Alternative Energy Cost Comparisons

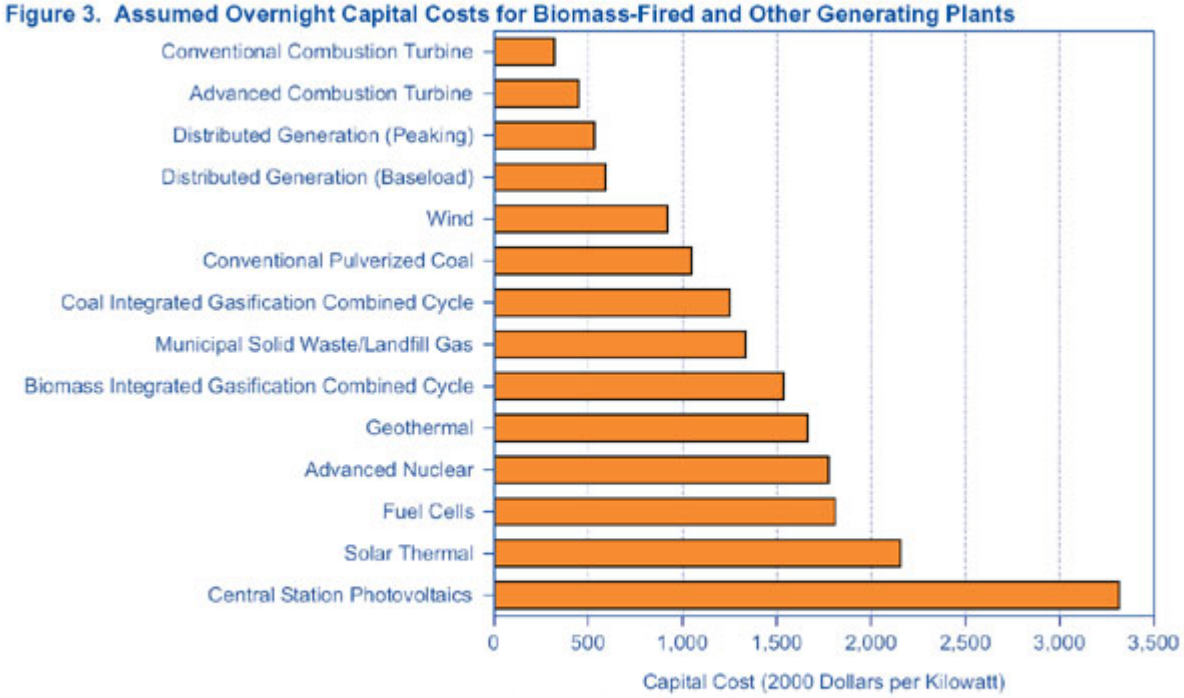
For more detailed description of alternative energy sources and costs see US DOE Web site : http://www.eia.doe.gov/oiaf/aeo/assumption/pdf/renewable.pdf

Energy Source	Typical Installation Size	Cost per kilowatt peak and per kilowatt hour*
Solar Energy (Photovoltaic's)	1-100 kilowatts	$6-10,000 per kWp or 20-40 cents per kWh
Micro turbines	30-300 kilowatts	Not available
Fuel cells	1-200 kilowatts	$3-4,000 per kWp or 10-15 cents per kWh
Wind Turbines	10 kilowatt -2 Megawatt	$1500-$3000 KWp 5-10 cents per kWh (lower numbers associated with larger Wind Farms).
Biomass generator	1- 1 megawatt–multi mW	$1500-$1800 per kWp 5-10 cents per kWh
Wave / Tidal turbine	1- 500 kilowatts	Not available
Internal combustion engines	50 kilowatt to 5 Megawatt	$400-900 per KWp
Central Power Generation	500-3000 Megawatt	$500-1000 per kWp or 3-5 cents per kWh

Source: http://www.solarbuzz.com/DistributedGeneration.htm

Cost by technology

Figure 3. Assumed Overnight Capital Costs for Biomass-Fired and Other Generating Plants



Note: Costs do not include contingencies, technological optimism, or regional multipliers.
Source: Energy Information Administration, *Assumptions to the Annual Energy Outlook 2002*, DOE/EIA-0554(2002) (Washington, DC, December 2001), web site www.eia.doe.gov/oiaf/aeo/assumption/index.html.

