INTERMEDIATE/SECONDARY **ARTICLES: New Technologies**

Increasing Solar Cell Efficiency

The recent focus of research and development in the solar industry is on increasing the efficiency and decreasing the cost of solar cells. A new material is being investigated for its ability to generate electricity from a segment of the solar spectrum that conventional solar cells are unable to use. Conventional solar cells absorb only visible light, which comprises about six percent of the solar radiation available. The ability to tap more of the solar spectrum has the potential to increase solar cell efficiency.

To reach more of the spectrum, researchers are looking at extremely small particles with semiconducting properties called **quantum dots**. Depending on their size, different parts of the infrared spectrum are absorbed by the quantum dots. When the dots are mixed with a polymer that conducts electricity and attached to electrodes, the result is a solar cell with the ability to generate electricity using the **infrared spectrum**. This new solar cell does not move electrons very efficiently yet, but researchers are developing ways to improve electron flow.

The next step for improved solar cell efficiency is to put together a solar cell that can absorb both the visible and infrared spectrum. This pairing could increase a solar cell's efficiency up to 30 percent.

Summarized from the January 22, 2005 edition of Science News.

Power from the Sea

Harnessing the energy of the ocean is a technological nightmare. Tidal power is predictable, but not constant. Wave energy is being used for small-scale applications, but not for meeting the needs of large communities. Corrosive seawater erodes any metal or wire that is used. Fish, mammals, invertebrates, and plants dominate the environment. Yet one company, Florida Hydro, is attempting to master all of these hurdles by developing a system to utilize the energy in ocean currents.

The large, energy rich ocean current known as the Gulf Stream flows between the coast of Florida and the Bahamas. It is here that Florida Hydro and its spin off company, Gulf Stream Energy, is focusing its research, licensing, and patent rights.

A new underwater generator has been developed to harness the energy of flowing water in the ocean. The new style of turbine has two open rings. The outer ring remains stationary, while the inner ring spins as water from the Gulf Stream flows through it. With the center open, these turbines are more "fish-friendly" than generators designed for land use. Florida Hydro anticipates installing as many as 1,000 new turbines in the next ten years to provide electricity from a previously untapped renewable energy source.

For more information, go to ***www.floridahydro.com/Technology.htm*** *and* ***www.popularmechanics.com/science/technology_watch/1288106.html.***

Clean Coal Technologies

Emissions free coal power plants? Is that possible? The scientists working on the FutureGen research project think it is. Funded by the U.S. government and the coal industry, FutureGen is planning to build the world's first zero-emission coal gasification power plant, which will cost an estimated one billion dollars. The FutureGen power plant will produce both electricity and hydrogen.

The U.S. has vast resources of coal, which is a vital component of the mix of energy sources meeting our energy needs, but reducing emissions from coal-fired power plants is imperative. The FutureGen plant will incorporate some of the newest clean coal technologies, including advanced gasifier fuel cells and carbon sequestration. The new gasifiers will convert coal into a gas fuel that can be used to make hydrogen to power fuel cells.

To reduce carbon dioxide emissions, FutureGen scientists are studying geologic formations to determine the potential for permanent storage. To implement this technology, a liquid form of carbon dioxide is injected into a suitable geologic formation, such as an underground salt water reservoir. Injecting the carbon dioxide could also work in combination with enhanced oil and gas recovery systems.

While still in the planning stages, FutureGen has the potential of keeping coal the energy source of choice for generating electricity in the United States for years to come.

For more information, go to ***http://fossil.energy.gov/programs/powersystems/index.html*** *and* ***www.distributedenergy.com/de_0503_clean.html.***