

## Objections

One thermodynamic criticism is often made of renewable sources – by anti-environmentalists, and even environmentalists such as George Monbiot. Renewable energy can never match the economy of concentrated hydrocarbons they argue; there may be a lot of it, but it is too sparsely distributed. This overlooks the fact that a great deal of effort in our society is spent to distribute them in non-concentrated, decentralized forms.

For example the electric grid is used to take the output of large electric plants and distribute them a few kilowatt-hours a time to multiple users. Similarly gas utilities distribute gas for heating and cooling. Filling stations distribute refined petroleum in the form of gasoline and diesel fuel to multiple cars and trucks. It would be a lot easier to produce energy in a distributed manner for distributed use, and concentrate it for the few (mostly industrial) cases where we need huge quantities of energy in a small space.

Renewable critics also point out how many square miles would have to be covered with solar cells to supply all our electricity, let alone all of our energy. There are a lot of reasons PV cells may not be presently able to supply a large percent of our energy - but lack of land to put them on is not one of them. Solar cells on rooftops, south walls, and parking lots alone could supply a lot more electricity than the U.S. uses. So could U.S. roads. There are some arguments worth considering against doing this (yet). Lack of environmentally sound places to put solar cells is not one of them.

In general land use arguments against renewables don't make sense. For one thing solar and wind don't actually use more land than many of our other sources. For instance, according to the DOE, a concentrating solar thermal plant would require less than 10% of the land consumed by the Grand Coulee Dam to produce the same amount of electricity<sup>320</sup>. Similarly, if land destroyed by mining is taken into consideration, CSP also uses around the same amount of land that coal plants do<sup>321</sup>. PV, even when not installed on rooftops and other existing human built structures consumes less land than CSP. Wind uses more land than solar, but uses it more lightly. Overall it does not seem that there is a reasonable land density argument to be made against solar and wind.

What about storage techniques such as pumped storage? Pumped storage to hold ten hours average consumption at today's rate would require less than 4,000 square miles compared to the 43,600 miles currently used to generate hydroelectricity, or the 92,600 consumed by all the dams in the NID inventory<sup>322</sup>.

Another argument is that a lot of the proposals are already being carried out to some extent without solving the problem; that does not invalidate the fact that if carried through completely they can save or produce a great deal of energy. What we need to exceed is not our best current operating procedures, but our current average efficiency. If comprehensive adaptation of a widely used technique can raise that average high enough, then so much the better.

## End Notes

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<sup>320</sup>U.S. Department of Energy - Energy Efficiency and Renewable Energy, *Solar FAQs— Concentrating Solar Power* — ALL. 8/Feb 2007, 18/Jan/2008  
[http://www.eere.energy.gov/solar/cfm/faqs/third\\_level.cfm/name=Concentrating%20Solar%20Power/cat=ALL#Q84](http://www.eere.energy.gov/solar/cfm/faqs/third_level.cfm/name=Concentrating%20Solar%20Power/cat=ALL#Q84)

<sup>321</sup> According to the DOE, coal plants consume slightly more land than CSP.  
Ibid 320

According to an in depth 1984 study, CSP uses slightly more land than coa.  
Byron A. Miller and Martin J. Pasqualetti, "Land Requirements for the Solar and Coal Options," *The Geographical Journal* 150, no. 2 (Jul 1984): 192-212.

Given that solar energy has made a lot of progress since 1984, it seems likely that Miller and Pasqualetti were right when their study was complete, and the DOE is correct today.

<sup>322</sup> U.S. Army Corps of Engineers, "National Inventory of Dams", Feb 2005, 27-Jun-2007  
<<http://edcftp.cr.usgs.gov/pub/data/nationalatlas/dams00x020.tar.gz>>.