

Green Power

OVERVIEW

The U.S. Environmental Protection Agency (EPA) defines green power as electricity generated from renewable resources, such as solar, wind, geothermal, low-impact biomass, and low-impact hydro resources. Whereas energy efficiency measures may be implemented to reduce the overall energy use in your building, the purchase of green power helps to reduce the environmental impacts associated with the generation of electricity used in your building. Green power may be obtained from either onsite sources (i.e., a solar photovoltaic panel at your property) or offsite sources (i.e., a wind turbine farm). The specific requirements for benchmarking and the resulting effect on your metrics depend on where the electricity is generated:

- Onsite Green Power.** Onsite green power may be generated through solar photovoltaic panels or wind turbines located at your property. To benchmark, you will enter two meters: one to track how much onsite renewable electricity you use and export, and a second to track the electricity that you purchase from the grid. Because onsite renewable electricity generation is part of your building’s energy requirement, it must be tracked; it is not sufficient to enter only grid-purchased electricity. When you enter onsite green power, it is important that you indicate whether you own the Renewable Energy Certificates (RECs) that are associated with the green power you generate. You must own the RECs to see the benefits of onsite green power in your emissions metrics.
- Offsite Green Power.** Offsite green power is generated from projects that are not located at your facility (e.g., from a nearby wind farm). In some cases, the green power may be generated in an entirely different part of the country. To benchmark, you will enter a grid electric meter and mark that it is “green power.” You then specify the quantity that is green and the location where it was generated. Offsite green power improves your “Avoided Emissions” only. It is the purchase of an emissions benefit, but your electricity still comes from the traditional grid.

The only onsite green power meter types in Portfolio Manager are solar and wind, the most common forms of green electricity. You may have other forms of renewable energy at your building, such as geo-thermal heating and/or solar hot water. Portfolio Manager does not have specific tracking modules for these energy sources because it is not common or feasible to quantify their heat input. In these cases, you receive credit to the extent you lower your energy purchases. You also may buy RECs independent of your actual physical electricity. These purchases are typically made at a corporate level and are often not traceable to individual buildings. Because Portfolio Manager focuses on building metrics, there is no specific module for tracking these unbundled RECs at the portfolio level, but you may enter these purchases as offsite green power at the building level – you choose how to apply your corporate RECs across your portfolio.

This document explains the benchmarking requirements and metric details in the following sections:

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UNDERSTANDING ONSITE GREEN POWER

Onsite green power is electricity generated at your property from a renewable energy source (currently only solar or wind). There are two important principles followed in tracking onsite green power in Portfolio Manager:

- **All energy use must be tracked to evaluate energy performance.** You must track exactly how much renewable electricity you use, as well as how much electricity you obtain (source) from the grid. It is not sufficient to track only the grid-purchased electricity for the property, since it does not accurately reflect the total property energy use.
- **REC Ownership must be tracked to properly evaluate environmental impacts.** Your ability to claim the emissions benefit associated with onsite green power depends on whether you own the Renewable Energy Certificates (RECs)¹ associated with renewable energy produced by the system at your property. Your environmental benefit is affected by any transfer of RECs, including REC arbitrage. In Portfolio Manager, there is currently no accounting for any RECs associated with energy exported back to the grid.

How to benchmark

Portfolio Manager lets you to track two types of onsite green power: power generated from solar photovoltaic panels and power generated from wind turbines. These renewable sources of electricity are tracked with a unique “meter type.” The special meter type lets us collect additional pieces of information that are unique to onsite solar and wind systems and are required for accurate performance metrics.

