

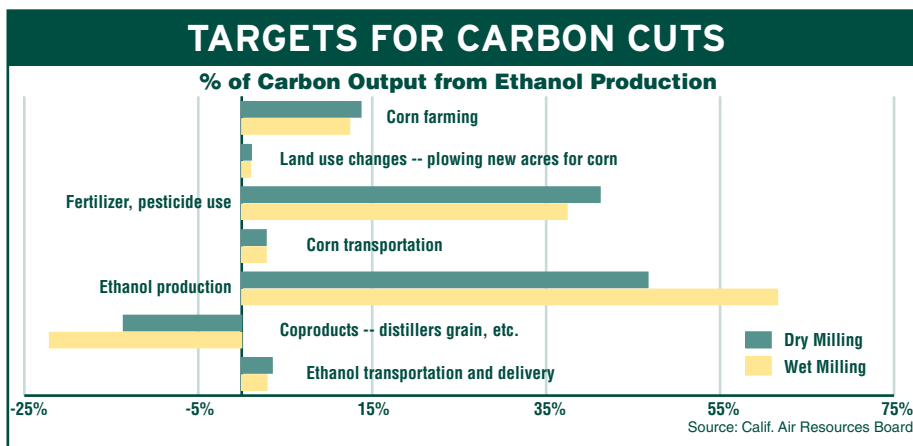
Technology

Ethanol's Push to Slash Carbon Emissions

In light of falling ethanol prices and the bankruptcy of industry giant **VeraSun Energy**, ethanol producers are scrambling to operate more efficiently and reduce their plants' carbon emissions. Survival depends on the ability to accomplish both goals: Winners will increasingly be determined by their ability to attract investment in energy saving and carbon reducing technologies.

With new tough federal and state carbon emission regulations hanging over their heads, once notoriously secretive biofuels producers are suddenly eager to tout their greenhouse gas reducing measures. Otherwise, they fear such efforts won't be fully taken into account by regulators as they grade each facility with a carbon intensity number. These numbers, based on plants' life-cycle greenhouse gas emissions, can make or break individual producers.

New low carbon fuel standards (LCFS) are pending in California and at least 10 other states. The California Air Resources Board says



transportation fuels' overall lifecycle carbon content must be reduced by 10% by 2020. Meanwhile, President-elect Barack Obama is sure to implement a national LCFS as part of his initiative to reduce greenhouse gases. Unfortunately, for corn ethanol, the fuel does little or nothing to help refiners reduce their fuel's greenhouse gas intensity.

Tight capital markets and the overall poor investment climate will complicate efforts to upgrade plants. That spells doom for ethanol plants run by managers with little knowledge or experience in agricultural economics and commodity cycles. As is the case with VeraSun, these facilities will be squeezed out by investors looking for returns on the one side and LCFS rules that will exclude them from critical markets if they don't make new investments in carbon-reducing technologies.

Which types of producers are likely to emerge as winners? Diversified operators, such as **Abengoa** and **Archer Daniels**

Midland [ADM], that can tap income streams from more profitable businesses to invest in new technologies. Another example: Poet, the largest ethanol producer in the U.S., has a novel hybrid ownership model—at least 25% of all its plants are owned by local farmers, giving Poet access to capital from the least leveraged sector of the U.S. economy—agriculture.

Also poised to succeed: the many ethanol plants owned by farmer cooperatives. They have access to what Under Secretary of Agriculture for Rural Development Thomas Dorr characterizes as underutilized capital—the vast amount of untapped equity farmers hold in their land. What's more, many of these co-ops work with firms that aggregate and monetize carbon credits, creating another source of capital that can be reinvested in plants to improve their carbon profiles.

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There are a slew of technologies, processes and practices that can lower corn ethanol's overall lifecycle carbon emissions. These technologies and practices can be applied in the field, during feedstock delivery, in the plant itself, and in the production and delivery of all important coproducts.

In the field, low-till or no-till farming helps reduce carbon emissions. Cutting back on the use of chemicals—from fertilizers to pesticides (which are often produced from fossil fuels)—helps to shrink corn ethanol's carbon footprint. Small producers have an advantage because they generally source corn locally and generate fewer emissions in delivery than larger producers gathering corn from a much wider area.

