

**SUSTAINABLE PRACTICES
FOR BUILDING OWNERS AND OCCUPANTS**

RENEWABLE ENERGY

**PHOTOVOLTAIC PANELS
WIND**

Photovoltaic Panels



Background:

Photovoltaic panels allow users to obtain clean energy from a renewable resource. A typical residential photovoltaic system consists of the following components:

1. Solar array: Converts solar energy to direct current (DC) electricity.
2. Inverter: Converts direct current (DC) electricity to alternating current electricity (AC) which is used in homes.

Systems can either be connected to the local utility or be installed independent of the local utility.

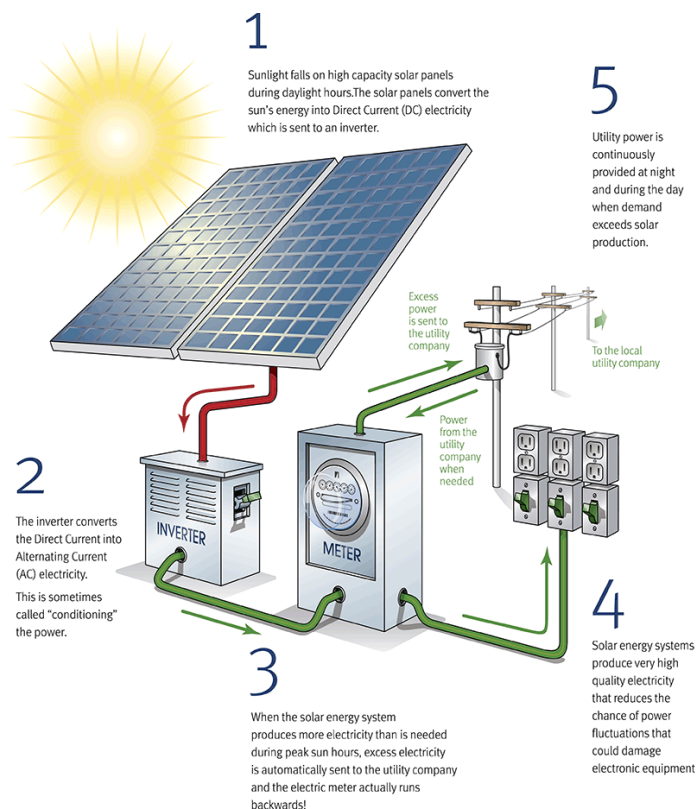
Some systems also include:

1. Battery: Stores electricity produced by solar array.
2. Bypass diodes: Allows certain solar cells to be bypassed if they are not producing electricity.
3. Blocking diodes: Prevents a battery from draining itself during the night when it is not being charged by the array.

Applicable City of Rochester Codes:

1. Section 120-148.2: Describes requirements for solar energy system installations.
2. Section 120-163: Indicates locations where solar arrays may be installed on a site.

Different codes may apply based on zoning.



Did you know?

The City of Rochester has adopted the New York State Unified Solar Permit, which speeds up the permitting process for solar projects up to 25 kilowatts and decreases costs. [Click here](#) to learn more.

Did you know?

The federal government extended the renewable energy tax credit through 2021. Through 2019 the credit remains at 30% of the cost of the system for both residential and commercial participants. This credit expires after 2021 for residential users, but remains at 10% for commercial users. New York State also provides a solar energy system equipment credit, which is a credit of 25% of a qualified solar system's equipment costs. The credit is capped at \$5000.

Sources: <https://energy.gov/savings/residential-renewable-energy-tax-credit>
<http://www.nrel.gov/docs/fy04osti/35297.pdf>
<http://solarcraft.com/wp-content/uploads/2013/04/how-solar-panels-work-illustration.gif>

Hyperlink: <https://www.nyseda.ny.gov/All-Programs/Programs/Clean-Energy-Communities/Clean-Energy-Communities-Program-High-Impact-Action-Toolkits/Unified-Solar-Permit>

Photovoltaic Panels



TARGET GROUP	WHAT CAN I DO
All members of the Rochester Community 	<ul style="list-style-type: none"> Consider the economic benefits of solar panels as described below. <p>To pursue solar photovoltaic panels, consider the following components:</p> <ul style="list-style-type: none"> The useful life of the arrays Array warranties compared to the expected useful life The current state of the roof (structurally and the next time the roof shingles will need to be replaced) Available space. The rule of thumb is for every 100 square feet, 1kW may be produced. Expected energy production
Developer, Business Owners, Institutions 	<ul style="list-style-type: none"> Consider solar-ready construction (e.g. run conduit to the roof, orient new construction to have southern facing slopes, plan for roof penetrations to not be located on the southern facing roof slope, etc.) in the event installation costs decrease and/or utility costs increase. Be aware that rating systems such as Enterprise Green Communities provide points for solar ready design. Consider the federal residential renewable energy tax credit (30%) (not applicable for rental units) and the federal commercial depreciation allowance.
Homeowner and Landlord 	<ul style="list-style-type: none"> Consider the federal residential renewable energy tax credit (30%) (not applicable for rental units) and the NYS tax credit (25%).

