


Algae Corrals Carbon Dioxide

BIOFUELS PRODUCED

By Cary
Bullock

WITH CONTINUED SUPPLY and price volatility in oil and gas markets and an abundance of cheap coal, coal-fired power production is regaining much of the luster it lost to combined-cycle gas generation. But a coal-fired power plant produces about twice the CO₂ emissions of a combined cycle gas plant with the same output.

Perhaps the answer to this dilemma is that we need to look at CO₂ sequestration in an entirely different way. Carbon is the building block of fuel. So why are we wasting it by letting it escape into the atmosphere or spending



Bioreactor tubes containing algae may be able to capture up to 80 percent of a coal-fired generating plant's carbon dioxide emissions during daylight hours..

Source: GreenFuel Technologies

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NEVADA FAULT NUCLEAR STORAGE COSTS

It will cost an extra \$30.8 billion to store nuclear waste at a proposed federal site in Nevada than it would to keep them at current reactor sites, according to a study released by the state of Nevada.

The federal government has said that a high-level waste storage facility at Yucca Mountain would save money.

millions of dollars to bury it in the earth or under the sea? What if instead, we could take those carbon-rich flue gases and recycle them into a continuous supply of clean, renewable fuels. Recent advances in algae bioreactor systems by some innovative new companies are proving that this pipe dream could become a reality in less than two years.

Algae bioreactor technology is simply an improvement on a process that Mother Nature invented millions of years ago called photosynthesis. During photosynthesis, plants recycle CO₂ into energy in the presence of sunlight. One type of plant is particularly adept at this process – algae. A tiny, single-cell plant of several thousand species, algae is so prolific that it is responsible for the vast majority of the Earth's atmosphere.

The fact that algae can recycle carbon into fuel is not a recent discovery. But up until now, nobody could figure out how to accelerate the process to the point at which it could compete with fossil fuel production. Algae bioreactor systems significantly accelerate algae growth, especially when exposed to large quantities of concentrated CO₂ – and what better source for

this CO₂ than power plant stack gases. With virtually no modifications to the power plant, a pipe is simply connected to the post-compliance section of the smokestack where it draws the flue gases into a system of algae bioreactors. Here the CO₂ is absorbed by the algae via photosynthesis. Pilot projects at several utilities indicate that a full-scale deployment of several hundred to more than several thousand acres of algae can recycle as much as 80 percent of a power plant's CO₂ during daylight hours.

But here's the kicker: CO₂ capture is simply icing on the cake. Once the carbon-enriched algae are dewatered, they can be converted into high-quality transportation fuels. The algae biomass contains lipid oils that can be processed into biodiesel, carbohydrates that can be fermented into ethanol, and protein that can be fed back into the boiler as a high-quality fuel to generate green electrons or processed into animal feed and high-value food supplements. None of the algae plant is wasted.

Unlike other fuel crops, algae grow using the poorest quality land and do not require potable water so they

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NRC NEEDS FUNDING

The Nuclear Regulatory Commission is short about \$95 million while it gears up for an expected upturn in applications for new nuclear plants, according to a General Accounting Office report cited by the *Associated Press* and *Amarillo Globe-News*.

Like the power industry, the NRC is expected to soon lose veteran employees. One-third of the agency's workforce is set to retire in three years.

COLORADO SOLAR

Colorado officials have blessed plans to develop a \$60 million solar unit in the southern part of the state that will be one of the largest facilities of its kind.

It will generate up to 8 megawatts, the *Associated Press* reported.

don't compete with food crops. And the algae multiply every few hours which means they can be harvested every day – not just once a year like corn or soybeans. A full-scale commercial deployment at a coal-fired power plant could provide an annual yield of 8,000 gallons of transportation-grade biofuels per acre. That's fifty to a hundred times the annual yield of corn or soybeans.

Of course, the technology still has a way to go to scale to full commercial deployment, and there will undoubtedly be some hurdles along the way. But a handful of forward-thinking, early adopters such as Arizona Public Service, NRG and Sunflower Electric (See Jan./Feb. *EnergyBiz* "Farming for Energy") have already committed to algae pilot projects and are studying plans for commercial-scale deployment at coal-fired assets.

A new report suggests that the United States can achieve a 60 to 80 percent reduction of emissions

through renewable technologies. It is estimated that there are about 1,700 power plants in the U.S. that have enough surrounding land to support a commercial-scale system. But just imagine the impact on our nation's renewable fuel supply if just one large coal-fired plant supported 10,000 acres of algae. That could be 80 million gallons of clean, renewable transportation fuels. Now there's some fuel for thought.



Cary Bullock is chief executive officer of Green-Fuel Technologies.

Push to Consolidate

UTILITIES PURSUE SAVINGS

By Salvatore Salamone

INCREASED DEMANDS TO rein in IT costs combined with the availability of new high-performance servers are leading many utilities to consider server consolidation and virtualization projects.

In fact, the market research firm IDC estimates that more than three-quarters of all companies with 500 or more employees are already deploying virtual servers where software is used to partition a single server (usually a 2- or 4-way x86-based server) to run multiple operating systems and applications on virtual machines.

The benefits are so significant that those who have such projects under way say that 45 percent of new servers purchased this year will be virtualized, according to IDC.

Virtualization has been around for years in mainframe and mini-computer environments. However, it's not been commonly used on Windows and Linux servers. So, why the sudden interest now?

With energy industry CIOs "consolidation does not come up as a separate topic, but it has been brought up as something that they are doing in conjunction with other projects," said the American Gas Association's Jim Linn, who is responsible for Best Practices in Information Technology.

For instance, companies are choosing to consolidate when doing a normal server upgrade or rolling out new applications. There are two reasons: Low server utilization rates and high operating costs.

For years, companies typically deployed each new application on a separate server. This was done because it reduced the possibility of conflicts between applications.

The problem with the one server per application approach is that servers are often underutilized. In 2006 the IT consultancy Gartner found that the average server utilization rate in most companies is 5 to 10 percent and that such rates are the "rule rather than the exception."

This can have great financial consequences since each server, regardless of its utilization rate, incurs labor costs for IT staff to manage, plus there are other costs including power, cooling, software license updates, warranties, and service contracts.