In facilities: the buzzword is fractionation—a process that extracts many coproducts from a kernel of corn before it's fermented. This leaves only the starch—the source of alcohol—thus reducing the amount of enzymes needed for fermentation and speeding up the process.

Fractionation is already used in the U.S. by Poet. The technique reduces corn to its components— bran, germ and endosperm—and sends only the starch-rich endosperm to the fermenter. The germ is a source of corn oil. The bran can be used as animal feed, burned as a fuel or processed through a separate cellulosic process to produce more ethanol. Each coproduct helps shrink a plant's carbon footprint. Poet has also developed a process for fermenting ethanol that does not require it to be cooked first, saving energy and lowering its overall carbon intensity by as much as 15%.

By far the biggest bang for the buck in terms of reducing a plant's carbon intensity can be achieved by eliminating use of fossil fuels: coal or natural gas. One way worth noting was pioneered by a Nebraska plant, E3 Biofuels. It developed a method to use methane from anaerobic digesters to power the plant. The closed-loop process uses manure from an adjacent feedlot and returns the favor by sending the ethanol plant's wet distillers grain back as cattle feed. Not only does the plant eliminate the need for almost all fossil

fuels, but it also generates carbon credits because the manure no longer decomposes on the field to release one of the more potent greenhouse gases, methane, into the atmosphere.

Another way of substituting renewable methane for natural gas is by tapping into landfills. The naturally occurring methane generated from decomposing garbage is captured and piped to ethanol plants. This technique is being used at a 50 million gallon a year (Mgy) plant in Jackson, Neb., and a 40 Mgy facility in Malta Bend, Mo.

A less sexy but effective way of driving carbon out of the process is to burn wood residues, corn cobs or other agricultural waste—even bran—in boilers to generate the heat needed by ethanol plants. This is being done by **Frontline BioEnergy** in Benson, Minn., to power the 40 Mgy **Chippewa Energy Ethanol Co.** plant. ■

VeraSun's Comeback Plans

VeraSun Energy is trying to regroup. The second-largest ethanol producer in the U.S. filed for bankruptcy protection under Chapter 11 in Delaware on Oct. 31. It plans to continue operating while restructuring.

Repercussions from the filing are being felt throughout the biofuels industry, making already scarce financing all the more difficult to obtain, industry sources say.

VeraSun, based in Sioux Falls, S.D., lists \$3.45 billion in assets and \$1.42 billion in liabilities. It blames softening prices for ethanol and sharp losses on corn hedges for having to seek protection from the bankruptcy court.

Standard & Poor's, a financial rating agency, says VeraSun ran into trouble because of a "lack of liquidity and weak market conditions." Nevertheless, it upgraded its rating for the company's secured bonds slightly, a sign it believes the company will survive. Jeff Broin, CEO of Poet, a rival large ethanol producer, concurs. "They have a solid [reorganization] plan," he says. (See our full interview with Broin on Page 4.)

VeraSun has received commitments for up to \$215 million in new financing and believes it will be able to boost that to a total of \$250 million. Its 14 plants are still producing ethanol, but the company is indefinitely delaying start-up of its 110 million gallons per year Jamesville, Minn. plant, originally slated to go on line next year.

VeraSun isn't the only ethanol company to run into trouble. **Greater Ohio Ethanol** and **Gateway Ethanol** have filed for bankruptcy protection this year and another one that's publicly held, **Pacific Ethanol** [PEIX] of Sacramento, Calif., booked a third quarter loss of \$54.9 million (see *Business Briefs* on Page 6).

The dearth of investment in the biofuels sector comes at a time when it needs to accelerate development of second generation facilities to meet coming government mandates for cellulosic-based biofuels. ■

Kiplinger's Biofuels Market Alert

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Investing

GreenHunter Scours for Biodiesel Bargains

Like a bargain shopper at a flea market, **GreenHunter Energy** [GRH] sees hidden value in abandoned assets that it can turn into profitable renewable energy businesses. Several of its early reclamation projects will soon start adding to its bottom line.