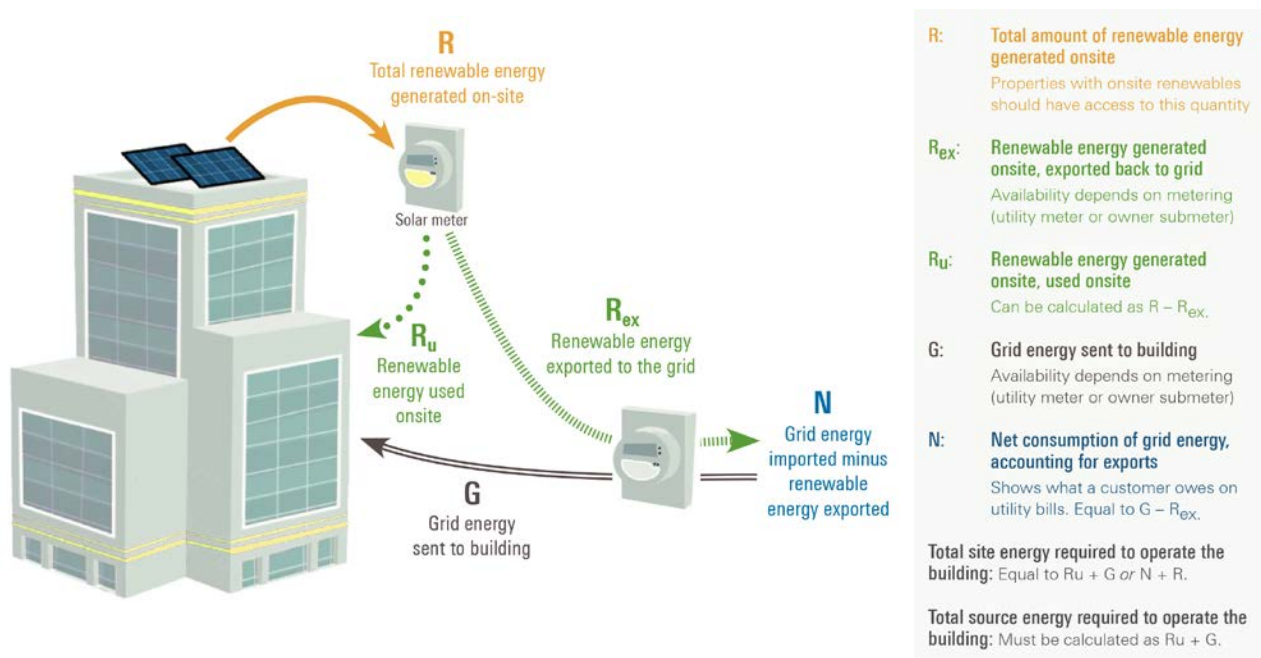
If you have an onsite system, chances are you also get some electricity from the grid. For example, you may use electricity at night or at other times when there is not adequate supply from an onsite solar system. Therefore, you need to enter two meters: an onsite renewable electric meter and a grid electric meter. The colored arrows in *Figure 1* show the electricity flows that are captured in each of these two meters. The green arrows correspond to information about your onsite system (your onsite renewable meter); the black arrow corresponds to information about energy from the grid (your grid electric meter).

1. **Onsite Solar or Wind Meter (Labeled as Flow R).** This meter is used to track both the electricity that you use onsite and any electricity that is exported back to the grid.
 - **Electricity generated by your system and used at your building (Labeled as Flow R_u).** The energy you generate and use onsite is an important energy need that must be included in your energy performance metrics. This amount is not always metered, but most buildings do meter the total amount of electricity generated, and if you don't export any energy to the grid, then this is the amount you need. If you do export electricity to the grid, and you do not have a physical meter tracking the amount of electricity you use you will need to compute this value by measuring your total system generation (R) and subtracting any exports to the grid (R_{ex}). You may want to consult with the energy service provider or utility that assisted with your system installation to determine where you can find this amount (energy that is generated by your system and used at your property).

¹ Renewable Energy Certificates (RECs) are tradable certificates that are widely used to establish environmental claims associated with buying or using green power. They represent the environmental, social, and other non-power qualities associated with the generation of one megawatt-hour of electricity from a renewable resource.

