U.S. CLEAN TECHNOLOGY

Alternative Fuels Bulletin: Volume 12

In this note, we take a closer look at the next generation biofuels market. We remain bullish on the longer term growth prospects of the biofuels sector. The market for next generation biofuels appears poised to grow rapidly over the next decade, driven primarily by policy mandates, cost and technology improvements. Clean generation sectors such as solar, wind, and geothermal dominated the race for Cleantech investments over the past decade. During the next decade, however, we expect to see significant investment opportunities in the clean transportation sector. CDXS (2-EW), AMRS (Not Covered) and GEVO (Not Covered) are three biofuel companies that should benefit from positive longer term growth trends in the biofuels sector.

Top Alternative Fuels News:

- Although $100 oil is the headline in U.S. newspapers, most refineries that supply fuel to service stations are paying the equivalent of a much higher price -- and those costs are already being felt when consumers fill up their vehicles. *Source: Reuters – March 9th, 2011*
- The United States cannot drill its way out of its energy problems and must begin reforms now to reduce oil dependence, President Barack Obama said, pledging to do all he could to stabilize fuel prices. *Source: Reuters – March 11th, 2011*
- Oil major BP has agreed to buy a Brazilian sugar and ethanol group for $680 million, expanding its presence in the country's biofuels industry in what it said was the largest deal to date for its alternative energy unit. *Source: Reuters – March 11th, 2011*
- The venture capital arm of Google Inc has invested in CoolPlanetBiofuels, a start-up that is developing technology to produce fuel from inedible biomass such as grass and wood chips. This process also produces a byproduct that can capture carbon and also be added to soil to improve crop yields, leading to what Google Ventures described as a "negative carbon fuel." *Source: Reuters – March 18th, 2011*
- Clean Energy Fuels Corp. has signed an agreement with major contract freight carrier Dillon Transport to build, operate and supply an LNG/CNG fueling station on Dillon-owned property in Dallas, Texas. *Source: Clean Energy Fuels – March 18th, 2011*
- Polypore International plans to further expand its Li-ion battery separator capacity for electric drive vehicles with an additional $65 million in capital expenditures, which would represent the fourth automotive-targeted expansion since August 2009. *Source: Green Car Congress – March 16th, 2011*

INDUSTRY UPDATE

U.S. Clean Technology
2-NEUTRAL
Unchanged

U.S. Clean Technology
Vishal Shah
1.212.526.4378
vishal.shah1@barcap.com
BCI, New York

Jake Greenblatt
1.212.526.7726
jake.greenblatt@barcap.com
BCI, New York

Anthony Kit
1.212.526.1887
anthony.kit@barcap.com
BCI, New York

The Dawn of the Clean Transportation Era

Rising oil prices, greater focus on energy security and technological progress of several competing clean transportation technologies lead us to believe that we are about to enter "the second growth phase of the Cleantech era", where clean transportation solutions appear poised to challenge several traditional energy concepts and potentially give rise to the next multibillion dollar market cap companies of the Cleantech sector. Not only do we see the policy outlook for clean transportation sector improving (at least relative to the clean power generation sector), but we also see fundamentals for several clean transportation sectors improving significantly over the next decade or so. High oil prices have a direct correlation to the clean transportation sector in contrast to low natural gas prices, which have a direct (negative) correlation to the clean generation sector. Moreover, we believe most of the technological progress in the generation sector has already been made - FSLR's module costs have decreased from ~$1.40/W to $0.75/W currently and shares are likely discounting ~$0.55-$0.60/W cost by 2013. Most biofuel/battery companies are, however, still only at the very early stages of cost reduction, and we believe street estimates are nowhere close to discounting the technological progress that is potentially likely at several of these companies.

Biofuels 101

Just as in the clean power generation sector where solar, wind, geothermal and other renewables are expected to contribute differently to the overall power generation mix, we expect the clean transportation sector to be dominated by Natural Gas, Biofuels and Electric Vehicles (EVs) – the penetration rate of each of these technologies would be likewise dependent on government policies and availability of local natural resources. We believe biofuels (especially drop-in biofuels) offer the greatest potential to dominate the global transportation fuels mix. About 11 billion gallons of corn-based biofuel (i.e., ethanol) per year are already being produced in the U.S. and selling for $1.50 to $2.50/gal (with a roughly equivalent amount of sugar-cane based ethanol in Brazil, selling for $1.00 to $2.25/gal), representing a $30 billion annual market. We estimate the mandated renewable fuels market in the U.S. has the potential to reach $90 billion at these prices by 2022. The current traditional fuels market is comprised of multiple markets: gasoline, diesel, jet fuel, home heating oil and other specialty markets. We see a significant amount of activity within all of these markets and expect multiple companies to dominate within each segment.