GreenHunter aims to deliver a high return for shareholders by buying industrial sites at deep discounts and economically transforming them into viable operations. The company retrofitted a waste oil recycling facility in Houston into the largest U.S. biodiesel refinery for about 50¢ per gallon of production capacity compared with the more than \$1 a gallon cost to build a new plant, according to Oppenheimer & Co. analyst Joseph Gomes. The firm is spending just \$22 million to buy and refurbish a biomass power plant in El Centro, Calif., that was shuttered in 1994. It's also repairing an existing biomass plant in Telogia, Fla., for about a third of the cost of replacement.

While the company's diversified business model also targets biomass and wind power, biodiesel will be its main driver in the near term. GreenHunter is committed to controlling the entire biodiesel production chain from feedstock sourcing through distribution. Owning the entire process enables the company to capture the \$1 federal biodiesel blending credit and lowers its exposure to commodity price swings. Its pending purchase of L&L Holdings will give it terminals and marine distribution capabilities along the Texas and Louisiana coasts.

Its Houston plant delivered its first shipment of B99 biodiesel (99% biodiesel, 1% petroleum diesel) in late October and is expected to reach full capacity of 105 million gallons per year in the first quarter of 2009. Including L&L Holdings, the company says it could generate overall sales of \$600 million to \$750 million next year consisting of \$250 million from biodiesel pro-

duction, \$350 million from distribution and \$15 million from power generation. William Blair & Co. analyst Mark Miller sees new production turning this year's expected loss of \$1.75 per share into a 2009 profit.

The Houston facility can produce biodiesel from a variety of plant and animal feedstocks, which should improve profitability, according to Miller. The company is developing feedstock supplies of the jatropha plant and researching algae as a potential feedstock.

Once GreenHunter develops a biofuels terminal on a parcel it is leasing near Tampa, Fla., it will have distribution coverage along most of the Gulf Coast to target its most promising market: oil companies operating diesel-powered offshore rigs. "There is no biodiesel offered to the marine market right now, but the trend for diesel usage in the Gulf is up," says Bruce Baughman, senior vice president of engineering and technology for GreenHunter BioFuels.

The ongoing credit crisis is also creating an upward trend in the supply of distressed assets sought by vulture investors like GreenHunter. "I would call this a buyer's market in the various businesses we operate," says GreenHunter spokesman Jack Zedlitz. While buying undervalued assets lowers capital spending, the company is still exposed to commodity risks and a difficult financing environment.

Indicative of the volatile biodiesel market, shares of GreenHunter have seen sharp price swings since going public in January. At a recent \$8.15, the stock is well below its 52-week high of \$25.45. But with biodiesel production ramping up, Oppenheimer & Co's Gomes rates shares a buy with a 12-month price target of \$20. Oppenheimer & Co. provides investment banking services to GreenHunter. ■

		Key Facts for Selected Publicly Traded Companies								Analysts' Recommendations (Total in November/3 months ago)				
							Total Returns %							
Company	Symbol	Share price (as of 11/10/08)	Market value (as of 11/10/08)	Earnings per share (last 4 quarters)	Revenue (last 4 quarters)	P/E ratio*	Past 3 months	Past year	Three-year annualized	Strong buy	Buy	Hold	Underperform	Sell
Archer Daniels Midland Co.	ADM	\$23.57	\$14.5B	\$3.74	\$78.1B	7.0	-10.0	-36.0	-2.7	2/0	3/1	6/7	0/0	0/0
GreenHunter Energy Inc.	GRH	8.15	159.0M	-1.00	1.0M	NM	-49.1	NA	NA	2/1	1/0	2/1	0/0	0/0
Nova Biosource Fuels Inc.	NBF	0.20	21.0M	-0.19	36.7M	NM	-35.5	-92.2	25.6	0/0	1/2	3/5	0/0	0/0
Stepan Company	SCL	34.80	333.0M	2.46	1.6B	13.5	-40.0	11.1	12.9	1/0	0/0	0/1	0/0	0/0

* The P/E ratio is based on the current year's earning estimate
NA = Not Applicable
NM = Not Meaningful

