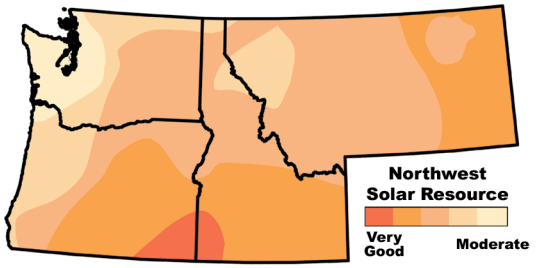
Solar Power

Renewable Northwest Project



SOLAR ENERGY IN THE NORTHWEST	
Total potential supply	> 30,900 average MW
Resource type	variable, predictable
Capacity factor	16–30%
Construction lead time	0–2 years
Real levelized cost (2006$)	
direct thermal	3–13 ¢/kWh*
photovoltaics	20-60 ¢/kWh*

** Levelized costs exclude incentives*
Sources: see endnote 1

The Basics

Solar energy technologies convert the sun's light into usable electricity or heat. Solar energy systems can be divided into two major categories: photovoltaic and thermal. Photovoltaic cells produce electricity directly, while solar thermal systems produce heat for buildings, industrial processes or domestic hot water. Thermal systems can also generate electricity by operating heat engines or by producing steam to spin electric turbines. Solar energy systems have no fuel costs, so most of their cost comes from the original investment in the equipment. The total installed costs of solar applications vary depending on the type of financing used. Solar photovoltaics generally range from $6-$10 per watt installed, or $12,000-$30,000 for a typical 2-3 kilowatt residential-scale system. A solar hot water system sized for a typical home is much cheaper and costs between $3,500 and $8,000 depending on the size and type of the system (above prices exclude any incentives or rebates).[2]

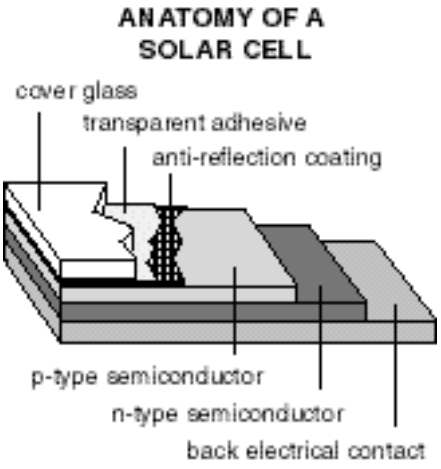
Resource Potential

The Northwest receives more than enough sunlight to meet our entire energy needs for the foreseeable future. As the map above illustrates, the Northwest's highest potential is in southeastern Oregon and southern Idaho; however, there are no "bad" solar sites—even the rainiest parts of the Northwest receive almost half as much solar energy as the deserts of California and Arizona, and they receive more than Germany, which has made itself a solar energy leader.

Photovoltaic Cells

Photovoltaics (PVs) convert sunlight directly into electricity, using semiconductors made from silicon or other materials. Photovoltaic modules mounted on homes in the Northwest can produce electricity at a levelized cost of 20-60 cents per kilowatt-hour (kWh) before incentives. Incentives can bring the levelized cost down considerably to 10-20 cents per kWh.[3]

PVs generate power on a much smaller scale than traditional utility power plants, so they can often provide high-value electricity exactly where and when it is needed. PVs are often the best choice for supplying power for remote, "off-grid" sites or in situations where the transmission or distribution system would otherwise need to be upgraded in order to meet peak demands. Distribution line extensions of more than half a mile are generally more expensive than investing in a PV system for a typical home.[4]



"The Northwest receives more than enough sunlight to meet our entire energy needs for the foreseeable future."

Other cost-effective PV applications include building-integrated power generation, meeting high summer demand for electricity (e.g., air conditioning), pumping water, lighting signs and powering equipment used for communications, safety or signaling.

Prices for photovoltaics are falling as markets expand. Solar PV demand has grown consistently by 20-25% per year over the past 20 years while solar cell prices fell from $27 per watt of capacity in 1982 to less than $4 per watt today.[5]

Direct Thermal

Direct-use thermal systems are usually located on individual buildings, where they use solar energy directly as a source of heat. The most common systems use sunlight to heat water for houses or swimming pools, or use collector systems or passive solar architecture to heat living and working spaces. These systems can replace electric heating for as little as three cents per kilowatt-hour, and utility and state incentives reduce the costs even further in some cases.

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Environmental Impacts

Solar power is an extremely clean way to generate electricity. There are no air emissions associated with the operation of solar modules or direct application technologies. Residential-scale passive construction, photovoltaic, solar water heating, and other direct applications reduce power generation from traditional sources and the associated environmental impacts.

