



# Global Highlights

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## Energy & the Environment

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### Unleashing the solar revolution: let the Sunshine in!

- Electricity is one of the most advanced forms of energy. It supplies 20% of the final energy needs of the world's population and this percentage is expected to grow as electrification rates rise and electric devices become more widespread along with the addition of new uses of electricity, like fuelling vehicles.<sup>1</sup>
- Worldwide electric power production burns 70% of all the coal supplied at the global scale and 40% of the natural gas, releasing more than 10 Giga-tones of CO<sub>2</sub> to the atmosphere every year (40% of the carbon emissions attributed to the energy sector). Both the need to stop global warming and the fact that fossil energies are depleting fast are already forcing the power sector to adopt a more renewable and decarbonised model.<sup>2</sup>
- In the long run, solar energy appears as the ultimate solution due to its huge energy potential (it could cover the world's entire electricity needs by making use of only 1% of the world's desert areas). At the moment, there are two main technologies that can generate electricity from the sunlight: **Photovoltaic Cells** (PVs or solar cells), which convert sunlight directly into electricity by relying on expensive technologies and materials (such as pure silicon), and **Concentrating Solar Power** (CSP), a large-scale, centralized power production technology which concentrates the sunlight with mirrors to generate heat that is used to produce steam-generated electricity. Solar cells are suitable for off-grid applications (meaning that no additional investments in transmission or distribution are needed) but even if technological advances and economies of scale have cut in half the cost of the solar cells in the last thirty years, the electricity produced remains very expensive (200-400USD per MWh compared to 50USD/MWh for conventional power). CSP is less costly (with costs around 170 USD/MWh) but plants must be located in deserts (requiring huge investments in transmission and distribution networks).
- High cost and low conversion rates (typically around 15%), have made solar to lag behind wind power. However, this could [change in the near future](#) as the installed capacity for solar cells increases (in fact it is expected that it could be multiplied by a factor of 5 by 2010) and the research efforts towards increasing the efficiency and reducing the costs of solar cells start yielding results. Different alternatives are being explored, from reducing the use of current materials, to using new ones -like cadmium telluride- or including concentrators. In the last months some discoveries have been announced that look very promising. Among them, there is a new concentrator developed by MIT professor [Marc Baldo](#), which can convert twice as much energy from sunlight as a conventional solar cell; or the use of nanomaterials by MIT professor Emanuel [Sachs](#) to reshape the surface of the silicon cells, increasing their efficiency by 27%. Similarly, a new solar cell has been developed by researchers at Spain's [CSIC](#), composed of a nanostructure capable of increasing the conversion rate of the new cell by 30% at the same cost as a conventional cell.
- Another key problem of making solar energy a dominant source of electricity is its intermittency and the impossibility of storing large amounts of energy at a competitive cost (CSP plants can incorporate some form of storage but at a low scale and high costs). However, this might no longer be the case. A group of researchers led by MIT professor [Daniel Nocera](#) have recently developed a new catalyst which can produce hydrogen in a cost competitive way by using solar energy to power the reactions (so far existing suitable catalysts were too expensive or used extremely rare materials). All in all, it seems that the unleashing of the solar revolution might be close to one decade away.

<sup>1</sup> See our [Global Highlights](#) of May 30th 2008.

<sup>2</sup> See our [Global Highlights](#) of July 11th 2008