Sources: MorningStar, Thomson One Analytics, Kiplinger

Interview

Broin: Raising Capital for Cellulosic Won't Be Easy

Jeff Broin is president and CEO of Poet, the largest ethanol producer in the U.S. Over 20 years, he has grown the company, formerly called Broin Companies, from a single small plant in Scotland, S.D., to 26 plants with annual production capacity of 1.5 billion gallons. Poet is in the forefront of developing second generation biofuels. With the help of an \$80-million grant from the U.S. Department of Energy (DOE), it's developing a 25 million gallon a year cellulosic facility at its plant in Emmetsburg, Iowa. Along with five other ethanol producers, Broin recently formed a new advocacy organization for ethanol: Growth Energy. The new outfit will encompass the Ethanol Promotion and Information Council, which he founded. Broin is also a member of the board of the American Coalition for Ethanol.

Q. Given the harsh financial climate, how difficult will it be to finance the ramp-up in cellulosic ethanol production to reach the mandated 100 million gallons in 2010 and 250 million gallons in 2011?

A. It is certainly going to be difficult to get the first dollars into this game. We are very appreciative DOE is providing some grants to help these first plants. But again, it is going to cost a lot more than the grant dollars. Poet's plan is to take a facility [Emmetsburg] we already have operating and add cellulosic ethanol to it, allowing us to leverage the operating facility.

Q. In five years—best-case scenario—what do you see production capability for cellulosic ethanol being?

A. Certainly we are going to see a ramp-up. Poet's goal is to be operational in 2011 and from there we would start to build out more facilities in 2012, 2013. We are not the only player in this game. There are others who we hope are successful. It is very difficult to predict how much will be available. We believe we will be able to build out significant capacity, starting in 2012.

Q. Does it make it harder for you to raise capital given what has happened to VeraSun Energy, which has filed for bankruptcy protection?

A. I think capital in general has been really difficult for all industries to obtain in the last year, year and a half, and our industry is definitely feeling the effects. I think that the more successful players, the players that do have the capital, do have income, are able to attain some debt in this situation we are in today.

Q. How do you compare the enzymatic process of making cellulosic with the thermochemical approach?

A. We are using a biological process with enzymes. We think that will be the first successful process. The other process [thermochemical] may take a little bit longer because it is a little more complex. But again we hope everyone is successful. The more cellulosic ethanol we have today or in the future, the better off this country is going to be by decreasing our reliance on foreign sources of energy.

Q. Transportation affects both supply and delivery. How concerned are you about the lagging transportation infrastructure for moving biofuels?

A. Actually, ethanol is less than 1% of the rail traffic in the U.S. We are not having any issue about moving ethanol by rail, although I do believe long term we are going to see pipelines built for ethanol. The capacity issue is going to be [solved by] economics. It will become economic for people to build pipelines. There are several companies looking at that today, and then we will have options. We can either move ethanol by rail or by pipeline. But there is not a shortage of rail capacity today to move ethanol. We haven't seen that at all.

Q. What about moving the feedstocks for cellulosic ethanol, either corncobs or corn stover?

A. All the cellulosic material for Poet's plant will come from very close to the facility, so literally it will come from a 20 to 30 mile radius from around that plant. So it is very similar to trucking grain into the facility. We'll also truck cellulose into the facility on the same roads as we are trucking the grain on, so we don't see any big issues there, either.

Q. Do you see ethanol and renewable fuels as being in the vanguard of the green energy economy?

A. There is only one product today that has the potential to displace significant volumes of oil, and it is ethanol. If you look at the projection of the yield from DuPont and Monsanto, if you look at the projections of the amount of cellulose we have available today, we literally could, over the next 20 years, replace gasoline with ethanol.

I know that is hard for people to believe but I have the hard numbers. We can replace gasoline with ethanol, and I think the oil industry is very nervous about that.

On the Horizon

Emerging Biobutanol

Ethanol's drawbacks are spurring new interest in biobutanol. While ethanol has only 70% of the energy content of gasoline, biobutanol's content is 90%. Moreover, it can be made from biomass and is compatible with pipelines, gasoline pumps and other existing infrastructure.

