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AMERICA'S ALTERNATIVE ENERGY SOURCES

Solar

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Current State of Solar Power

A. How much used?

In 2003, approximately 64 trillion Btu's, or less than 0.1% of total U.S. energy consumption, was harvested by solar collectors.[1]

B. Where?

While solar energy is harvested in all 50 states, the collection of solar energy is concentrated in the sunniest states, namely California and Florida.[2]

C. Cost?

In 2004, thermal collectors cost about $2.43 per square foot for installed systems.[3] In the same year, photovoltaic (PV) modules averaged $2.99 per peak watt of output.[4]

D. Who is using it?

In 2005, the heating of swimming pools accounted for about 94% of U.S. thermal collector output,[5] and powering buildings, either directly or through the electric grid, consumed over 85% of the electricity generated by PV cells. Approximately speaking, 40% of PV output was used commercially, 33% residentially, 13% governmentally, and 10% industrially. The remaining 4% was used, in order of magnitude, for miscellaneous ("other") purposes, transportation, and utilities.[6]

Outlook for Solar Power

A. Pros and cons?

Because solar energy is generated by a massive chemical reaction external to our own planet, it holds a unique advantage over other energy sources. For practical purposes, it is not only an abundant source of energy, but a limitless one. PV systems are very cost effective in remote locations, competitive in the long run in developed areas, and can provide reliable power in locations subject to brown- and black-outs. In addition, many systems are engineered and built in the U.S., supporting the national economy.[7]

Despite its abundance, harvesting solar radiation efficiently presents some unique challenges. Due to conditions in the atmosphere and attitude of the earth with respect to the sun, not all areas of the country are as well-suited to solar collection as others.[8][9] Also, while solar energy may be limitless, the materials necessary to produce thermal collectors and PV cells are not.

B. Barriers

The major barrier to further adoption of solar energy collection is the initial capital expense of installing the systems. With system payback horizons often stretching beyond the near term (5 years), the harvesting of solar energy must be viewed as a strategic investment, rather than an expense or simple "purchase" by the consumer or enterprise.

C. Incentives

Numerous incentives are available to install both thermal and PV systems in both residential and commercial applications. Summaries of, and links to, grant and loan programs relevant to Pennsylvania residents can be found below.[10]

Costs for Solar Power

A. Infrastructure

Installing a thermal domestic hot water system in a residential context, and without the application of any incentive programs, normally costs between $1,500 and $3,000.[11] Averaged over $5M in new installations, the installed cost for module- and cell-based PV systems was $2.99 and $1.92/peak watt respectively in 2004.[12]

B. Cost per kilowatt hour

No operating costs are associated with either thermal or PV systems during their operational lifetimes, due to a lack of moving parts and the free input of solar radiation.

C. Environmental costs

The production of PV cells costs both materials, such as silicon, and about 600kWh/m^2. These environmental costs take between one and four years to recover,[13] well worth the expense for a system that is capable of operating maintenance-free for up to thirty years.

Recommendations

For individuals and businesses that qualify for incentive programs, solar technologies make a lot of sense. Even without subsidies, thermal and PV systems may be desirable in some situations

for their reliability, good stewardship, or simplicity. This technology will be much more effective as economies of scale reduce the initial

[1] http://www.eia.doe.gov/emeu/aer/txt/ptb0102.html accessed 11/3/06
[2] http://www.eia.doe.gov/cneaf/solar.renewables/page/solarreport/solar.html accessed 11/3/06
[3] http://www.eia.doe.gov/cneaf/solar.renewables/page/solarreport/table37.html accessed 11/3/06
[4] http://www.eia.doe.gov/cneaf/solar.renewables/page/solarreport/table50.html accessed 11/3/06
[5] http://www.eia.doe.gov/cneaf/solar.renewables/page/solarreport/table38.html accessed 11/3/06
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[13] http://www.nrel.gov/ncpv/pdfs/24596.pdf accessed 11/3/06