Blend versus Drop-In: The Different Types of Biofuels

Gasoline and diesel are the two most commonly used petroleum-based transportation fuels available today. With the relatively widespread use of ethanol fuels and other emerging biofuel alternatives, it can be somewhat tricky categorizing and differentiating between the types of new fuels in the context of petroleum-based fuels. An important factor to consider, along with feedstock inputs and costs, is whether the biofuel has a blending constraint. In other words, can the biofuel act as a 'drop-in' fuel to directly substitute for conventional fuels? Or will the biofuel act as an additive and be mixed in as a proportion of today's petroleum-based fuels?

For example, ethanol, which includes corn, cellulosic, and sugar-derived, is considered an additive as it must be blended with gasoline to safely power most vehicles. In the U.S., ethanol has a blend wall of 10% in gasoline on a volumetric basis for conventional, non-flex

fuel vehicles. Higher blend concentrations can potentially damage the vehicle's engine and components. However, flex-fuel vehicles, which represent approximately 4% of U.S. vehicles according to the USDA, can run on an ethanol blend of up to 85%.

Biodiesel, on the other hand, does not have the same problems that exist for ethanol biofuels. Biodiesel, which is primarily produced from vegetable oils and animal fats, can be substituted and used as a 'drop-in' fuel for conventional petroleum-based diesel fuel or blended in any amount up to 100%.

Below, we give a broad definition of biofuel products being developed and produced today.

- **Corn Ethanol**: Corn ethanol is the most prevalent type of biofuel available in the United States and represented nearly 10.8 billion gallons out of the 138 billion gallons of gasoline demand in 2009, or 7.8% of the U.S. gasoline consumption. Although economics for corn ethanol are reasonable, it has been heavily debated for its societal impact on the food vs. fuel dilemma.
- **Sugar-Derived Ethanol**: Sugar-derived ethanol's largest market is in Brazil, which aggressively began to use its domestic sugarcane production in the 1970s to become less dependent on oil and the effects of oil price volatility.
- **Cellulosic Ethanol**: The food vs. fuel debate that surrounds corn ethanol has contributed to the need for second generation biofuel feedstocks, which include cellulosic crops that are not widely cultivated or parts of crops that are not edible. Cellulose is a complex carbohydrate that accounts for the majority of the cell wall in plants. Most animals, including humans, cannot digest cellulose, which makes it largely a waste product of crops. For example, cellulosic ethanol can be produced from sugarcane bagasse, which is the fibrous biomass that remains after sugarcane stalks are squeezed for their juice. Fermentation of cellulosic feedstock is also more challenging compared to first generation feedstocks (e.g., corn, sugar from sugarcane) as the cellulose is more difficult to hydrolyze. In addition, different types of yeast must be used to ferment the various complex sugars following the hydrolysis process.
- **Biodiesel:** Biodiesel typically uses animal fats and vegetable oils as feedstocks and has been receiving more attention with algae-based biotechnology applications. Biodiesel is created by combining vegetable oil or animal fat with an alcohol (e.g., ethanol) and a catalyst (e.g., sodium hydroxide or potassium hydroxide). There are a number of vegetable oils that can produce biodiesel, including sunflower oil, soybean oil, palm oil, coconut oil and rapeseed oil. In the U.S., the most common biodiesel feedstock is soybean oil, while in Europe the most common is rapeseed oil. Animal fats, which are generally a by product of meat processing, can also be used to create biodiesel.
- **Biobutanol**: Biobutanol is the bio-based equivalent of petrobutanol, which has longer hydrocarbon chains compared to ethanol biofuels and thus is more similar to conventional gasoline. According to the U.S. Department of Energy, biobutanol can be blended as gasoline in concentrations of up to 11.5% on a volumetric basis. However, some industry participants, such as Butylfuel Inc., claim that biobutanol can be used as 'drop-in' fuel to directly replace gasoline without any modifications to the vehicle.
- **Methanol**: Methanol, also known as wood alcohol, uses natural gas as a feedstock. According to the U.S. Department of Energy, the use of methanol began to decline in the 1990s as it was found to have contaminated ground water. Today, auto manufacturers no longer make vehicles that can support methanol as a fuel.

Next Gen Biofuels - Challenges and Opportunities

The majority of ethanol used today is derived from corn kernels, a form of starchy biomass. During the ethanol production from corn, enzymes are used to convert starches to simple sugars and yeasts are used to ferment sugars into ethanol. Cellulosic biomass also contains sugars, but these sugars are much harder to release than those in starchy biomass. Moreover, the process of releasing sugars results in formation of by-products that inhibit fermentation and some of the sugars from cellulosic biomass are difficult to ferment. Longer term, the DOE estimates that cellulosic ethanol costs can decline to $1.07/gallon, and that this cost point, cellulosic ethanol can become competitive with gasoline.