Commercial quantities of the fuel in the U.S. may be just two or three years away—good news for refineries that must comply with a rapidly approaching federal mandate for advanced biofuels.

Biobutanol may also be able to give ethanol a helping hand. When mixed with ethanol, it can help to lower ethanol's evaporative emissions in gasoline blends and allow the fuel to be shipped through pipelines.

Biobutanol can be blended into gasoline currently at about 12% by volume. **BP** [BP] and **DuPont** [DD] have tested blends of up to 16% and found that they delivered fuel performance similar to 10% ethanol/gasoline blends.

But there are drawbacks. It's not cheap to produce, and it's extremely toxic to the bacteria used to make it.

Still, even with the inherent difficulties of making the fuel, a number of companies are picking up the biobutanol baton. The **BP-DuPont** joint venture is in the lead, but **Cobalt Biofuels**, **Gevo** and **Tetravita Biosciences** are also working on the fuel.

Cobalt Biofuels of Mountain View, Calif., recently raised \$25 million for a pilot plant that it plans to put into operation in 2009.

Gevo, of Englewood, Colo., is partnering with **ICM**, which builds and retrofits biofuels plants, on converting a 1 Mgy corn ethanol plant to an isobutanol plant by next summer. Gevo currently operates a 10,000 gallon a year pilot plant and aims to have a commercial plant in production in the first quarter of 2011. The company is testing feedstocks such as glucose and sugar but hopes to use cellulosic inputs in the future.

Tetravita just closed another round of financing and hopes to move to about an 80 gallon per year scale in the next six months. It's working with a mutant of the bacteria that traditionally produce butanol and is also developing a process that continually removes the butanol as it is made so that it won't kill off the bacteria.

Converting ethanol plants to butanol plants could prove a way to get more biofuels into the gasoline stream since butanol can be blended at higher percentages than ethanol. Though credit markets are tight, advanced biofuels have a better chance of getting funding than ethanol. According to Brian Burris, general counsel for ICM, advanced biofuels are looked at differently since there is still a "how to get there first" mentality. ■

Oil Eyeing Ethanol?

Are oil companies mulling getting involved in the ethanol business? The industry was abuzz recently with talk that **BP** [BP] had been kicking the tires of **VeraSun Energy** before the large ethanol producer filed for Chapter 11 protection last month. And now, sources tell us, it's no longer a stretch to consider that some ethanol producers may be tapped by oil firms to act as subcontractors.

Deep-pocketed oil companies would assume the risk of buying corn. They would then supply the corn to an ethanol refinery that would be paid a set fee for processing it. The oil refiners would take the alcohol fuel leaving the ethanol refinery to market the coproducts, such as distillers dried grain.

Although many ethanol proponents have described this as a deal with the devil, it is seen as a pathway to survival for an industry in which more than a few players are teetering on the edge. Not only did high corn prices take their toll—many producers locked in corn prices higher than they are today—but spot ethanol prices have fallen almost as precipitously as gasoline prices, which are less than half of what they were just this summer.

An ethanol firm signing on to indentured servitude to an oil company would at least keep it in the game. Ethanol producers wouldn't enjoy the exorbitant profits they saw in 2006 when ethanol blew past \$5 per gallon in some markets. But, like a regulated utility, they may be able to enjoy a small, yet steady income.

Oil firms would get more than just a steady source of ethanol. They'd be able to swing their huge weight in corn markets, and influence ethanol markets more directly. ■

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BUSINESS BRIEFS

Monsanto Co. [MON] is taking an interest in sugarcane. The crop company is acquiring Brazilian firm **Aly Participacoes Ltda.**, which operates **CanaVialis**, the world's largest sugarcane breeding company, and **Alellyx**, which develops biotech traits for sugarcane. Monsanto will pay \$290 million for the acquisition.

