky.
- ▶ Ask about warranties and on-going maintenance needs for the equipment you are purchasing.
- ▶ Be aware you still need to pay BWL for your electric bill.
- ▶ Be aware that you will still use electricity from BWL during the 83% of the hours of the year that your array won't be producing energy.
- ▶ Be aware that if you have water, sewer, steam or chilled water service with BWL that you will still be responsible for those utility costs.

Next Steps

- ▶ Complete the online quiz associated with this educational material on BWL's website
 - ▶ <https://www.lbwl.com/installsolar> - link to solar quiz
- ▶ After you complete the quiz, in 1-3 business days you will receive an email from DocuSign that contains your contract with BWL that you need to successfully complete the installation process. Please review and sign the agreement.
- ▶ After your agreement is signed, you can proceed with the installation.
- ▶ Once the installation is complete, have your contractor schedule a code inspection with the local government inspector.
- ▶ The inspector will contact BWL, who will initiate your meter swap and enroll you in our Distributed Generation program.