Ethanol appears to be the current solution, but industry experts see several new/improved chemistries in the market over time. Next generation biofuels offer the flexibility to produce customized chemistries - longer or shorter carbon fuels for different type of applications. For instance, cellulose can be converted into diesel instead of plant oils. This type of characteristic allows for production or different fuels for different applications.

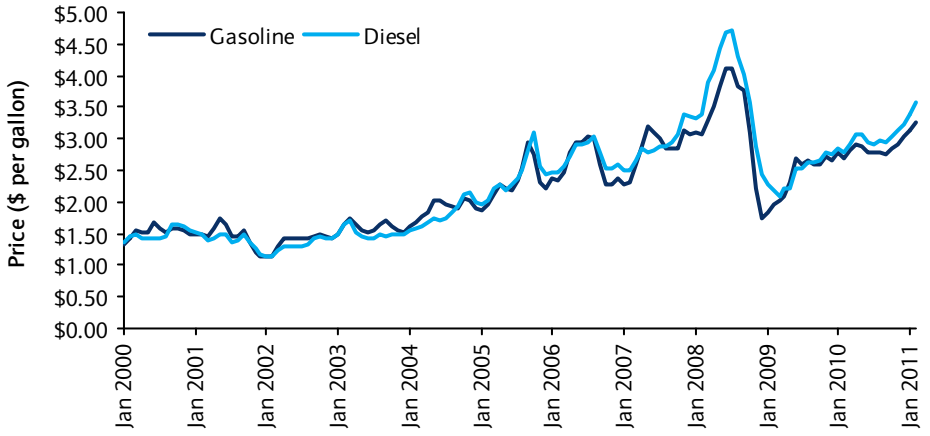
Cost Trends

The costs to produce for ethanol fuels have come down over the years and are now priced relatively competitively with gasoline and diesel prices. With the recent oil price hike due to the Middle East conflicts, the economics for ethanol fuels make even more sense as gasoline and diesel prices approach nearly $3.25 and $3.60 per gallon, respectively, according to the U.S. Department of Energy. We believe improved biocatalysts that can lead to better yield rates, lower capex spending on production facilities, stronger operating expertise, and the higher availability of low cost cellulosic feedstocks can likely keep biofuels price competitive with conventional fuels in the future.

Corn ethanol fuel is currently priced at approximately $2.55 to $2.70 per gallon, depending on the production region. Cellulosic ethanol, on the other hand, is typically more expensive to manufacture as production capacity and economies of scale are still limited. The cost breakdown for corn ethanol is approximately 58% feedstock, 10% capital, 30% operating, and 2% enzyme, while cellulosic ethanol's cost breakdown is 36% feedstocks, 20% capital, 29% operating, and 15% enzymes. Biodiesel fuel is priced at a premium compared to ethanol fuels due to higher production and manufacturing costs. Biodiesel fuel prices typically sell in the range of $3.00 to $4.00 per gallon.

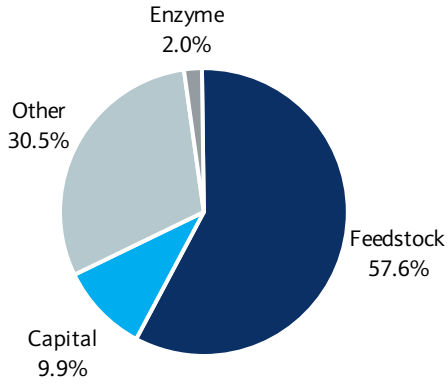
The quest for next generation biofuel production is $1/gallon production cost, which the DOE estimates can be achieved in the 2012-13 timeframe. As of 2007, the cost per gallon of cellulosic ethanol was estimated to be ~$2.65/gallon. Most private companies are in this cost ballpark at small scale production levels currently. One area of near term improvement appears in the development of low cost enzyme solutions - Novozymes for instance recently estimated that the cost of enzymes for cellulosic ethanol production was reduced to ~$0.50/gallon over the past 2 years resulting in total production costs of ~$2/gallon.

Figure 1: Price Trends for Conventional Gasoline and Diesel in the U.S.



