GreenMountain Engineering Research Note, October 2005

Advancing Solar's Environmental Benefits: A Life-Cycle Analysis

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In order to identify opportunities for minimizing the environmental impact of solar electric power, we examined a variety of common materials and designs. We used an economy-wide life-cycle approach to capture full supply-chain effects, from feedstock to disposal or re-use. Results indicate that when better technology choices are made, ecological burdens can be reduced while increasing economic value. Specifically, **this study confirms and quantifies the environmental benefits of photovoltaics. At the same time, the study indicates that certain easily-implemented design and material choices are environmentally preferable to others.**

Compared to conventional power generation (as defined by the current U.S. energy mix), a standard (non-environmentally-optimized) photovoltaic system provides significant environmental and social benefits:

- It reduces global-warming gas emissions (grams CO_2 equivalent) by a factor of six (6);
- It reduces the environmental and social costs passed on to society by a factor of ten (10);
- It promotes three to five (3-5) times more new jobs per watt installed capacity.

However, solar energy industry participants at each step of the supply chain can provide even greater environmental benefits by selecting certain economically-competitive and widely-available materials and designs. In particular, we recommend that the industry whenever feasible:

- For raw material, *use solar-grade feedstock* to reduce embodied energy content;
- During cell production, *choose rapid thermal processing* to reduce energy use;
- When making modules, *use advanced encapsulants* to extend panels' useful life;
- When designing systems, *connect to the grid* to avoid batteries;
- When siting systems, *integrate them into architechure* to reduce balance-of-system hardware;
- Finally, *make installation part of new construction* to make implementation more efficient.

To Learn More

This Research Note summarizes a GreenMountain Engineering White Paper available for download at:
http://www.GreenMountainEngineering.com/news.htm

About GreenMountain Engineering

GreenMountain Engineering, LLC is the leading consulting firm specializing in clean energy products and manufacturing equipment. GreenMountain develops innovative electromechanical systems from concept through production. The firm's solar power practice--with clients such as Evergreen Solar and Miasolé--encompasses the entire supply chain, from novel techniques for processing wafers and manufacturing cells to novel designs of photovoltaic modules, consumer products and industrial applications.