- Electricity generated by your system and exported to the electric grid (Labeled as Flow R_{ex}).** Many onsite systems export electricity to the grid. For example, a small school may have periods during which the generation of the onsite system exceeds the building's demand and therefore the excess electricity is exported to the grid. In contrast a large office building may never generate more electricity than it needs and therefore will not export any electricity. If you export electricity, you must quantify your exports. This information might be obtained from a bi-directional digital electric utility meter installed at your property that measures flow to the grid. Some buildings may not be able to read this value from a physical meter on their site, but rather will find it on the utility bill. You may want to consult with the energy service provider or utility that assisted with your system installation to determine where you can find this export amount.
2. **Grid Electricity Meter (Labeled as Flow G).** This Portfolio Manager meter is used to track all electricity that is sourced from the grid, meaning all electricity (kWh) that flows from the grid to your building. If you do not export electricity, then your utility bill is your total grid electricity. If you do export electricity, then you need to be very careful to include *all* energy that flows from the grid to your property; this is typically tracked via a bi-directional meter and may be reported on your utility bill. It is not sufficient to enter what is called a "net" meter, which only shows you the difference between the energy you import from the grid and the energy you export (i.e., $G - R_{ex}$). Although your utility may give you financial credit for exports (R_{ex}), the total flow of energy from the grid into your building (G) is required for a complete assessment of your performance. It is common for utility bills to separately report the "net" value ($G - R_{ex}$) and the export value (R_{ex}). In this situation, you will need to compute G by adding these two values together. You may want to consult with your energy service provider or utility to determine how you can quantify G from your utility bill.

Figure 1 – Configuration of an Onsite Renewable System



The Electric (Onsite) Solar or Wind Meters are unique meter types in Portfolio Manager. *Figure 2* illustrates a meter consumption table for an onsite green power meter. There are two extra fields that are unique to this meter type. First, there is the column used to track the energy exports offsite (i.e. back to the grid). Second, there is a place to track the REC ownership associated with that month's electricity. There are three options for REC Ownership: Owned, Sold/Not Owned, and REC Arbitrage. You select your REC ownership option for each monthly entry. It is possible that you will sell your RECs in one year but retain them in the following year. Information on your REC ownership over time is critical to accurately calculate of your GHG emissions benefit.

It's important to make sure you actually "own" the RECs. This can be confusing, especially if you have a Power Purchase Agreement. Please review your contractual agreement to double check ownership of the RECs. You may have purchased the energy with the RECs (bundled) or just the energy (unbundled). In some cases, RECs associated with onsite green power installations are sold to help finance the installation/operation of the onsite system or in a power purchase agreement to reduce the price of the energy you are purchasing. Once the RECs are sold, the onsite system's electricity generation is no longer considered green and you may not claim any emissions benefits for power generated from the onsite system.

Under specific type of sale known as REC arbitrage, system financing can be facilitated by selling the RECs that are associated with your onsite system and purchasing other RECs as replacements. This can be done to take advantage of price differentials of RECs produced elsewhere. In this case, you have sold the RECs associated with your onsite system and therefore you cannot claim that your onsite system electricity generation is green. You will, however, be able to claim the benefit of *offsite* green power associated with the replacement RECs you purchased. In August 2021, Portfolio Manager began accounting for the Arbitrated RECs as Offsite Green Power. Prior to that, users had to manually attribute their Arbitrated RECs to their Grid Electricity to get credit for the Offsite RECs.