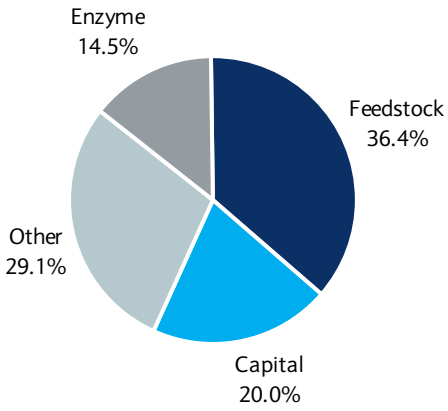
Source: U.S. Department of Energy

Figure 2: Corn Ethanol – Cost Breakdown



Source: USDA

Figure 3: Cellulosic Ethanol – Cost Breakdown



Source: USDA

Multiple Production Approaches: Biochemical, Thermochemical Lead the Way

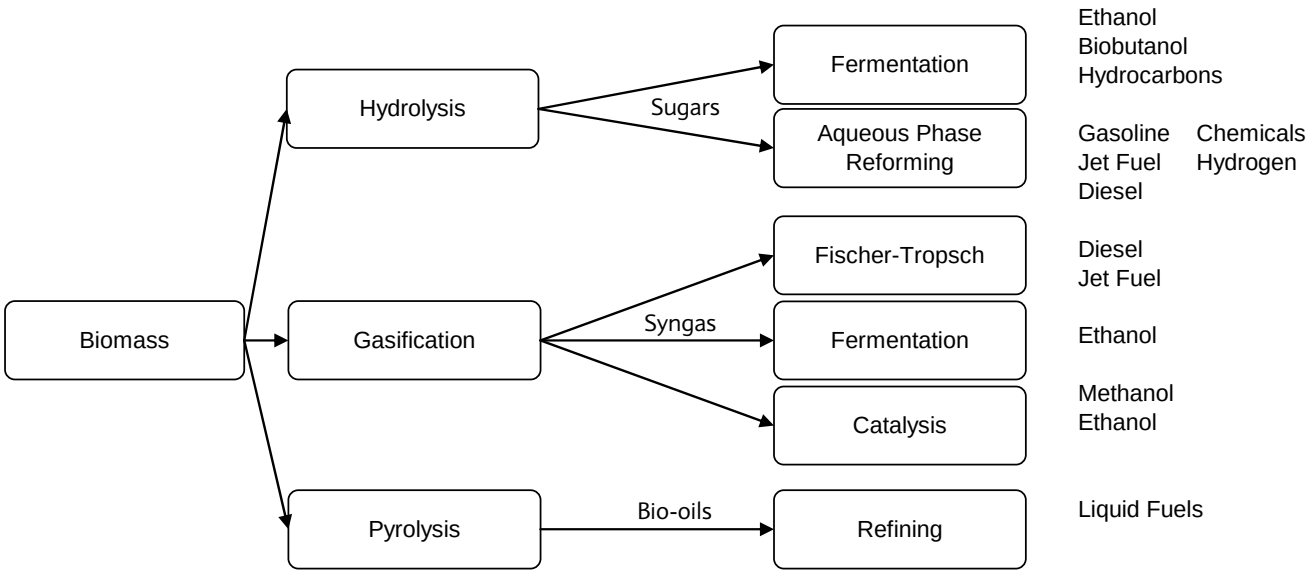
Biofuels are produced from a wide range of biomass resources such as algae, corn kernels, corn stalks, soybean, canola oils, animal fats, prairie grasses and hardwoods. Next generation biofuel companies are currently trying to figure out the best approach to convert biomass into fuel. Cost, capital requirements and feedstock availability are expected to be the three most important factors in determining success or failure of biofuel companies. In general, there are two broad approaches used to produce biofuels from biomass: biochemical conversion and thermochemical conversion. Biochemical processes are currently more popular. The largest currently used biofuel (ethanol) is produced using a biochemical conversion process. We explain the various conversion processes in more detail below:

- **Biochemical process**: Biomass undergoes physical or chemical pre-treatment in order to open up the structure and to separate the sugar containing components: cellulose (6-carbon sugar) and hemicellulose (5-carbon sugar) from the non-sugar lignin (makes up a third of the biomass, other two-thirds are made up of cellulose and hemicellulose). Enzymatic or acid hydrolysis is then used to break down the cellulose into sugars. Sugars are then fermented using either yeast or bacteria in order to produce a dilute solution of ethanol. Diluted ethanol is then distilled to produce fuel-grade concentrated ethanol. How do cellulosic ethanol companies differ? Different companies are experimenting with different combinations of pre treatments, enzymes and acids in order to reduce processing costs.
  - **Fermentation**: Fermentation is the process of converting sugars into ethanol. The fermentation process is caused by bacteria or yeast that breaks down sugar into ethanol and carbon dioxide.
  - **Aqueous Phase Reforming**: In the aqueous phase reforming process, hydrogen is produced from biomass such as glycerol, sugars and sugar alcohols. The reforming process is completed in the liquid phase and creates hydrogen without evaporating water.
- **Thermochemical process**: As the name implies, heat and chemicals are used in high temperature, low oxygen conditions to break biomass. As the biomass breaks down, it releases hydrogen, carbon monoxide, and carbon dioxide, which is collectively known as synthetic gas or syngas. Syngas is not clean - it contains contaminants such as tar and sulfur that interfere with the conversion of syngas into products. Syngas is cleaned, cooled, and either metabolized by bacteria and converted to ethanol or used as a feedstock for Fischer-Tropsch synthesis. Why use this process over biochemical process? Roughly one third of cellulosic biomass (lignin rich area) cannot be easily converted biochemically and hence has to use thermochemical process.
  - **Fischer-Tropsch Synthesis**: The Fischer-Tropsch process is a chemical reaction that converts syngas, which is a mixture of hydrogen, carbon monoxide, and carbon dioxide gases, into liquid hydrocarbons.
  - **Catalysis**: Catalysis is a broad process of introducing a catalyst to accelerate a chemical change in a reaction.

