Diabologic: Energy 2008

by Frank Dolinar

I discussed the Large Hadron Collider (LHC), which was about to go through its initial tests, in my September 2008 article. Physicists need such an enormous and complex device because of the energies needed to perform the experiments they are attempting. The researchers at the LHC apparently have available all the energy needed to power these experiments, and will for the foreseeable future.

Elsewhere, however, energy needs are increasing and costs are rising. Energy vendors – most notably of late, oil companies – are generating bigger profits, in large part because of the relatively static supply and increasing demand. Billions of dollars, euros, and yen (as well as Yuan and Rupee) find their way to oil producing countries. Developed countries complain about the direction of the cash flow.

The current financial rollercoaster and protracted political season has led to much talk about generating more energy and "fixing" the economy. Republicans want to drill for oil everywhere: offshore, in national parks, in the arctic tundra. Democrats have a broader vision, which includes biomass, wind farms as far as the eye can see, the possibility of new nuclear plants, and gives a passing reference to solar. There is also a proposal that would require all vehicles sold in the US to be engineered for Flex fuel.

Each proposal has some merit. Proponents tend to see their proposal as the only one worth pursuing. We will more likely need parts of all of them in the short term, with the mix changing over time as new and better technologies become available. For a number of reasons, we need to start now – with current technologies – making the transition away from energy generation that requires burning of fossil fuels.

Personally, I think that the long-term prospects for solar offer amazing benefits. Few people seem to give solar more than a passing mention. Perhaps no one yet understands the implications of recent changes in solar energy generation and fuel cell technology. Or perhaps it's the difficulty of billing on the basis of the number of sunbeams used. Solar energy generation is rapidly becoming cost effective with other energy generation technologies. Here's what I've seen coming along in the last three years or so.

- January 2006 – Researchers at the University of Toronto have discovered a way to make photovoltaic (pV) solar cells react to infrared radiation… with 5 times the energy content of visible light.
- December 2006 – the US Department of Energy announced a mechanism for concentrating sunlight to get a record 40% energy conversion. The previous record was 8%.
- December 2006 – Researchers at the University of Tokyo developed a nanoscale photoconductor that is an insulator in the dark but generate an electrical current under UV or visible light.
- April 2007 – Dr. Wayne Campbell at Massey University in New Zealand took a cue from nature and developed a range of colored dyes for use in dye-sensitized solar cells. These are being incorporated into not-so-ordinary window glass to generate electricity for buildings – at about a 10th of the cost of current silicon-based photo-electric solar cells.
- Late 2007 – NanoSolar, in California, is manufacturing rolls of pV roofing material via a proprietary process that makes it possible to produce 100x thinner solar cells 100x faster.
- April 2008 – Researchers at the University of Washington studying solar cell configurations discovered that by using a design based on the structure of a popcorn ball (tiny spheres grouped into bigger porous spheres) the efficiency of cheap solar cells was more than doubled.
- June 2008 – Researchers at Penn State have built a solar cell that can harvest hydrogen directly from water, mimicking photosynthesis and providing a clean and inexpensive way to produce hydrogen for the fuel cell car in your future.
- March 2008 – A team from the University of Wisconsin-Madison and University of Maryland (UM) team has developed a new nano-structured platinum/ruthenium catalyst that operates at room temperature and paves the way for more efficient hydrogen fuel-cell vehicles.
- October 2008 – MIT spin-off SyOnyx has developed a way to force sulphur atoms into silicon to create a material called "black silicon" that is 100 to 500 times more sensitive to light than conventional silicon in visible light and the infrared spectrums. Expected applications include more efficient photovoltaic cells and more sensitive detectors for medical imaging, surveillance satellites, and digital cameras.

These few examples strongly suggest that solar energy has a bright future… and just in time.

