

The Economics of Renewable Energy

Economic considerations should not be the only basis upon which energy policy is based. However, they cannot be ignored. Since renewable energy sources are used to generate electricity, comparisons are made by comparing the cost of electricity generated using various energy sources. It is necessary to conduct an analysis that includes the cost to build the facility, the cost to operate and maintain it, and the cost of any fuel that must be purchased. We call such analyses *levelized cost analyses*. They are estimates, not facts, and the results depend greatly on the assumptions input at the beginning (for instance, interest rates or the cost of fuel over the period of the study). Levelized cost analyses are the accepted basis for trying to compare the costs of various types of electricity generation.

Historically, the price of hydroelectric power has been cheapest, then geothermal, coal, natural gas, and nuclear. Wind and solar power have been more expensive, due to inefficiencies and high capital costs. Over the last 30 years, however, the cost of both has fallen to a small fraction of what it used to be. Meanwhile, hydrocarbon prices have increased. Thus, the economics of renewable energy have improved, and they continue to change every day.

The most recent levelized cost analysis that I found came from the California Energy Commission. The cost estimates for some common generating technologies were:

Levelized Costs of Various Generating Technologies:ⁱ

<u>Plant type</u>	<u>Cost (¢/kWh)</u>	<u>Plant Type</u>	<u>Cost (¢/kWh)</u>
Hydroelectric (in conduit) ⁱⁱ	4.57	Geothermal	6.21
Wind	6.72	Nuclear	10.39 ⁱⁱⁱ
IGCC	10.63	Hydroelectric (small)	11.81
Solar Trough	28.14	Conventional	46.85
Solar Photovoltaic	69.56	Ocean Wave	83.76

Costs are in cents per kilowatt-hour. IGCC = Integrated Gasification Combined Cycle.

These are estimates for California, where renewable energy resources are of a higher quality than those in Missouri. With that said, the above table suggests that three types of renewable energy—hydroelectric, geothermal, and wind—may already be cost effective when all factors are considered. Given the problems associated with both coal and nuclear power, Missouri may want to do everything possible to maximize exploitation of hydroelectric, geothermal, and wind power before turning to nuclear and coal-fired generating stations.

It is difficult to retroactively estimate the cost of passive solar schemes integrated into thoughtful design at the time of construction. They are thought to be one of the most cost effective ways to save energy, however. For instance, in a tour of the LEED Platinum Alberici Building, John Alberici stated that the green features of the building saved enough energy to return 14% on their cost each year. Other kinds of solar schemes are more expensive. Despite the huge size of the solar energy resource, more progress needs to be made before it is truly cost competitive for most people. Government support of efforts to attain that goal should be an important part of our energy policy.

ⁱ Data in the table is from *Levelized cost of electricity generation by resource type*. California Energy Commission. Retrieved 1/15/2008 at www.ca.gov/electricity/levelized_costs.html.

ⁱⁱ Hydroelectric in conduit means hydroelectric generators placed in existing aqueducts, culverts, etc. Several systems in California pipe water long distances from the mountains to the coastal cities or central agricultural valley. The idea is to use this water to generate electricity.

ⁱⁱⁱ It is not known whether the cost of decommissioning a nuclear plant, or of storing nuclear waste, was included in the analysis. If not, one would need to increase the estimated cost to account for those factors.