Figure 2 – Example Data Entry Table for Onsite Renewable System

	Start Date	End Date	Energy Used On Site kWh (thousand Watt-hours)	Energy Exported Offsite kWh (thousand Watt-hours)	Total Cost (\$)	Estimation	REC Ownership	Last Update
<input type="checkbox"/>	1/15/2019	1/15/2020	344	25	10,000	<input type="checkbox"/>	Arbitrage	3/11/2021 KSCHEID

What onsite green power means for your performance metrics

A building that uses electricity from onsite green power, as opposed to electricity sourced from the grid, will have a higher ENERGY STAR score. The score is a measure of the thermodynamic performance of your building, which is a function of the amount and type of fuel your building consumes. Each fuel is assigned a national site-to-source factor in order to measure the efficiency of the building, not the efficiency of the utility supplying energy to the building. Since electricity generated from onsite green power (located either on the building or property) is effectively "behind" the utility meter, it is not subject to the generation, distribution, and transmissions losses of traditional grid-sourced electricity. It therefore is assigned a lower site-to-source conversion factor, resulting in a higher score. This is true even if the RECs are sold or arbitrated.

The environmental implications (total emissions and avoided emissions) of onsite green power depend on whether you own the RECs associated with your onsite renewable electric generation. If you own the RECs, then you will see the benefit of your green power in lower Total GHG emissions. If you sell the RECs associated with your onsite system (or never owned them in the case of power purchasing agreements) then the power generated by your onsite system is no longer considered green. This means your Total GHG emissions are computed as though you had

purchased grid electricity. If you arbitrage the RECs, then you no longer have onsite green power (that has no emissions associated with it), but you have offsite green power (which is the equivalent of buying RECs bundled with grid electricity).

The effect on these metrics is summarized in *Figure 3*.

Figure 3 – Performance Metrics Associated with Your Onsite System

Metric	Own RECs	Sell RECs	Arbitrage RECs	Explanation
Site Energy	No Effect	No Effect	No Effect	Renewable electricity is still a real energy requirement for the operation of your building.
Source Energy	✓ Improves	✓ Improves	✓ Improves	Onsite renewable energy is not subject to the same generation, transmission, and distribution losses as the grid.
Score	✓ Improves	✓ Improves	✓ Improves	The score is based on your source energy and will also improve.
Total Emissions	✓ Improves	No Effect	No Effect	If you own the RECs, there are no emissions associated with onsite green power. If you sell or arbitrage the RECs, this electricity is treated as if it came from the grid.
Avoided Emissions	✓ Improves	No Effect	✓ Improves	If you own the RECs, you get credit for the avoided emissions from your onsite system If you sell the RECs, you do not get any avoided emissions credit If you arbitrage the RECs, you get avoided emissions based on the new RECs you received in the trade.

UNDERSTANDING OFFSITE GREEN POWER

Offsite green power is a product you purchase from your local utility or third-party supplier. Often the supplier will bundle RECs with the underlying physical electricity into a single product. In this case, the actual electricity may be generated at a fossil fuel power plant in your area, while the RECs may be the environmental attributes of green power generated in another part of the country. Although the RECs were generated elsewhere, they are bundled to your electricity purchase, and therefore, you own the rights and can count the avoided emissions in your GHG reporting. The emissions benefit is based on the location where your RECs were generated, not the location of your property.

In some cases, you may purchase your electricity from a local utility and purchase your RECs separately. This may occur if your organization makes a corporate purchase of RECs to cover electricity use across an entire portfolio of properties. Although these RECs are not bundled with electricity at the time of purchase, you can effectively “bundle” them in Portfolio Manager, by designating grid purchased electricity as green power and entering the appropriate REC information.

How to benchmark

An offsite green power purchase starts as a purchase of electricity from the grid, through your local or third-party supplier. Therefore, to benchmark offsite green power you will begin by entering an electric grid meter. All electric meters have an extra column in the meter consumption table, specific to green power, as shown in **Figure 4**. You will check the “Green Power” box if you have a bundled product from your utility or if you purchase RECs independently (through corporate purchases) and wish to link them to your grid purchase. Selecting the “Green Power” checkbox for your electric meter will open an additional dialogue box (**Figure 5**) where you will answer a few questions about the source of your green power.

