

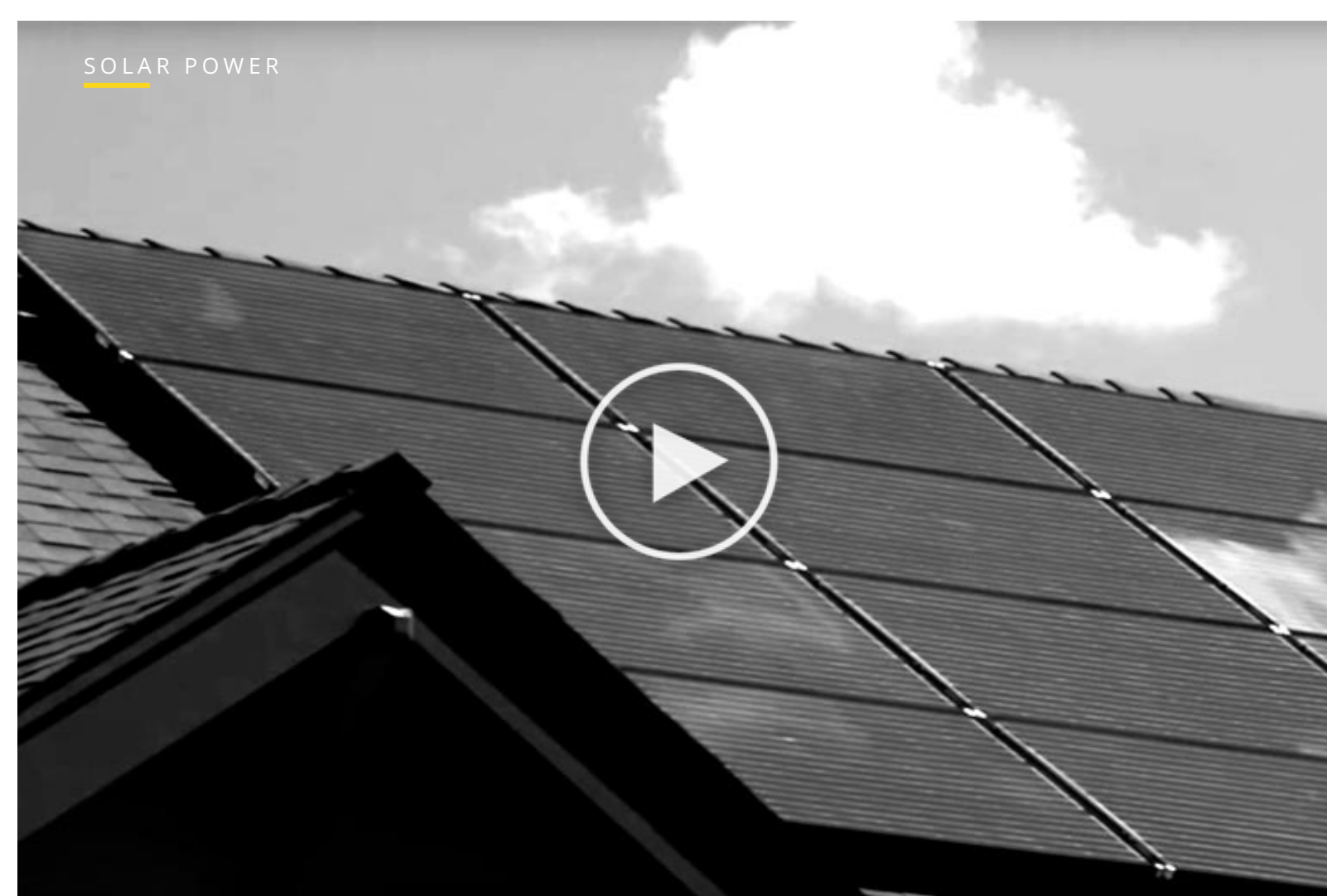


## USE THE SUN Step 12

**Solar photovoltaic (PV) panels are the most cost effective renewable energy source** for most zero energy homes. Installing a PV system is the last step to take to reach the net zero energy goal, since PV panels are the most costly of all strategies. The amount of solar PV panels required to reach the zero energy goal should be calculated only after all other energy-saving measures – outlined in the [Twelve Steps to Affordable Zero Energy Home Construction and Design](#) – have been modeled to minimize energy use. The goal is to minimize the use of solar panels as much as possible to cover the remaining energy needs of the home at the lowest cost possible. Since the price of solar photovoltaic systems is dropping rapidly, this is something of a moving target.