Source: http://www.eia.doe.gov/oiaf/analysispaper/biomass/figure_3.html

Comparative Table

Evaluation	Solar Thermal	PV	Hydro	Wind	OTEC	Tidal	GEO
Capital Costs	Large	Large	Enormous	Moderate	Enormous+	Enormous	Small
Operating Costs	Moderate	Moderate	Negligible	Small	Unknown	Negligible	Small
Efficiency	15%	5--10%	80%	42%	7% +	25%	100%
Renewable	Yes	Yes	Yes	Erratic	Yes	Yes	NO
Storage	Not Needed	Unclear	Built-IN	Essential	Not Needed	Unclear	Not Needed
Pollution	None Really	Waste Heat	None	Visual	None	None	Steam Plumes
Levelized Costs	25 cents KWH	16 cents KWH	4 cents KWH	4.5 cents KWH	Unknown	Unknown	Low
Environmental Impact	Moderate	Large	Enormous	Small	Unknown	Outrageous	Small
Large Scale	Too Expensive	Possible but Expensive	Proven already	Very Possible	The Solution	Discrete Locations	Discrete Locations
Small Scale	NO	Difficult	Low Head --> Legal	Definitely	NO	NO	NO

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National Renewable Energy Laboratory

Learning About Renewable Energy and Energy Efficiency

Renewable Energy Basics

The United States currently relies heavily on coal, oil, and natural gas for its energy. Fossil fuels are *nonrenewable*, that is, they draw on finite resources that will eventually dwindle, becoming too expensive or too environmentally damaging to retrieve. In contrast, *renewable energy* resources—such as wind and solar energy—are constantly replenished and will never run out.

Solar

Most renewable energy comes either directly or indirectly from the sun. Sunlight, or solar energy, can be used directly for heating and lighting homes and other buildings, for generating electricity, and for hot water heating, solar cooling, and a variety of commercial and industrial uses.

Wind

The sun's heat also drives the winds, whose energy is captured with wind turbines. Then, the winds and the sun's heat cause water to evaporate. When this water vapor turns into rain or snow and flows downhill into rivers or streams, its energy can be captured using hydropower.

Biomass

Along with the rain and snow, sunlight causes plants to grow. The organic matter that makes up those plants is known as biomass. Biomass can be used to produce electricity, transportation fuels, or chemicals. The use of biomass for any of these purposes is called biomass energy.

Hydrogen

Hydrogen also can be found in many organic compounds, as well as water. It's the most abundant element on the Earth. But it doesn't occur naturally as a gas. It's always combined with other elements, such as with oxygen to make water. Once separated from another element, hydrogen can be burned as a fuel or converted into electricity.

Geothermal

Not all renewable energy resources come from the sun. Geothermal energy taps the Earth's internal heat for a variety of uses, including electric power production, and the heating and cooling of buildings. And the energy of the ocean's tides comes from the gravitational pull of the moon and the sun upon the Earth.

Ocean

The ocean can produce thermal energy from the sun's heat and mechanical energy from the tides and waves. NREL does not conduct research in ocean thermal energy or ocean mechanical energy. See the U.S. Department of Energy's Consumer Guide Web site for basic information ocean energy.

Hydropower

Flowing water creates energy that can be captured and turned into electricity. This is called hydroelectric power or hydropower. NREL doesn't perform any research in hydroelectric power technologies. For more information on hydroelectric power, see the Hydropower Basics from the U.S. Department of Energy's Wind and Hydropower Technologies Program.

Source: http://www.nrel.gov/learning/re_basics.html