- **Pyrolysis**: Pyrolysis is the process of breaking down biomass by using lower amounts of heat with limited oxygen. This process produces bio oil, which can then be refined to produce various biofuels.
- **Algae conversion**: In this process, special strains of algae are propagated in enclosed bioreactors (tubes, plastic bags, flat tanks) or in large open ponds. Algae have a potentially very high biofuel yield per acre (more than 5,000 gallons per acre). The algae are fed carbon dioxide (CO2), in some cases from nearby heavy CO2 emitters like coal-powered plants, cement kilns, or breweries. The algae are separated from the water by centrifuge or other means and the oil is extracted using a solvent. The oil is then processed into biodiesel, using first-generation technology.
- **Other processes**: Hydroprocessing technology is used to convert animal fats and vegetable oils into a petroleum-equivalent fuel very similar to diesel. Catalytic depolymerization involves the breaking down of feedstock molecules more directly into biomass-based diesel.

It is well understood that biofuels would need to be produced from high-yield non food biomass resources (not corn and sugarcane) in order to achieve the U.S. renewable fuels target of 36 billion gallons in 2022. Fermentation pathways are also known to be a very good solution for producing custom designed hydrocarbons which can be used to make products for high value markets.

Figure 4: Main Pre-Treatment Processes and Pathways for Biofuel Production



Source: USDA

What about Feedstock Supply?

Feedstocks are crops or biomass materials that serve as the preliminary input for biofuel production. Feedstock supply has been considered to be the primary issue impacting the biofuels industry. In the U.S., approximately 35-40% of annual corn crop is expected to be utilized in the manufacture of ethanol. According to estimates from the World Bank, the price of corn has increased to more than $7 per bushel, in part due to higher oil prices.

Feedstocks can be divided broadly into four different generation types.

- **First Generation Feedstocks**: First generation feedstocks are the most prevalent used in the biofuels industry right now. For example, the majority of biofuel production in the U.S. relies on corn feedstocks and sugarcane in Brazil.
- **Second Generation Feedstocks**: Second generation feedstocks are crops that are not widely cultivated for consumption purposes and also generally refers to biomass materials that have more cellulose and lignin substances compared to first generation feedstocks. Cellulose is a complex carbohydrate that accounts for the majority of the cell wall in plants. Most animals, including humans cannot digest cellulose, which makes it largely a waste product of crops. Historically the production of ethanol has used the sugars and starches from crops to create fuels, with the cellulose going unused. However by converting cellulose into sugars, non edible crops, and non digestible parts of crops are able to be converted into biofuels, increasing total fuel supply, without impacting the supply or price of food.
- **Third Generation Feedstocks**: Algae and halophytes are considered to be third generation feedstocks. Halophytes are salt water plants that can grow in relatively harsh conditions. Although this process is relatively new, small scale production so far has indicated promising results in terms of yield, varying in the range of 10,000 to 20,000 gallons per acre each year.
- **Fourth Generation Feedstocks**: According to Greentech Media Research, fourth generation biofuels are produced through advanced biochemistry, hydro processing, or through new technologies such as Joule's Solar to Fuel methodology, which can convert solar energy and CO2 into liquid fuels.

