Powering the Future with Solar Energy

How Solar Energy Can Help Meet America's Growing Energy Needs

Solar power is produced through two main technologies: photovoltaic (PV) cells, which convert sunlight directly into electricity, and concentrating solar thermal (CST) power, a utility-scale technology that uses mirrors and lenses to focus sunlight into a concentrated beam, which is converted into steam that generates electricity. Optics and photonics define the fundamental mechanisms involved in the conversion of light into electricity.

Key Facts

- Nearly every area of the U.S. has the sufficient solar resources for PV systems.
- Constant sunlight is not required for solar power to be used. On partly cloudy days, PV systems can produce up to 80% of their potential electrical capacity and up to 25% on very overcast days. CST systems have the ability to run overnight or in bad weather by storing heated transfer fluid in a hyper-efficient thermos bottle.
- According to the National Renewable Energy Laboratory, a 90-square-mile, PV-generating station in an average solar location in the U.S. would produce enough energy to meet the entire country's peak demand.

Today's Applications

- Solar energy could be used on a more widespread basis right now. Renewable energy generates 2.4% of U.S. electricity. Solar contributes only one-eighth of 1%. However, technology already exists today to provide a significant fraction of the country's growing electricity needs.
- Applications include the powering of homes and businesses in sources such as water pumps, back-up power generators, cooling systems, appliances, and indoor and outdoor lighting. Solar energy also powers remote locations -- for example, isolated buildings, roadside telephones and space satellites.

Economic Impact

- According to the U.S. Department of Energy, the national market for solar energy is worth approximately $2 billion and has created roughly 20,000 high-tech, high-value jobs. In just 12 years, the industry is expected to grow to more than 150,000 new jobs.
- The market for solar energy is expected to grow by more than 30% each year for the next several decades.
- Depending on the size, a solar energy system installed in either a home or business will pay for itself in a matter of years in money saved on electricity bills.

The Future

- Continued investments in solar R&D will lead to costs that are more competitive with fossil fuels.
- Smaller and cheaper solar panels will mean all buildings and homes could be equipped to not only produce, but also conserve, their own solar energy.
- Researchers are working to develop technologies that may allow solar energy to be used in an electrolysis process that separates the hydrogen and oxygen in water so the hydrogen can be used in fuel cells for transportation and in buildings.

Continued R&D funding and investment tax cuts for solar energy technology are needed to fully realize its potential applications and energy savings.

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