

COMPARATIVE EVALUATION OF SOLAR POWER GENERATION OPTIONS: A USER'S PERSPECTIVE

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For those of us working in the area of renewable power generation, it is often necessary for us to compare renewable technologies with one another and/or with more conventional sources of power generation. In fact, once a technology has demonstrated the ability to produce electricity, there are only three questions that U. S. utility resource planners and dispatchers ask in their evaluation of whether or not to consider adding it to their particular mix of power-generation options.

1. What is the cost of the power?
2. Will the system readily interface with the grid?
3. Are there any constraints on the dispatchability of the power?

In this paper, we address the first of these questions: that is, the cost of generating electrical power. The approach that is used is to calculate the levelized busbar energy cost(1) i.e.

$$LEC = \frac{FCR * CI_{pv} + OM + FL}{CF_a * C_{apr} * 8760}$$

where LEC is the levelized busbar energy cost
 FCR is the annualized fixed charge rate
 CI_{pv} is the capital investment to install the plant
 OM is the annualized cost of operation and maintainence
 FL is the annualized cost of fuel
 CF_a is the attained capacity factor, i.e., the ratio of the average yearly load to the rated system capacity
 C_{apr} is the rated system capacity (Note: CF_a* C_{apr} is the annual system energy output and 8760 is the number of hours in a year)

In this paper, we use the LEC methodology to compare the costs of energy produced with solar, wind, pv, and conventional power sources. We also review and discuss the sensitivity of these costs to such variables as the capital cost of the system, the capacity factor, hybridization, and the cost of externalities.

Reference

- (1) The Cost of Energy from Utility-Woned Solar Electric Systems, J. W. Doane, et.al, Jet Propulsion Laboratory, JPL 5040-29, ERDA/JPL1012-76/3, June 1976.