Figure 5: Feedstock Types

First Generation Biofuels	Type	Fuel	Approximate Energy Yield	Energy Metric	Scalability	Energy Efficiency Ratio
Cassava	Starches	Ethanol	955	Gallons per Acre	Slightly Difficult	3.0
Castor Beans	Non-Edible-Oil Plants	Biodiesel	151	Gallons per Acre	Slightly Difficult	3.2
Coconut	Edible-Oil Plants	Biodiesel	259	Gallons per Acre	Slightly Difficult	4.0
Corn	Starches	Ethanol	302	Gallons per Acre	Easy	1.9
Jatropha	Non-Edible-Oil Plants	Biodiesel	202	Gallons per Acre	Easy	6.3
Jojoba	Non-Edible-Oil Plants	Biodiesel	194	Gallons per Acre	Difficult	5.0
Oil Palm	Edible-Oil Plants	Biodiesel	572	Gallons per Acre	Easy	9.0
Peanut	Edible-Oil Plants	Biodiesel	102	Gallons per Acre	Easy	5.0
Rapeseed	Edible-Oil Plants	Biodiesel	115	Gallons per Acre	Easy	7.1
Sorghum	Starches	Ethanol	587	Gallons per Acre	Easy	8.0
Soy Beans	Edible-Oil Plants	Biodiesel	52	Gallons per Acre	Easy	3.2
Sugar Beets	Sugars	Ethanol	714	Gallons per Acre	Easy	1.3
Sugarcane	Sugars	Ethanol	662	Gallons per Acre	Easy	8.0
Sunflower	Edible-Oil Plants	Biodiesel	92	Gallons per Acre	Easy	2.2
Wheat	Starches	Ethanol	277	Gallons per Acre	Easy	2.0

Second Generation Biofuels	Type	Fuel	Approximate Energy Yield	Energy Metric	Scalability	Energy Efficiency Ratio
Corn Stover	Cellulosic Feedstocks	Ethanol	165	Gallons per Acre	Easy	19.7
Hybrid Poplar	Cellulosic Feedstocks	Ethanol	459	Gallons per Acre	Easy	7.2
Miscanthus	Cellulosic Feedstocks	Ethanol	1,871	Gallons per Acre	Slightly Difficult	32.5
Sugarcane Bagasse	Cellulosic Feedstocks	Ethanol	700	Gallons per Acre	Easy	8.0
Switchgrass	Cellulosic Feedstocks	Ethanol	505	Gallons per Acre	Easy	25.3

Third Generation Biofuels	Type	Fuel	Approximate Energy Yield	Energy Metric	Scalability	Energy Efficiency Ratio
Algae	Algae	Biodiesel	15,000	Gallons per Acre	Difficult	3.4
Halophytes	Halophytes	Biodiesel	800	Gallons per Acre	Difficult	3.2

Fourth Generation Biofuels	Type	Fuel	Approximate Energy Yield	Energy Metric	Scalability	Energy Efficiency Ratio
Advanced Biochemistry	N/A	N/A	N/A	N/A	Difficult	N/A
Hydroprocessing	N/A	N/A	N/A	N/A	Difficult	N/A
Joule's Solar to Fuel	Solar Converter	Ethanol	25,000	Gallons per Acre	Difficult	N/A
Joule's Solar to Fuel	Solar Converter	Biodiesel	15,000	Gallons per Acre	Difficult	N/A

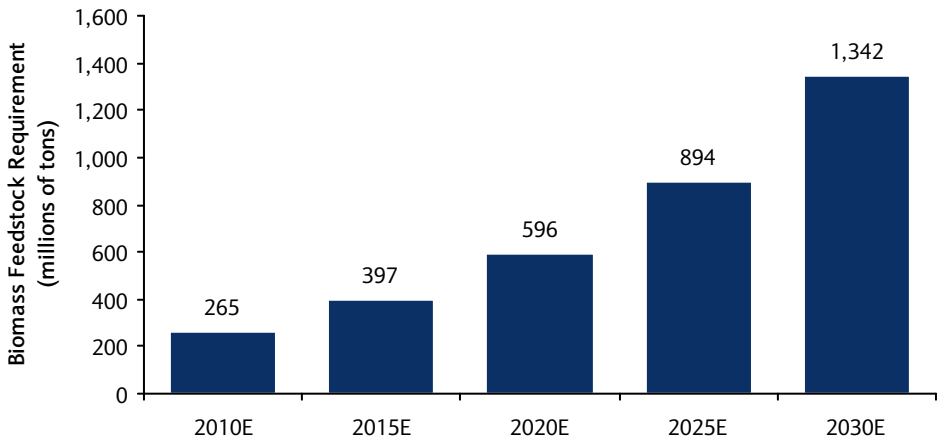
Source: Barclays Capital Research, Industry Reports, Earth Policy Organization, Journey to Forever, Journal Star, U.S. Department of Energy, Delta Farm Press, Science Daily, World Changing, Energy Now, Joule Unlimited, Carbohydrate Economy, BioGreen Energy, Terra Nova Bio, Bio Agro Life, Clean Houston, Bioenergy Feedstock Information Network, NextFuel, GTM Research

Note: The energy content of ethanol is about 67% that of gasoline and the energy content of biodiesel is about 90% that of petroleum diesel.