Syngenta [SYT] is developing sugarcane planting technology in conjunction with **Deere & Co. [DE]**. The technology would reduce the size of sugarcane cuttings used in planting from 11.8 to 15.8 inches to under 1.5 inches, allowing more frequent replanting, which, in turn, eliminates yield degradation and will lead to a 15% yield gain. The smaller cuttings will allow lighter planting equipment, saving fuel costs and reducing planting costs per acre by 15%. The companies hope to begin selling the new technology in 2010 and believe it will have a market potential of \$300 million annually by 2015.

Archer Daniels Midland Co. [ADM] is expanding in Brazil with a joint venture with sugarcane producer **Grupo Cabrera**. They will build two processing complexes that will each have a 3.3 million ton crush capacity, producing about 40 Mgy of ethanol. One of the plants will be located in Limeira do Oeste, Mina Gerais, and will come on line in 2009. The other will be in Jatai, Goias, and will begin producing ethanol in 2010. These projects will each consist of a sugarcane plantation, sugar mill, ethanol plant and biomass-powered cogeneration facility to provide power and steam. Meanwhile, ADM's CEO admitted at a recent shareholder meeting that Brazilian rain forests are being destroyed, but pointed the finger at weak Brazilian regulations and governance.

Magellan Midstream Partners [MMP] tested a B5 blend successfully in its 7.5 mile pipeline between its terminals in Gallena Park and East Houston, Texas. The pipeline doesn't transport jet fuel, so residue from the blend isn't a concern. Next up: a longer test between Houston and Dallas.

Pacific Ethanol [PEIX] took a big hit in its third quarter. The company reported a net loss of \$54.9 million, more than ten times the loss it took in the third quarter last year. Although sales increased 56% over this period last year, highly volatile corn and ethanol prices hurt the producer. Another factor: a noncash asset impairment of \$26.6 million due to suspending construction of the Imperial Valley, Calif. plant.

Also feeling the pinch: The Andersons [ANDE]. Although the ethanol firm's total revenue went up in the third quarter, it wasn't from ethanol. The Anderson's Grain & Ethanol Group's operating income declined by over 30% in the third quarter compared with the same period a year earlier.

A former oil exec will head Range Fuels. David Aldous, former executive vice president of Royal Dutch Shell will take the reins from the cellulosic firm's founding CEO Mitch Mandich, who'll stay on as board director. This isn't the first instance of an oil executive moving into the biofuels realm—in 2006, Patricia Woertz left Chevron to become CEO of Archer Daniels Midland Co. Meanwhile, Range Fuels is building a new plant near Soperton, Ga. The first phase of the wood chip-to-ethanol facility should be completed in late 2009, giving the plant a capacity of 20 Mgy.

Solix Biofuels raised \$10.5 million for its algae pilot plant. In addition to the Series A funding, the company also has an agreement for an additional \$5 million for its pilot plant on the Southern Ute Indian Reservation in southwest Colo. The first phase of the plant should be completed in 12 to 18 months and will consist of four acres of photo-bioreactors to grow algae as well as a laboratory. Phase two will include a five-acre expansion to bring the facility to commercial scale. The Series A funding was led by I2BF Venture Capital and Bohemian Investments and included Valero Energy Corp., Infield Capital and Southern Ute Alternative Energy, which is working with Solix Biofuels to develop the facility.

Air New Zealand will conduct a biofuels test flight on Dec. 3 in Auckland, New Zealand. The jatropha-based fuel comes from **UOP LLC**, a **Honeywell [HON]** company and will be used in a 50% blend in one of four engines. The plane used for the flight will be a New Zealand Air Boeing 747-400 with Rolls-Royce RB211 engines. The flight is part of a joint initiative between Air New Zealand, UOP, **Boeing [BA]** and **Rolls-Royce**.

RESEARCH AND TECH

A possible fuel producing fungus was discovered by Montana State Univ. researchers in a Patagonia rain forest. Testing shows that under limited oxygen the organism produces compounds typically associated with diesel fuel. The Montana State Univ. team will work with researchers from Yale to try and get a better understanding of the fungus' genetic makeup.

Glycerol may be recyclable into another biofuel. Researchers at the Univ. of Oxford have found a way to turn the biodiesel byproduct into a feedstock for methanol. The method cuts out costly processing steps and works at a low temperature and pressure.