Why PV is Important To You

This petrol station in Perivale, United Kingdom, has grid-connected, roof-mounted photovoltaic modules that generate electricity to power the pumps and lights under the canopy. So even if grid power is interrupted, the petrol pumps remain fully operational.

PV is highly reliable and needs little maintenance.
What's the value of electricity when it's unavailable?

To put this question in perspective, think back to your home's last power outage. Depending on what you were doing at the time, it was either a minor inconvenience or it brought your activities—such as cooking a holiday meal, for example—to a standstill. Now consider the fact that amazon.com loses $1 million per minute when a power disruption makes its Internet site unavailable. It's easy to see that reliability is key, whether you're feeding your family or fueling the U.S. economy.

PV systems, originally developed for use in space—where repairs are extremely expensive, if not impossible—are highly reliable. PV still powers nearly every satellite that circles the Earth, because it operates reliably for long periods of time and needs virtually no maintenance. And to dispel a commonly held "PV myth," PV systems can generate power in all types of weather. On partly cloudy days, they turn out as much as 80% of their potential energy. Even on extremely overcast days, they can still produce about 25% of their maximum output.

PV systems are easy to maintain. They have no moving parts, so visual checks and battery servicing are enough to keep systems up and running. Because manufacturers test solar panels for hail impact, high wind, and freeze-thaw cycles representing year-round weather conditions, weather damage is no greater potential problem for PV systems than for other types of energy production systems.

A PV system in Arlington, Virginia, feeds clean energy into the utility grid that supplies electricity to the Pentagon. As a distributed resource, PV puts the power supply at the point of use. The benefits of PV systems often far outweigh the cost because of their modularity, reliability, environmental benefits, and ability to augment traditional power sources during peak demand.

PV costs little to build and operate.
Isn't PV expensive?

Although we've made great strides in reducing costs in the last 20 years or so, electricity from PV is not yet cost-competitive with electricity from an established grid. However, it really doesn't have to be! PV supplies electricity when and where energy is most limited and most expensive, making a valuable *strategic* contribution to our energy mix. Energy from PV doesn't simply replace some fraction of the generation; it displaces the *right portion* of the load. Once installed, PV systems can produce power continuously with little upkeep and minimal operating costs.

Consider these facts. Because PV cells use the energy from sunlight to produce electricity, the "fuel" is free. PV systems are usually placed close to where the electricity is used and usually require much shorter power distribution lines than those needed to bring power in from the utility grid. In addition, using PV eliminates the need for a transformer "step down" the power from the utility line. Less wiring means lower costs, shorter construction times, and reduced permitting paperwork, particularly in urban areas. All these factors make PV systems cost-effective over their useful lives.

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Low-maintenance, cost-effective PV systems are ideal for supplying power to remote communications stations, navigational buoys at sea, and homes more than a quarter mile from utility power lines.

Isle Royale National Park is on an island in Lake Superior, Michigan—47 miles from the nearest electric utility. The park has purchased and installed five small solar electric systems to generate its electric power. The PV systems have helped to eliminate some safety and human-comfort concerns associated with the diesel-powered generators used earlier.

PV has virtually no environmental impact.
Would you be willing to pay a little more for your electricity if you knew it was environmentally "friendly"?

According to a 1999 utility market research study (Farhar 1999), the answer for most of us is *yes*. When customers are aware that there are utility energy options, including PV, 70% are willing to pay at least $5 more per month and 38% are willing to pay at least $10 more per month—realistic costs for today's PV systems. And these systems have almost no impact on the environment.

Because PV systems burn no fuel and have no moving parts, they are clean and silent, producing no atmospheric emissions or greenhouse gases that have detrimental effects on the planet. Compared with electricity generated from fossil fuels, each kilowatt of PV-produced electricity offsets up to 830 pounds of oxides of nitrogen, 1,500 pounds sulfur dioxide, and 217,000 pounds of carbon dioxide, *every year*, according to a report from the National Renewable Energy Laboratory (Herig 2000).

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These are serious numbers, and the potential of PV-generated energy to make such great strides in avoiding pollution will only continue to climb the PV industry grows and expands.

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At a facility in Camarillo, California, workers manufacture PV panels for producing solar electricity. Because PV doesn't rely on imported oil, manufacturing "home-grown" energy within our borders boosts our economy and strengthens our energy security.

PV is produced domestically, strengthening our economy and reducing our trade deficit.
Is it important to you to know that your power doesn't depend on foreign oil?

It seems pretty clear that reducing our nation's dependence on foreign oil is a worthy goal. Using PV protects us against the threats of fuel price volatility and political instability, and it allows us to produce our own energy within our own borders. By building the PV industry, we're investing in "home-grown" energy, which creates domestic jobs and strengthens our economy.

