



Overseer's Undercurrent The Evolution of Energy Markets II: Challenges and Opportunities

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I'm hot on the trail of a fantastic new renewable energy technology that promises to harness natural processes, eliminate the environmental problems associated with fossil-fuel combustion, and deliver utility-grade power at a cost cheaper than hydroelectricity.

What could it be? Geothermal, landfill gas? They've all been tried. The next generation of concentrated solar collectors or frictionless wind turbines? Or perhaps some form of wave or tidal power? Methane recovery from cows?

Not even close.

From a breathless news release issued this week by Alternate Energy Holdings, Inc. (AEHI), I've learned that scientists have successfully developed a prototype "mobile lightning farm." Yes, claims the release, "AEHI is able to harness the natural energy delivered in a bolt of lightning . . . by collecting power from the ground area surrounding a lightning strike and converting it into usable electricity to be sold through existing power grids."

AEHI believes that lightning captured in this manner will produce electricity at half a cent per kilowatt-hour, and the capital investment will pay for itself in four to seven years.

Ben Franklin would be overjoyed.

All we need to do is to complete a mobile full-scale lightning farm that will go into field testing during the upcoming peak lightning season. Then, it should be a relatively simple matter to predict when and where lightning will strike, position the mobile unit for maximum exposure to the elements, capture and contain the instantaneous energy without blowing up the truck, convert it into alternating current, connect to the nearest transmission tower, sign a power-purchase agreement with the local utility, apply for federal production tax credits, obtain financing from Goldman Sachs, and watch the paychecks come rolling in whenever storm clouds roll by.

Better invest now. This could be your fleeting opportunity to get in at ground level for the hottest, cleanest, cheapest energy tech play of the 21st century!

Something tells me we've entered the "gee whiz" phase of the current energy crisis - defined as the time coinciding with near-record oil prices, when any and every new concept for energy production appears cost-effective and not nearly so crazy as it will after tomorrow's hangover.

That's not to say that we won't realize innovations that could change the energy business in fundamental ways. It wasn't all that long ago when wind, solar, and geothermal were "alternative" energy sources, or that programmable controls or super-efficient lighting were closer to science fiction than to reality. But even now, in most places, these technologies face difficulties in winning widespread adoption, seamless interconnection with the grid, or the complete confidence of the utility, financial, and regulatory community.

I cannot predict what the breakthrough technology of the new millennium will be, but I can try to outline some of the forces that will dictate where and how money gets invested, lay out what some of the greatest challenges are, and perhaps identify some of the less intermittent energy market opportunities (certainly less fleeting than lightning strikes) that smart energy professionals may be able to capture and harness.

Water: Nearly 20 percent of all the electricity consumed in California is associated with water capture, conveyance, irrigation, purification, or processing. Conversely, the power system depends on water, whether for hydroelectricity or for cooling thermal generation units. But we are in an era when other environmental considerations could trump power. River and wilderness restoration efforts - whether on the Klamath, San Joaquin, or Merced rivers - could well dictate dam removal.

Tearing down San Francisco's O'Shaughnessy Dam to restore Hetch Hetchy Valley would not only alter a century of water use and rights patterns but also take out some 300 MW of power production - although neither strikes me as the wisest move.

Desalination has long been on the drawing boards in California, but it is on the verge of becoming cost-effective, practical, and maybe even necessary. Desal requires a great deal of energy, which explains why many proposed plants are adjacent to power stations. But the state's new policy to ban once-through cooling at coastal generators is already threatening the symbiotic relationship between energy and desal projects at Moss Landing, Carlsbad, and other sites.

Global warming/climate change: It doesn't really matter if you believe in all the "parade of horrors" that are being predicted as a result of climate change, or whether human activity is their cause or possible prevention. Containing greenhouse gas emissions has become the single filter through which all of California's energy and environmental policies now flow. The passage of landmark legislation this year will dictate utility resource procurement, land use, and investment patterns for decades to come. It will determine what new technologies are allowed to enter the market, and it will probably cause developers outside the state to change their plans to build conventional coal plants. As other regions and maybe even the federal government come to terms with the issue, we could see profound changes in how we produce and use electricity.

Nuclear resurgence: Although California will not see new nuclear facilities unless and until there is a final solution for waste (storage or reprocessing), we can count on increased pressure to maintain and extend the life of existing plants. The nuclear industry is seizing the moment everywhere else, it seems, and at last count the Nuclear Regulatory Commission has received notices of intent for some 30 new

units and has approved license extensions for 44 existing units, with about three dozen other extension applications pending or expected. And surprisingly, the public at large seems OK with the idea. What we don't know is exactly what technology will be employed for the new generation of nukes, where these plants will go, or how they will be paid for. Oh, yes, and the waste still needs to go somewhere.

Innovation and investment: The influx of new money and ideas into the energy sector has the potential to completely change the rules of the game for investors, producers, and consumers (Circuit, Oct. 6 and June 2, 2006). I can easily imagine how a breakthrough in battery technologies meant to improve cell phones and laptops could translate into improvements in electric automobiles and maybe even energy storage to solve the intermittency problem. There are entrepreneurs who readily see how ethanol will give way to biodiesel, and that the same cellulosic feedstock for transportation fuels could also be cracked, manipulated, or genetically engineered into a whole range of products that will alleviate our petroleum dependence.

The caveats: This is fickle money, looking for big returns and quick exits so it can move on to the next Big Thing. And these people really do not want to get bogged down in the regulatory process or the utility morass.

But the most positive aspect, I think, is that we're seeing a new level of interest in energy and the environment among college students and those even younger. Where five years ago, universities were closing down their electrical engineering programs for lack of interest, there is a move back into the sciences that can be applied to understanding and perhaps solving the climate change dilemma - and energy is a major part of that.

Somewhat like a previous generation whose imagination was captured by ecology, alternative energy, and a desire to change the world, this new blood represents the future. They will be involved for the long haul, and they are the real drivers of whatever energy market we will create.
- Arthur O'Donnell

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