Solar Power
FACT SHEET

"The Northwest receives more than enough sunlight to meet its entire annual power needs."

SOLAR ENERGY RESOURCES IN THE NORTHWEST	
Total potential supply	> 200,000 average MW
Resource type	intermittent, predictable
Capacity factor	16–30%
Construction lead time	0–2 years
Real levelized cost (1998$)	
direct thermal	2–13 ¢/kWh
rooftop photovoltaics	17–21 ¢/kWh

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: electric 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 produce electricity by operating heat engines or by boiling steam to spin electric turbines. Solar energy systems have no fuel costs, so most of their cost comes from the income needed to pay back the original investment in the equipment. The costs of solar applications vary depending on the type of financing used and the relative availability of solar radiation.

Resource Potential

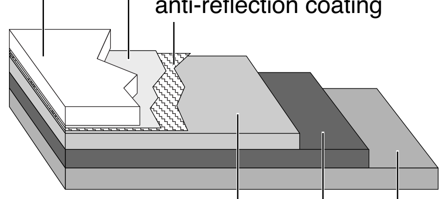
In the Northwest, solar energy offers more potential than any other renewable resource; in fact, the region receives more than enough sunlight to meet its entire annual power needs. As the map to the right illustrates, the Northwest's highest potential is in southeastern Oregon and southern Idaho; however, 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.[2]

Photovoltaic Cells

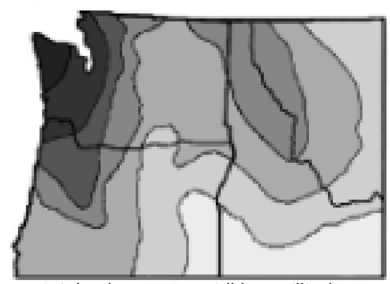
Photovoltaics (PVs) convert sunlight directly into electricity, using semiconductors made from silicon or other materials. Photovoltaic modules mounted on homes in the Northwest can produce electricity at a real levelized cost of 17 to 21 cents per kilowatt-hour (kWh)[3].

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.

ANATOMY OF A SOLAR CELL



DISTRIBUTION OF SUNLIGHT



total solar energy striking a tilted, south-facing surface (kWh/m@/day)

source: U.S. Dept. of Energy

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. Between 1975 and 1998, sales volume for PV modules grew by an average of 21 percent per year, while real prices fell from $80 to less than $4 per watt of capacity.[4]

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 2 cents per kilowatt-hour, and utility and state incentives reduce the costs even further in some cases.

Renewable Northwest Project • 917 SW Oak St., Ste. 303, Portland, OR 97205 • Phone (503) 223-4544, Fax (503) 223-4554 • www.rnp.org

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 land use impacts from typical utility generation, transmission and distribution.[5]

Net Metering

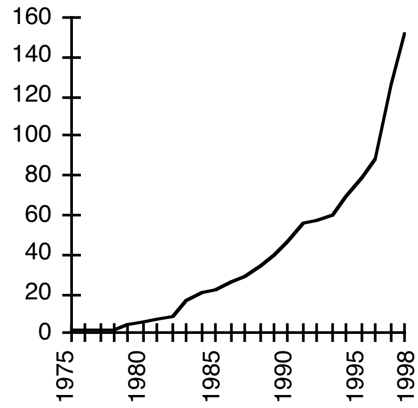
Utilities in all four Northwestern states offer net metering programs, which make it easy for customers to install solar electric systems at their homes or businesses. In a net metering program, customers feed extra power generated by their solar equipment during the day into the utility's electrical 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.

Most net metering programs keep track of power generation and consumption using only the electric meter already connected to the customer's building; the meter literally runs backward when power is being fed from the solar system into the grid, and then runs forward again when power is drawn from the utility grid. 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. Some utilities may even go further, such as Orcas

WORLDWIDE PHOTOVOLTAIC MANUFACTURING

(megawatts)



source: Worldwatch Institute

Power and Light in North Puget Sound, Washington, which offers customers a half cent above the retail price for power they generate.

Net metering works well with the latest generation of PV systems, which have sophisticated electronic power controls. Modern PV systems provide electricity exactly matched to the utility's voltage and frequency, and they shut off automatically when the utility power supply fails, so they pose no risk to electric line repair crews.

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

Incentive Programs in the Northwest

Every state in the Northwest offers incentives for solar energy development. Oregon and Idaho offer low-interest loans and substantial tax credits for solar systems bought by businesses, individuals or governments. Oregon and Washington offer technical assistance for setting up solar systems, and Montana and Oregon exempt non-commercial solar systems from property tax assessment. Many local utilities also provide incentives. For example, some Oregon utilities offer technical assistance, no-interest loans and cash discounts for solar water heating systems; the Washington State University Energy Extension offers a 25 percent rebate for off-grid solar systems; the City of Olympia offers one for on-grid systems; and the Okanagan electric co-op sells solar systems to customers at cost.

---

[1] Power supply estimate assumes use of 1% of NW land area, with 13% efficient panels and 4 kWh/m^2 average insolation. Construction time from *Fourth Northwest Conservation and Electric Power Plan,* Northwest Power Planning Council (NWPPC), 1998, appendix FSO. Real levelized cost of energy for PV and direct thermal based on capital cost, O&M, annual output and project life given in "Solar Energy Systems for the Million Solar Roofs Initiative," NWPPC, June 1998, assuming 6.5% after-tax cost of capital and 2.5% general inflation. Estimates do not include tax incentives or property taxes.

[2] NWPPC *Power Plan, op. cit.* note 1. Germany's sunlight from *How the Northwest Can Lead an Energy Revolution,* Atmosphere Alliance, 6/98, pg. 7.

[3] "Real levelized cost" is a common way of comparing electricity from different sources. All expected costs for the project—including equipment, finance charges, maintenance and fuel—are corrected for inflation, amortized over the life of the project and divided by the amount of electricity that will be produced each year. Real levelized cost estimates are somewhat lower than actual average costs because they factor out the effect of inflation.

[4] Line extension costs from Bill Edmonds, PacifiCorp, 6/99. Comparison to solar based on project parameters in note 1, assuming 1.5 kWa load, $7,000/kWp installed cost for modules and batteries and 6¢/kWh retail price for electricity. Other cost-effective uses from *Photovoltaics: Advancing Toward the Millenium,* National Renewable Energy Laboratory, 1996. Sales volume and prices from Worldwatch Institute.

[5] NWPPC, *op. cit.* note 1.