Feedstock Requirements

Different feedstocks under various farming practices have different yield potentials. According to the World Watch Institute, a ton of biomass can yield approximately 100 gallons of ethanol. As farming practices and technology improves, we expect yields to improve over time. We assume that biomass conversion rates can improve by 0.5% per year due to improved farming practices and technology. That said, in order to reach the expected global demand for biofuels, we expect biomass feedstock requirements to be approximately 265 million tons in 2010 and grow to approximately 1,342 million tons by 2030.

Figure 6: Estimated Biomass Feedstock Requirement



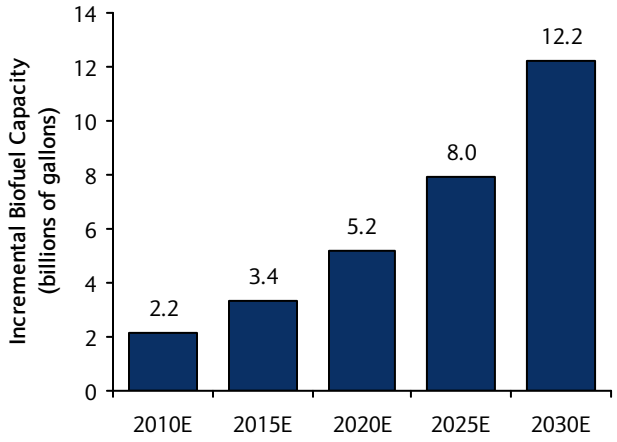
Source: Barclays Capital Research, Industry Sources

Capex Requirements

Several countries have adopted policies and target requirements that increase the mix between petroleum-based fuels and biofuels. Biofuel production capacity will have to grow in order to meet future target requirements. That said, we expect global capex spending on biofuel production facilities to increase yearly as biofuel requirements get more stringent within each country.

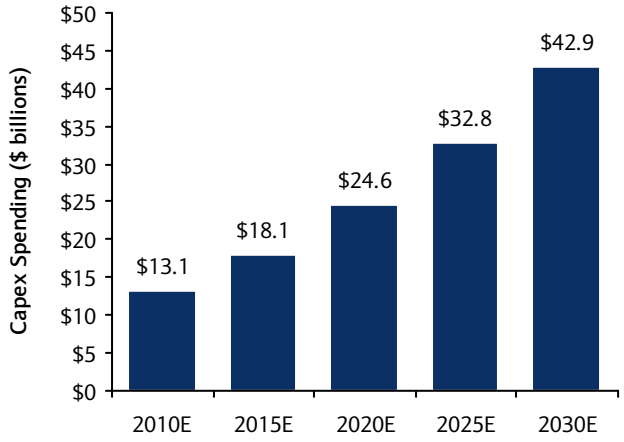
In 2015, we estimate capex spending to reach approximately $18.1 billion in order to support production facilities that are bringing an additional 3.4 billion gallons of biofuels online. By 2030, capex spending could reach nearly $42.9 billion to support the 12.2 billion gallons of biofuels that are expected to come online. Our estimates assume that capex spending for commercial facilities is approximately $6 per gallon (as high as $10-$12 per gallon for smaller demonstration and pilot-scale facilities). We expect capex to trend downwards to $3-$4 per gallon as construction expertise improves and larger production facilities are built.