Figure 4 – Example Data Entry Table for Offsite Green Power

	Start Date	End Date	Usage kWh (thousand Watt-hours)	Total Cost (\$)	Estimation	Green Power	Demand (kW)	Demand Cost (\$)	Last Update
<input type="checkbox"/>	1/1/2021	2/15/2021	43,666		<input type="checkbox"/>	<input checked="" type="checkbox"/> Edit			3/11/2021 KSCHEID

Figure 5 –Example Dialogue Box for Offsite Green Power Information

About the Green Power for this Entry: 12/18/2020 through 01/21/2021

Quantity: kWh (thousand Watt-hours) The quantity of green power must be entered in the same units as your energy usage for this time period.

Generation Location:
 I know the specific plant where the energy was generated.
 I don't know the specific plant, but I know the eGRID Subregion (US) or Province (Canada) where the energy was generated.
 eGRID subregion (US) or Province (Canada):
 I don't know anything about where the energy was generated.

Fuel Source(s):
 Biogas
 Biomass
 Geothermal
 Small Hydropower
 How Much? %
 Solar
 Wind
 How Much? %
 Unknown

Save

The quantity and location are necessary to compute the benefit of your green power:

- **Quantity of Green Power.** In many cases, your entire electricity bill may not be green power; you may have an agreement that specifies either a certain amount (kWh) or a certain percentage of your power as green. For accurate characterization of your emissions benefit, this amount is required.
- **Generation Location.** You must indicate the location where your renewable energy was generated. If you know it, you can select a specific plant or region. The benefits of green power depend on where it is generated because this is where traditional electric generation is being replaced. That is, green power reduces the need for conventional methods of electric generation in the region where it was produced, which may differ from the location of your building. If you do not know where your green power was generated, you can select “I don’t know.” In this case, your property will be assigned the emissions factor from the cleanest region of the grid (the one with the smallest non-baseload emissions factor), yielding the most conservative estimate of your benefit.
- **Fuel Source (optional).** Although the benefit of your emissions is based on the location where your power was generated, you can also enter the fuel source to provide greater specificity about your green power purchase. If you don’t know the fuel source, you can leave this question blank or select “Unknown.”

What offsite green power means for your performance metrics

The purchase of offsite green power is a GHG reduction strategy. When you purchase offsite green power, you purchase the rights to a zero-emissions energy supply. These purchases can be an important part of your overall GHG reductions strategy. With offsite green power you still purchase and receive your electricity from the local utility and your electricity is sourced from the national grid. Like any other building that receives its energy from the grid, you are assigned the national source energy factor. For this reason, the computation of your site energy and source energy are unchanged. These metrics quantify the real energy requirements of your building. The purchase of the RECs does not change the thermodynamic energy requirements of your building.

Standard GHG accounting protocols recommend using two complementary methods to estimate GHG emissions; a location-based approach and a market-based approach.

- **Location-based method (which Portfolio Manager uses)** uses the regional grid-average emissions factors. In this method onsite green power (solar or wind on your property) improves (lowers) your Total Emissions if you own the RECs, but offsite green power (purchasing RECs with grid electricity) has no effect on Total Emissions. Offsite Green Power is represented in Avoided Emissions.
- **Market-based method** uses energy supplier-specific emissions factors and both onsite and offsite green power will improve (lower) your Total Emissions because they both are assigned a zero emissions rate.

The metrics are summarized in *Figure 6*.

Figure 6 – Offsite Green Power and Your Performance Metrics

Metric	Effect	Explanation
Site Energy	No Effect	Renewable electricity is still a real energy requirement for the operation of your building.
Source Energy	No Effect	Although you have purchased green power, the actual electrons delivered to your building come from the main electric grid. Therefore, your source energy does not change.
Score	No Effect	The score is based on source energy. Because source energy is not affected by the purchase of green power, neither is your score.
Total Emissions	No Effect	Offsite green power is not reflected in your total emissions.
Avoided Emissions	✓ Improves	Offsite green power is counted towards the avoided emissions associated with your building.