Understanding kWs, kWhs, and your net meter (Oregon PGE example)

FREQUENTLY-ASKED QUESTIONS

WHAT IS NET METERING?

Oregon's net metering law allows all utility customers to generate their own electricity and reduce their electricity bills. If you install a photovoltaic system, your utility will come to your site and switch out your existing utility meter for a bidirectional "net" meter. The meter keeps track of the energy you acquire from the utility, and what you supply to the grid. Each month, the energy you used from your utility is offset by the energy you send to the utility. You are only charged for the difference or the "net".

If you generate more energy than you use in a given month, your electric bill will have no charges, and you will receive kilowatt-hour credits that will be applied to your future electric bills. Unused credits will accumulate in your Portland General Electric account. This means credits accumulated during sunny summer months can be applied to charges during Oregon's cloudy winter months, eliminating the need for batteries to store your excess energy. Each year on the designated date, any unused credits will be donated to a low-income housing fund and cannot be carried forward into the following year.

Let's say your solar PV system generates 200 kWh of energy in a particular month. Here are three scenarios showing how energy is measured at the net meter and how many kWhs the customer is charged for:

- If you consumed 200 kWh in the month, the net meter would register 0 kWhs; the customer would be charged for 0 kWhs (because total consumption is equal to total production).

- If you consumed 100 kWh in the month, the net meter would register -100 kWh; the customer would be charged for 0 kWhs and a credit of 100 kWhs would be issued to the account.

- If you consumed 500 kWh in the month, the net meter would register 300 kWh usage from the utility; the customer would be charged for 300kWhs (or previous kWh credits would be used).

DOES MY NET METER KEEP TRACK OF HOW MUCH ENERGY IS PRODUCED BY MY PV SYSTEM?

No. The amount of energy you supply to the grid is not the same as the total amount of energy produced by your PV system. It is only equal to the amount leftover in excess of the electrical loads in your house when the system is producing more than you are using. Your PV inverter or data monitoring system records how much energy your PV system has actually produced.

BOTH MY SOLAR INVERTER / DATA MONITORING SYTEM AND MY UTILITY NET METER RECORD ENERGY IN TERMS OF KILOWATT-HOURS. WHAT IS A KILOWATT-HOUR?

The kilowatt-hour (symbolized kWh or kW-hr) is a unit of energy equivalent to one kilowatt (1 kW) of power expended for one hour (1 h) of time. Note that one kilowatt is equal to 1000 watts. The kilowatt-hour is the billing unit for energy delivered to consumers by electric utilities. Your solar PV system also produces energy in terms of kilowatt-hours.

For example, a heater rated at 1000 watts (1 kilowatt) operating for one hour uses one kilowatt-hour of energy. Using a 60-watt light bulb for one hour consumes 0.06 kilowatt-hours of electricity. Using a 60-watt light bulb for 100 hours consumes 6 kilowatt-hours of electricity.

Similarly, let's say you have a 3kW PV system and that this PV system is currently producing 2000 watts of **power** (2kW) under moderately sunny conditions. If this PV system were to continuously produce 2000 watts of **power** for 1 hour of **time**, the total **energy** produced would be 2kWh (2kw x 1hr).

HOW DO I READ MY NET METER? (Warning- this is more advanced)

Rather than a single meter display that registers both kWhs delivered to the customer and kWhs received from the customer, your Portland General Electric bidirectional "net" meter cycles through a series of three screens. These screens change at a regular interval, typically every five seconds, and repeat continuously. The **first screen** shows all **8**s. This indicates that the meter's display is working properly. The **second** and **third screens** will show a number in the upper left area of the electronic display referred to as the Register ID. The Register ID indicates which register index is currently being displayed.

- Register ID 01= kWhs Delivered to Customer
- Register ID 02= kWhs Received from Customer

The index is like the odometer in a car. It increases in increments only until it reaches "99999" and then it returns to zero. In order to determine how much energy is either delivered (Register 01) or received (Register 02) over a period of time, the register index must be recorded at the beginning and the end of the period. The difference between the beginning and end readings is the amount of energy (kWh) delivered or received.

In addition, there is a **caterpillar line** on all screens, made of segments. These digital segments light up in either a left-to-right direction or in a right-to-left direction to indicate the flow of electricity.

- If **left-to-right**, then you are drawing power from PGE.
- If **right-to-left**, then you are sending power to PGE.

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HOW CAN I CALCULATE MY MONTHLY HOUSEHOLD ENERGY CONSUMPTION?

Total household energy consumption can be calculated using the following equation:

$$\text{Total Household Energy Consumption} = \text{Solar kWh Produced (solar inverter or monitoring system)} + \text{Total Energy Delivered (Register "01")} - \text{Total Energy Received (Register "02")}$$

Remember, in order to determine how much energy is delivered (Register 01), received (Register 02), or produced by your solar PV system (Recorded at solar inverter or solar monitoring system) over a period of time, the register index must be recorded at the beginning and the end of the period. The difference between the beginning and end readings is the amount of energy (kWh) delivered, received, or produced.

For example:

Solar kWh Production		Delivered Register "01"		Received Register "02"	
Current Index	40820	Current Index	78352	Current Index	27360
Previous Index	40480	Previous Index	77845	Previous Index	27145
kWh Produced	340	kWh Delivered	507	kWh Received	215

632 KWh (total household monthly energy consumption) =
340 KWh (solar production) + 507 KWh (delivered to customer) – 215 KWh (received from customer)

HOW CAN I CALCULATE WHAT PERCENTAGE OF MY MONTHLY ENERGY USE IS BEING OFFSET BY MY SOLAR PV SYSTEM?

You can calculate the percentage of your monthly energy use being offset by your PV system using the following equation:

$$\text{\% Monthly Offset by Solar} = \text{Total Monthly Solar kWh Produced (solar inverter or monitoring system)} \div \text{Total Monthly Household Energy Consumption (calculated above)}$$

Using the example above, we can calculate that this particular household offset 44% of its electrical needs that month with solar energy:

44% (offset by solar) =
340 KWh (solar kWh production) ÷ 632 kWh (total net monthly household energy consumption)

HOW CAN I CALCULATE WHAT PERCENTAGE OF MY TOTAL ENERGY USE HAS BEEN OFFSET BY SOLAR SINCE THE SYTEM WAS INSTALLED?

You can use the same equation to calculate what percentage of your total energy use has been offset by solar since the net meter was first installed. It will be important to note which month of the year your system was installed when doing this calculation. For instance, if your system was installed in June and you are doing the calculation in October, you may have accumulated many kWh "credits" during the summer months which will then be used over the winter.

% Total Offset by Solar	=	Total Solar kWh Produced (solar inverter or monitoring system)	÷	Total Household Energy Consumption (calculated above)