

### **Heat of the Sun: Solar Thermal Electricity**

Solar energy has even more potential than wind to produce electricity. Enough solar energy strikes the surface of the earth every 40 minutes to produce all power consumed for a year<sup>278</sup>.

Solar thermal power plants currently produce electricity for ~11 cents per kWh<sup>279</sup>, by using concentrating mirrors to produce heat to drive turbines. (The principle is the same as setting a bit of paper on fire with a magnifying glass.). Because heat is cheaper to store than electricity, the heat from the concentrators may be stored at \$35 per kWh<sup>280</sup>. 16 hours storage makes the electricity fully dispatchable, allows plants to operate at about 65% of nameplate capacity, and (at the price mentioned) adds around 1 cent per kWh over the first twenty years of plant life. If you assume around a half cent per kWh additional O&M for the storage facility, this gives us a price ~12.5 cents per kWh – expensive, but less than hydrogen, flow batteries, or new nuclear plants for the same capability.

There is a major consortium who believes that the combination of simply mass producing the mirrors on a large scale, combined with using waste heat from the engines to produce water and air conditioning, would lower this price to between 3 and 5 cents per kWh<sup>281</sup>. Reliability is about 70%. (Solar thermal requires more storage than wind. An obvious cause is that night happens continuously 12 or so hours out of every 24. In addition, unlike wind, solar power from deserts does not provide access to widely differing sites. Extreme cloudy weather (especially multi-day extreme cloudy weather) will probably happen at the same time on differing sites.

## End Notes

---

<sup>278</sup> Ken Zweibel, James Mason, and Vasilis Fthenakis, "A Solar Grand Plan,". *Scientific American* Jan 2008, By 2050 Solar Power Could End U.S. Dependence on Foreign Oil and Slash Greenhouse Gas Emissions, 18/Jan/2008 <<http://www.sciam.com/article.cfm?id=a-solar-grand-plan>>.

<sup>279</sup> Otis Port, "Power From The Sunbaked Desert | Solar Generators May Be a Hot Source of Plentiful Electricity,". *Business Week* 12/Sep 2005: SCIENCE & TECHNOLOGY, The McGraw-Hill Companies Inc, 14/Oct/2005 <[http://www.businessweek.com/magazine/content/05\\_37/b3950067\\_mz018.htm](http://www.businessweek.com/magazine/content/05_37/b3950067_mz018.htm)>.

<sup>280</sup> National Renewable Energy Laboratory (NREL), *NREL: Concentrating Solar Power Research - Parabolic-Trough Thermal Energy Storage Technology*. National Renewable Energy Laboratory (NREL), 26/Mar/2005 <[http://www.nrel.gov/csp/thermal\\_storage\\_tech.html](http://www.nrel.gov/csp/thermal_storage_tech.html)>.

<sup>281</sup> Gerhard Knies, *Deserts as Sustainable Powerhouses and Inexhaustible Waterworks for the World*, Sep-2006). Sep 2006. *Trans-Mediterranean Renewable Energy Cooperation - (Formed by The Club of Rome, The Hamburg Climate Protection Foundation, and the National Energy Research Center of Jordan)*, 3/Jan/2007 <<http://www.trecers.net/downloads/GCREADER.pdf>>.