

## **Solar, Wind & Biofuels: Inside Three Green Energies**

### ***Special Report***

The following are three reports covering some of the hottest cleantech sectors: wind, solar, and algae biofuels.

In each section you'll find growth targets for the respective industries, policy guidance, and a few investment recommendations.

#### **Solar**

Of all the energy sources available to us, the Sun is our largest source by far, dropping 970 trillion kWh worth of free energy on us every day. Enough solar energy strikes the United States each day to supply its needs for one and a half years.

Put another way, the amount of solar energy the Earth receives every minute is greater than the amount of energy from fossil fuels the world uses in a year!

Now modern attempts to harvest the sun's energy date back to the 1870s, and the first solar motor company was founded in 1900. The first documented design was a concentrating solar power (CSP) device.

Today, CSP plants have been radically improved. Modern plants usually use huge arrays of parabolic trough mirrors to superheat oil or molten salts, which is then used to drive a turbine. Such designs have two key advantages: They can provide their own power storage and continue operating when the sun goes down; or when the sun isn't shining, they can be switched over to run on natural gas.

Of course, most solar investors will find the bulk of solar opportunities – not in CSP – but in photovoltaics (PV).

PV is what most people think of when talking about solar. This is what you see when you gaze upon solar panels on the roof of a home or building.

From solar cells to panels to ingots – silicon-based PV is where we've seen the most opportunity for investors. Some of the most established PV or PV-related companies include:

- SunPower (NASDAQ:SPWRA)
- JA Solar (NASDAQ:JASO)
- Suntech Power (NYSE:STP)
- Trina Solar (NYSE:TSL)
- Canadian Solar (NASDAQ:CSIQ)
- Solarfun (NASDAQ:SOLF)
- LDK (NYSE:LDK)
- Yingli (NYSE:YGE)
- Renesola (NYSE:SOL)
- Daqo (NYSE:DQ)

Another major player in the solar game is First Solar (NASDAQ:FSLR). But unlike most PV outfits, First Solar's claim to fame is its thin-film solar. Basically, instead of using silicon, First Solar relies on Cadmium Telluride to make a thinner, cheaper panel. And while the company's technology doesn't offer up as much in the way of efficiency as your basic, silicon-based PV – its cost advantage has enabled the company to fly.

Today, there are a number of new thin film developers looking to knock First Solar from its perch. And there are some that may be able to pull this off. We'll continue to follow these firms at Green Chip Stocks.

#### **Wind**

Of all forms of renewable energy, wind will likely provide more power generation than anything else.

In the United States, 20 percent of our power generation will come from wind by 2030/2035. And globally, we could see 20 percent by as soon as 2025.

But the big picture for investors is manufacturing. And while Europe took the early lead, and growth trends are explosive for the United States, it will be China that provides the bulk of the world's wind turbines going forward.

Sure, there are still opportunities with companies like GE (NYSE:GE), Vestas (PK:VWDRY), and Siemens (NYSE:SI). But Chinese wind turbine manufacturers are quickly gaining market share.

In fact, they've already started, and really have no choice if they want to reach their very aggressive renewable energy goals.

Today, Sinovel is China's biggest wind turbine player. Although it doesn't trade domestically, you can indirectly play the company's momentum with American Superconductor (NASDAQ: AMSC). American Superconductor provides specialty components for Sinovel. To date, the company has more than \$100 million in component contracts with Sinovel.

### Investing in Algae Biofuel

Hundreds of millions of years ago, the earth was covered with shallow oceans filled with algae and other simple critters.

As landmasses shifted and grew, water was displaced, leaving thick masses of algal residue that were eventually buried and compressed.

Skip forward a few eons, throw in some heat and pressure and ta-da! Oil.

Then, in 1859, Colonel Drake drilled the first oil well in Titusville, PA, unleashing not only oil. . . but an economic juggernaut that would dictate our way of life for years to come.

The world began to use oil for everything from fuel to waterproofing, and since then has consumed over a trillion barrels. With such furious consumption – and no way to make more – world oil reserves are set to dwindle.

Essentially, we're going to deplete in less than 300 years what took hundreds of millions of years to form. And with the depletion of oil, alternatives are destined to emerge.

And, ironically, algae is one of them.

### Biofuel Bliss

Research like that being done at the Colorado State University's (CSU) Engines and Energy Conservation Laboratory and the University of New Hampshire (UNH), suggests that algae could supply enough fuel to meet all of America's transportation needs in the form of biodiesel.

That's right . . . all of it!

Whereas with our current biodiesel feedstocks, like soy and palm, there's no way we could grow enough to supply all of our transportation needs.

In fact, it would actually require twice the land area of the US devoted to soybean production to meet current heating and transportation needs.

That's a lot of beans!

Algae, on the other hand, could supply all U.S. diesel power using a mere 0.2% of the nation's land.

In fact, enough algae can be grown to replace all transportation fuels in the U.S. on only 15,000 square miles or 9.6 million acres of land.

That's about the size of Maryland.

Granted, that still may sound like a lot. But consider that we now use 938 million acres for farmland in the US.

I'd show you a pie chart of how much land would be required for algae growth - but the slice is so tiny, it wouldn't even be visible.

Of course, the question is how the heck can you make so much biodiesel from such a small amount of algae?

Well, let's revert back to ninth grade science class for a moment.

Biofuels are really a form of solar energy. Because crops convert solar energy into chemical energy in a process called. . . Anyone? Anyone?

Photosynthesis!

It's this chemical energy, in the form of oils that we need to produce biofuels.

According to the UNH report, the more efficient a particular plant is at converting solar energy into chemical energy, the better it is from a biofuels perspective.

So in this area, algae is the clear winner.

In fact, algae does this so well that up to 50% of its body weight can be fat, or the oil needed to make biodiesel.

That makes algae the highest-yielding feedstock for biodiesel, producing 24 times more oil per acre, on average, than the next leading feedstock: palm oil at 635 gallons/acre/year.

And some companies have far surpassed the 15,000 gallon per acre accepted benchmark.

In fact, one company can produce **180,000 gallons of biodiesel every year from just one acre of algae**. That comes to about 4,000 barrels, at a cost of \$25 per barrel or \$.59 per gallon.

So, how is this going to be done?

Algae Profits Bloom

It is possible to use human sewage and wastewater from agricultural endeavors to enhance the growth of algae.

In fact, when done right, algae can double and even triple overnight with the addition of these fertilizers.

Compare that to the five-month growing season for soy or canola!

Plus, as algae grows it absorbs Co2 from the air. MIT has even fed emissions from their on-site power plant directly to algae being cultivated for biofuel production.

In addition, fertilizer for other food crops can be produced by using the leftover nutrients that aren't used to make the biofuel.

So let's back up and look at the big picture.

We have the technology right now to cultivate algae that can be used as fuel, using human and animal waste as fertilizer.

This is waste that would otherwise need to be treated or end up in our nation's ground water.

Not a bad deal at all!

Then, after the necessary oils have been extracted from the algae, we use the byproducts (phosphorus and nitrogen) as fertilizer for the food crops that feed the nation— all while extracting CO2 from the air.

That's a beautiful thing.

And that's why we're currently looking at a number of companies . . . some public, some soon to go public . . . that we believe will capitalize in a big, big way on algae.

Of course, we don't plan on making any sudden moves until we see validation on a commercial scale. So we'll keep you updated at Green Chip Stocks.

You can view the HTML version here: [Solar, Wind & Biofuels: Inside Three Green Energies](#)

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