Today, the PV industry generates about 3,000 jobs for every $100 million of module sales. If the industry continues to grow at the rate we've seen in the last few years—an average of about 36%—it could employ some 150,000 Americans in high-value, high-tech jobs within 20 years (*Solar Electricity: The Power of Choice*, 2001).

As we keep steadily increasing our PV exports to other countries, our current trade deficit moves steadily toward a trade surplus. And PV is a free-market commodity, involving a mix of large and small businesses—customer choice underpinning success and growth. As the costs of PV keep declining and the technology keeps improving, the industry has the potential to become one of the world's largest.

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A photovoltaic system provides power to illuminate bus stops all night "the Strip" in Las Vegas, Nevada. PV became the "power of choice" when officials discovered that extending grid service to this area was more expensive than purchasing solar electric systems.

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PV is modular and thus flexible in terms of size and applications.
What if you could size your energy-generating system down to the kilowatt?

With PV, one size does not fit all. That's one of its main advantages. A PV system can be constructed to any size in response to the energy needs at hand. And a PV system can be enlarged or moved as these energy needs change. For instance, homeowners can add modules every few years as their energy usage and financial resources grow. And ranchers can use mobile trailer-mounted pumping systems for watering cattle that are rotated around different fields.

In urban applications, PV can eliminate the need for costly trenches in streets. PV can be an outstanding choice for urban areas where grid power is unavailable or grid connections would be very costly or cumbersome. Lighting, irrigation, median sprinklers, water pumping, school and hospital warning signs, communications, and emergency services are just a few of the many successful uses for PV in our cities and towns.

The Sacramento Municipal Utility District installed this 210-kilowatt crystalline silicon PV system at its Hedge substation in California. Distributed generation systems like this are helpful where there is a heavy power draw in the mid-afternoon on hot summer days. These peak power needs can be met by connecting solar systems to the grid to produce power when the solar resource is at its maximum.

PV meets the demand and capacity challenges facing energy service providers.

Can PV help prevent brownouts and blackouts?

The answer is a resounding yes. When demand for electricity is high, such as during a heat wave when everyone's air conditioner is running, utilities must fire up their "peaking" power plants to meet the demand for just a few hours a day. These peaking plants are expensive to operate, and the utility's electric distribution system must be sized to handle these high, albeit short-term, loads. When a utility installs grid-connected PV arrays, the PV-generated electricity is used directly to help supply a building's peak demand; this is often called "peak load shaving." Coincidentally for photovoltaics, the need to meet peak loads arises when the sun is shining the brightest!

Another important benefit of PV systems is that they can produce power near the point of use—a concept we call "distributed generation." Before the grid becomes overloaded, then, PV systems step in to provide electricity to individual homes and buildings.

PV helps energy service providers manage uncertainty and mitigate risk.

Why install PV at a power plant?

Because it makes sound financial sense. As the energy industry moves from the monopoly, no-risk financial environment of the past toward more competition, financial risks to energy suppliers become a concern. The fuel-free, modular attributes of PV play a key role here. Because PV uses no fuel, there's no uncertainty about rising and fluctuating fuel prices. In addition, clean renewable energy technologies like PV tend to have minimal costs associated with complying with legislation that protects the environment. PV's modularity also figures in—power plants that are built as a series of modules tie up less capital for a shorter period of time when the plant is under construction.

A modular plant can begin operating as soon as each module is completed, producing revenue sooner than nonmodular plants. And a failure in a modular plant affects only a portion of the plant; a failure in a nonmodular plant can shut down the entire operation. Finally, modular plants can be moved to areas of higher value or used in other applications, if that becomes necessary.

4 Times Square—a 48-story New York City skyscraper designed in the 1990s—features a photovoltaic "skin" that includes thin-film PV panels; they replace traditional glass cladding material. The PV skin extends from the 37th to the 43rd floor on the south and west walls and is a highly visible part of the midtown skyline. Durst Organization, the developer, included a variety of energy efficiency strategies in the building. Kiss + Cathcart Architects designed the PV system in collaboration with Fox and Fowle, the base building architects. Energy Photovoltaics of Princeton, NJ, developed the custom PV modules.

PV serves both form and function in a building.
But doesn't PV look really ugly on the roof?

Not anymore. State-of-the-art PV modules are now available in a variety of colors and styles, allowing designers to use them as aesthetic elements built right into roofs, skylights, awnings, entryways, and facades. Today's modules can even be specified to transmit a percentage—usually 80% to 90%—of natural light. Mixed with nontransmissive modules, these systems create a pleasant environment inside the building, helping to ventilate and heat the building at the same time.

When PV systems are properly integrated into a building "envelope," they don't just provide power and light, they contribute to the structure itself. This relatively new concept, called "building-integrated PV," is taking hold. Think of it this way—since a building has to have windows, why not have windows that produce power? It makes financial sense, too, because the savings on conventional structural materials often offset the cost of the PV materials.

Now you know why PV is important to *you*. It's also important to the environment.

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