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The Value of Solar Energy to Pennsylvania: Economic Development, Job Creation, Peak Load Reduction, Increased Reliability, Security, Environmental and Health

Pennsylvania has a proud history as an energy producing state. The earliest record of mining coal in Pennsylvania dates back to 1761 at Fort Pitt in Pittsburgh. Oil was first discovered in Titusville in 1859 and the first Pennsylvania natural gas well was in Murrysville in 1878.. However, at the start of the new millennium, with its fossil resources largely in decline, Pennsylvania's economic development lies not in these polluting resources of the 18th and 19th centuries, or in continuing to import oil and natural gas, but in harnessing the state's own renewable resources.

Pennsylvania is blessed with a number of renewable resources, several of which have begun to be developed. Hydropower, biomass, wind and solar are the primary four. Each has its own characteristics, cost of production, and benefits. This paper summarizes the attributes of solar energy and estimates their potential benefits for Pennsylvania.

Economic Development and Job Creation

Solar energy is growing at the rate of 43 % per year worldwide. Solar energy can be harnessed using various technologies for a number of applications, which generally include solar thermal for water and space heating, and solar photovoltaics (PV) for generating electricity.

On an energy capacity basis, solar photovoltaics (PV), employs more workers than other renewables.¹

Table 1: Labor Requirements for Renewable Energy Technologies in the U.S.

Technology	Model Project Scale	Person Years per MW
Solar PV	2 kW systems	35.5
Wind	37.5 MW	4.8
Biomass Co-Firing	100-750 MW	3.8 – 21.8

¹ Renewable Energy Policy Project, *The Work that Goes into Renewable Energy*, REPP No. 13, November 2001, p. 3.

While there have been several central generating solar PV plants in western states, it is far more likely that Pennsylvania’s solar resource will be developed as distributed generation, at or near its end use. Pennsylvania’s only solar PV manufacturing facility, Ebara Solar is currently a research and development facility rather than a large scale manufacturing facility. Thus the system design and installation jobs will be more important than manufacturing jobs, at least in the short term. However, in neighboring states of Ohio, Delaware, Virginia, and New Jersey, solar PV manufacturing facilities are rapidly growing to keep up with national and international demand.

Wind and PV offer 40% more jobs per dollar than coal. While labor intensity for renewables may drop due to economies of scale and technological change, sharp declines in coal mining are expected to continue. In 1918, there were 330,000 jobs in coal mining in Pennsylvania²; by 2002, the number had fallen to 7,663.³

A renewable portfolio standard (RPS) with a very modest requirement for solar PV would create 8,946 jobs in Pennsylvania by 2010 even without manufacturing in the state. These jobs will be local jobs, typically employing electricians, builders, engineers and other contractors to design, install and service solar systems throughout the state. If even a single module factory were to locate in Pennsylvania, this would mean an additional 50 manufacturing jobs.

If Pennsylvania were to adopt the same solar “set-aside” that has been incorporated into the RPS in New Jersey, it would result in the following level of solar power generation in the state:

Table 2: Solar Generation in Pa. under an RPS Requirement

Year	Annual Consumption in Pa. (MWh)	Total RPS		Solar Set-Aside RPS		
		%	(MWh)	%	(MWh)	PV Capacity (MW)
2005	146,355,183	2.5%	3,658,880	0.012%	17,563	17.6
2006	148,550,510	3.0%	4,456,515	0.030%	44,565	44.6
2007	150,778,768	3.5%	5,277,257	0.055%	82,928	82.9
2008	153,040,449	4.0%	6,121,618	0.095%	145,388	145.4
2009	155,336,056	4.5%	6,990,123	0.160%	248,538	248.5
2010	157,666,097	5.0%	7,883,305	0.160%	252,266	252.3

² Edmunds, W. E., *Coal in Pennsylvania*, Pennsylvania Geological Survey, 2002. Available at <http://pittsburgh.about.com/gi/dynamic/offsite.htm?site=http%3A%2F%2Fwww.dcnr.state.pa.us%2Ftopogeo%2Feducation%2Fcoal%2Fes7.pdf>

³U.S. Department of Energy, Energy Information Administration data. Available at <http://www.eia.doe.gov/cneaf/coal/page/acr/table19.html>.

Environmental and Health Benefits

PV is the cleanest renewable energy resource⁴, with the lowest emissions of any commercially available technology. PV scores the highest in public preferences for electricity sources, scoring higher than natural gas, hydropower and even wind power.⁵ Solar power creates no hazards or barriers to birds, fish or other wildlife. It is also silent, which can be an advantage in situations requiring backup power such as hospitals and banks.

The clean air benefits from incorporating solar energy into a Pennsylvania RPS would be very significant. By 2010 the emissions offsets statewide would be:

Pollution Reduction		
CO2	800,347.4	tons
VOC	21,363.7	lbs
NOx	3,480,700	lbs
CO	147,172.1	lbs
SO2	1,2426,550	lbs
Particulates (P10)	150,337.1	lbs
Mercury	29,286.46	grams

Peak Load Reduction

In the PJM power pool, the price for all units of energy traded through the pool is set on an hourly basis by the market clearing bid price for the last unit of generation bid in to serve demand. As demand rises, the total revenue received by all generators rises. Thus the value of demand reduction from the perspective of ratepayers is not just the market piece. It is the market price plus the increase in the bid price multiplied by all other generators except the last unit.

Load reduction is a critical tool to insure affordable electricity costs for all customers. When consumption is reduced, particularly during peak periods, the market price for electricity is reduced for all consumers. As demand rises, particularly in peak periods, the price of energy rises relatively rapidly. Solar PV generates a large fraction of its energy during summer on-peak periods, increasing its market value by approximately 33% over that of baseload power.⁶ The value of load reduction during summer peak

⁴ Power Scorecard, www.powerscorecard.org.

⁵ Consumer survey by National Conference of State Legislature and the National Association of Regulatory Utility Commissioners, January 1998.

⁶ Mid Atlantic States Cost Curve Analysis, JBS Energy Inc., Dec. 2000.

hours is almost 25 cents per kWh – 4.6 times the market price of power. During summer mid-peak hours, the value is 8.2 cents/kWh. In periods of higher heat such as the summer of 2002, the value of load reduction is higher, reaching 46 cents/kWh for peak and 14 cents for mid peak.

While specific values will vary depending on the level of demand, and the addition of other new generation, it will always be the case that “demand reduction (and solar PV generation) has a value to society on the order of more than twice the market price of power during most hours of the year, and that it rises to being three to eight times as valuable as the increased market price during the 10% of hours closest to the peak.

It is clearly in the best interest of society to spend money and send price signals beyond the market price to encourage energy efficiency and load shifting, particularly during the summer peak. Distributed photovoltaic generation, with its relatively strong correlation with peak loads, could be particularly important in this regard.”⁷

Increased Reliability and Security

Another of PV’s attributes is its ability to increase system reliability and to enhance security for the end user. PV systems with battery back up can provide power for critical loads when the grid itself is down, as a result of storms, blackouts or other events. For customers such as hospitals, police, financial institutions, communications centers and others, back up power is essential. Currently backup is usually provided through the use of diesel generators. Not only is diesel polluting, noisy and highly flammable, it is also less reliable than solar PV. The value of increased reliability will depend greatly on the end user, but can easily run as high as \$1 million per hour.

⁷ *Ibid.*