## Plan for Solar

The site you select for your zero energy home should have unobstructed sunlight between the hours of 9am and 4pm. The south or west roof should have enough square footage to hold the number of solar panels needed. Eliminate any building elements from the design that will cast a shadow on the panels or interfere with their placement. Roof installations such as dormers, chimneys, plumbing vents, and utility masts should be located so they do not interfere with panel placement or impair solar access to the panels.



## Consider Micro-Inverters

If there are potential obstructions, such as trees, buildings, leaves, unusual amounts of dust, snow, or other objects partially shading the panels at any time during the day, a central inverter's electric production will be reduced to the level of the lowest producing panels. Micro-inverters, however, allow non-shaded panels to work at optimal efficiency even though some of the panels are shaded. Another advantage is that micro-inverters will accommodate additional panels without purchasing a second centralized inverter, saving significant costs when expanding the system.

## Energy Modeling

Use energy modeling to estimate the annual energy use of the home in kilowatt-hours (kWh). Then you can ask a solar contractor to calculate the size and cost of a PV system capable of generating that amount of energy over the course of a typical year in your climate. A solar contractor can also tell you how much roof area will be required for sufficient solar panels. Energy production can be calculated using the online [PVwatts program](#) from the National Renewable Energy Laboratory.

## Purchasing the PV System

Get several quotes from reliable installers to get the most cost-effective system. If you're taking out a construction loan or if the buyer is taking out a mortgage, the cost of the PV system can be included in the financing. Financial incentives from utilities and state governments can reduce the cost of the system for either the builder or the buyer. Check the [DSIRE website](#) to find out what incentives are available in your state. By purchasing the system with the home, the buyer will retain the full value of energy generated over the life of the system. As electricity prices rise over time, the financial return will grow. The home will also reflect the extra market value of the PV system. The downside to purchasing the system will be the upfront cash needed if it is not rolled into the buyer's mortgage. Incentives never pay the entire cost and the benefit of the federal income tax credit (30% of the system purchase price) only comes around when the homebuyer files their annual tax return.

## Solar Leasing

If you do not want to add the price of the PV system to the home, consider suggesting that the buyer lease the PV system. Leasing is an appropriate choice in some situations. For example, if the buyer doesn't have an income tax liability, tax credits are worthless. Alternatively, the buyer may not want to be responsible for maintaining the system.

In some states, smaller solar PV systems can be installed on a 20-year lease at virtually no cost to the buyer through the Sun Run program. For instance, in Oregon, a 3kWh system leased through the Sun Run program costs \$6000 up front and the lessee can receive a \$6,000 tax credit taken over four years. This gives the homeowner all the power produced by the system at no cost for the next 20 years. At least six other states offer the Sun Run program, each with their own cost structure. Detailed [information on solar leasing](#) is available from the U.S. Department of Energy.

## Net Zero Ready

Another approach to reducing upfront costs for a zero energy home is to plan for, but postpone installing a PV system. Consider designing and building the home to be a "net zero ready" or "net zero capable" home. These are highly energy-efficient homes, sized and pre-wired for future solar PV installation and with sufficient roof area and solar orientation to meet the zero energy goal once PV panels are installed. The buyer can transform his zero energy-ready home into a zero energy home by leasing or purchasing solar panels when they are ready to do so, at which point they can size the panels based on their actual family usage and, if purchasing, take direct advantage of subsidies and tax incentives. Learn how to [become a partner in the Department of Energy's Zero Energy Ready Home building program](#).

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