Net Metering

Utilities in all four Northwestern states offer net metering programs, which make it easy for customers to install solar electric systems at their homes or businesses. In a net metering program, customers feed extra power generated by their solar equipment during the day into the utility's electrical grid for distribution to other customers. Then, at night or other times when the customer needs more power than their system generates, the building draws power back from the utility grid.

Net metering allows customers to install solar equipment without the need for expensive storage systems, and without wasting extra power generated when sunlight is at its peak. Such programs also provide a simple, standardized way for customers to use solar systems while retaining access to utility-supplied power.

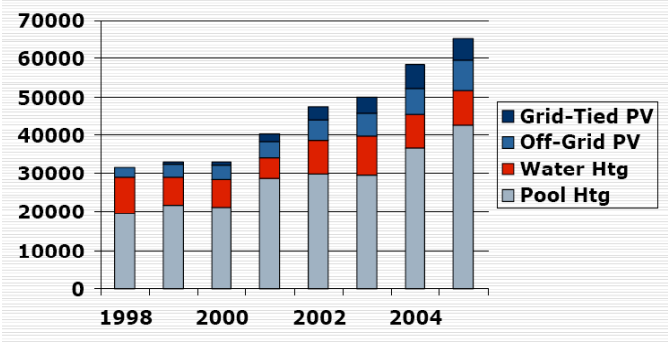
In most net metering programs, the utility installs a special 'dual-reading' meter at the customers building which keeps track of both energy consumed by the building, and energy generated by the solar array. The customer is billed only for the net amount of electricity that they draw from the utility, effectively receiving the utility's full retail price for the electricity they generated themselves.

Net metering is available from utilities throughout Oregon and Washington, and law requires most Montana utilities to offer it as well. Additionally, Idaho Power and Rocky Mountain Power offer net metering in Idaho in accord with a Public Utilities Commission rule.

Incentive Programs in the NW

Every state in the Northwest offers incentives for solar energy development. Oregon, Idaho and Montana all offer low-interest loans and substantial tax credits for solar systems bought by businesses, individuals or governments. Washington now offers a production incentive of $0.15/kilowatt-hour or more for electricity from solar energy, depending on where the technology was manufactured. Montana and Oregon also exempt solar systems from property tax assessment, while Idaho and Washington exempt solar system purchases from sales taxes. Many local utilities and regional organizations also provide incentives. For example, the Energy Trust of Oregon offers additional rebates and loans to customers of Oregon's two largest utilities and many utilities offer additional rebates, loans, or production incentives for solar energy systems.[7]

Annual U.S. Solar Installations by Technology



Source: Interstate Renewable Energy Council [6]

More Information

National Renewable Energy Laboratory: www.nrel.gov/

American Solar Energy Society: www.ases.org/

SolarBuzz: Portal to the World of Solar Energy: www.solarbuzz.com/

DSIRE: Database of State Incentives for Renewable Energy: www.dsireusa.org/

Sources and Notes:

[1] Solar potential from *Renewable Energy Atlas of the West*, Land and Water Fund of the Rockies, et al. (July 2002). As-Levelized costs of PVs from "Solar Electricity Global Benchmark Price Indices", SolarBuzz, (Sept. 2006), http://www.solarbuzz.com/SolarIndices.htm, accessed 9/20/06.
-Levelized costs of solar thermal from "Solar Energy Systems for the Million Solar Roofs Initiative," NWPCC (June 1998). 1998 prices adjusted for inflation.

[2] PV costs from, *Get Your Power from the Sun: A Consumers Guide*, US Dept. of Energy, Office of Energy Efficiency and Renewable Energy (Dec. 2003).
-Solar hot water costs from *Oregon Solar Thermal Market Characterization,* Energy Trust of Oregon (ETO) (May 2004) and "Solar Programs – Homeowners Fact Sheet", ETO (Aug. 2006).

[3] Levelized costs from SolarBuzz, *op. cit.* note 1.

[4] Line extension costs from Bill Edmonds, PacifiCorp, (June 1999). Comparison to solar assumes 13% efficient panels and 4 kWh/m^2, 1.5 kWa load, $7,000/kWp installed cost for modules and batteries and 6¢/kWh retail price for electricity.

[5] PV Demand from "Solar Energy Growth" SolarBuzz (2006), http://www.solarbuzz.com/StatsGrowth.htm, accessed 9/20/06.
Prices from "Solar Energy Costs and Prices", SolarBuzz (2006), http://www.solarbuzz.com/StatsCosts.htm, accessed 9/20/06.

[6] Graphic from "U.S. Solar Marketing Trends" (presentation), Larry Sherwood, Interstate Renewable Energy Council, delivered at SOLAR2006 (July 2006).

[7] For a full list of incentives, see the DSIRE database listed above.