Calculate Payback Period:

$$\text{Payback (Years)} = \frac{\text{Total System Cost} - \text{Federal and State Tax Credits}}{\text{Total Energy Savings Per Year}}$$

Note: Total system costs include costs for arrays, installation, any application fees and system components.

The National Renewable Energy Laboratory estimates energy savings in Rochester, NY to be 1500 kW-hr/kW-year for a net-metered system. Multiply this conversion number by the kW of your photovoltaic system. Then multiply by the cost per kW-hr of your utility provider. Ex: 5 kW * 1500 kW-hr/kW-year * \$0.14/kW-hr = \$1,050 saved in total energy savings over a year.

Wind



Background:

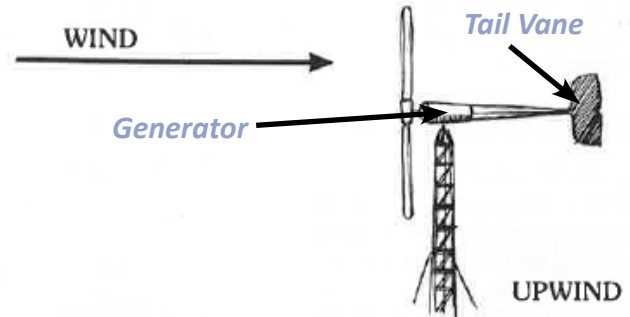
Wind is a renewable resource that can generate electricity through turbines. Wind turbines offer the ability to extract energy from certain geographical locations based on wind speeds. There are two basic types of turbines:

Horizontal Axis Wind Turbines:

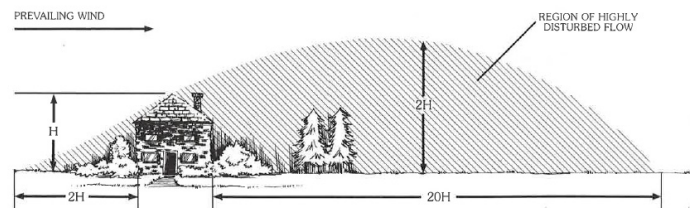
The first way to extract energy from wind turbines is through the horizontal axis, which is the most common way. The tail vane is used to keep the turbine facing the wind. The generator is mounted at the top of the tower (hub height).

Vertical Axis Wind Turbines:

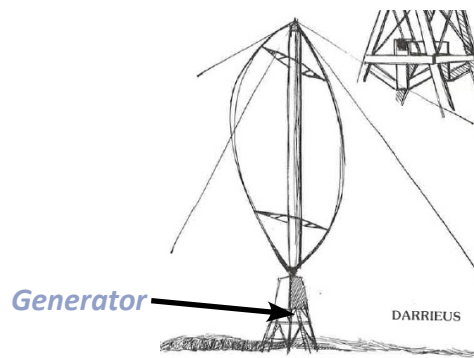
The major difference with vertical axis turbines from horizontal axis wind turbines is that the shaft is vertical. The generator can be mounted at the ground level which helps with maintenance. Vertical axis turbines do not rely on specific wind direction.



Horizontal Axis Turbine



ZONE OF DISTURBED FLOW OVER A SMALL BUILDING



Vertical Axis Turbine



Did you know?

Section 120-163 of the City Code permits wind energy conversion systems for both residential and non-residential uses if certain conditions are met.

Did you know?

NYSDERDA currently has a Small Wind Turbine Program that will provide incentives to install up to 2 MW of turbines per site. Residential, commercial, institutional and government users are eligible. [Click here](#) for more information.



TARGET GROUP	WHAT CAN I DO
<p>All members of the Rochester Community</p> 	<ul style="list-style-type: none"> • Consider the economics of wind turbine installation using the "Calculate Payback Period" section below. • If you choose to install turbines, some factors to consider include: <ul style="list-style-type: none"> • Zoning restrictions • Site obstructions • Costs of energy production and payback • NYSERDA funding for small wind turbines
<p>Developer, Business Owners, Institutions</p> 	<ul style="list-style-type: none"> • Consider wind-ready construction (e.g. run needed conduit to the future tower location) in the event installation costs decrease and/or utility costs increase.

Calculate Payback Period:

$$Payback (Years) = \frac{Total System Cost - Federal and State Tax Credits}{Total Energy Savings Per Year}$$

Note: Total system costs include the costs for the turbine, tower, installation, any application fees and system components.