Figure 7: Estimated Incremental Biofuel Production Capacity Coming Online



Source: Barclays Capital Research, U.S. Department of Energy, Industry Sources

Figure 8: Estimated Capex Spending on Biofuel Production Facilities

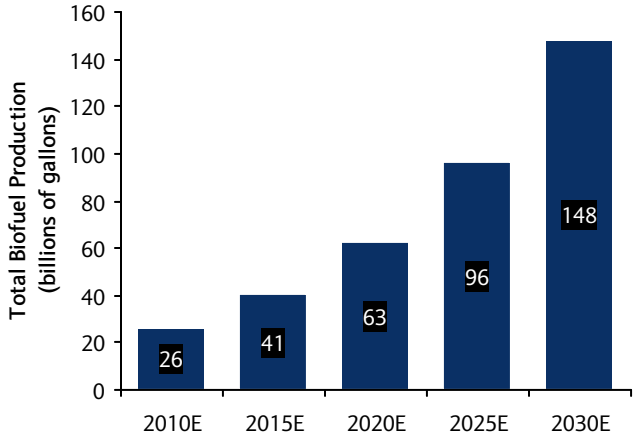


Source: Barclays Capital, U.S. Department of Energy, Industry Sources

Market Size

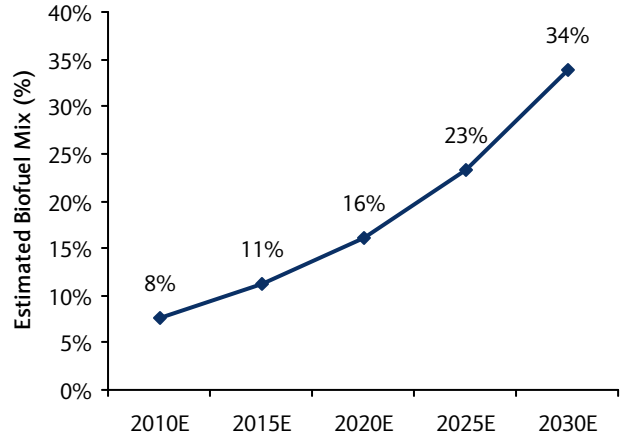
We estimate the global biofuel market has the potential to reach $320 billion by 2030 as the demand focus shifts away from conventional fuels towards cleaner alternatives. We estimate the global biofuel production to grow from 41 billion gallons in 2015 to 148 billion gallons in 2030. We assume that biofuel production would grow at a CAGR of 9% through 2030, which is relatively in line with a sample size of 42 different countries' policy targets. There is potential upside to these estimates as technologies further develop and production yields improve. As economics for cellulosic biofuels make more sense, we could also see countries elevating their biofuel policy requirements as well.

Figure 9: Estimated Global Biofuel Production



Source: Barclays Capital Research, U.S. Department of Energy, Industry Sources

Figure 10: Biofuel Mix as a % of Motor Fuel Consumption



Source: Barclays Capital Research, Industry Sources

Business Model Development

First, given the high capital investment requirements and the lack of near term profitability potential (due to small scale), most biofuel companies are targeting the higher profit margin speciality chemicals segments. Similar to companies in the battery technology segment (companies are targeting the grid in the near term as opposed to passenger auto segment), chemicals segment offer a lower-risk pathway to move down the cost and efficiency learning curve for most biofuel solutions. The value of chemicals produced by biological processes can be up to 2 to 10 times higher than biofuels. Second, in order to start a commercial, cash flow positive plant, companies are following non-traditional approaches such as using waste gases of a steel mill in place of a capital intensive gasifier for fermentation or retrofitting existing corn ethanol facilities for high efficiency butanol production for chemicals markets. By adopting these business models, capital costs can be controlled to under $100 million in most cases as opposed to traditional capital intensive process cost of $300-400 million.

Biofuel Production Plans

Figure 11: Selected Companies Developing Next-Generation Biofuels in the U.S.

Company	Plant location	Plant type	Technology	Biofuel	Production Capacity (million gallons per year)					Feedstock
					2009	2010	2011	2012	2012+	
Abengoa Bioenergy	York, NE	Pilot	Bio	Ethanol	0.02	0.02	0.02	0.02	0.02	Ag residue
Abengoa Bioenergy	Hugoton, KS	Commercial	Bio	Ethanol				11.6	11.6	Ag residue/energy crops
AE Biofuels	Butte, MT	Demo	Bio	Ethanol	0.15	0.15	0.15	0.15	0.15	Ag residue
AE Biofuels	Keyes, CA	Commerical	Bio	Ethanol			5	10	10	Ag residue
Amyris	Emeryville, CA	Pilot	Bioengineered	Petroleum equivalents	2	2	2	2	2	Crops
Amyris	Campinas, Brazil	Pilot	Bioengineered	Petroleum equivalents	(1)	(1)	(1)	(1)	(1)	Crops
Amyris	Campinas, Brazil	Commercial	Bioengineered	Petroleum equivalents					(2)	Crops
BlueFire Ethanol	Lancaster, CA	Commercial	Bio	Ethanol			3.9	3.9	3.9	Municipal Solid Waste
BlueFire Ethanol	Fulton, MS	Commercial	Bio	Ethanol					19	Multiple
Cello Energy	Bay Minette, AL	Commercial	Cat	Petroleum equivalents		(2)	(2)	(2)	(2)	Multiple
Central Minnesota Cellulosic Ethanol Partners	Little Falls, MN	Commercial	Bio	Ethanol					10	Wood waste
ClearFuels Technology	Kauai, HI	Pilot	Thermo	Ethanol			1.5	1.5	1.5	Ag residue
ClearFuels Technology	Collinwood, TN	Commercial	Thermo	Petroleum equivalents					16	Wood waste
Cobalt Biofuels	Mountain View, CA	Pilot	Bio	Biobutanol		0.035	0.035	0.035	0.035	Multiple
Cobalt Biofuels	Mountain View, CA	Demo	Bio	Biobutanol			1.5	1.5	1.5	Multiple
Coskata	Madison, PA	Demo	Hybrid: Bio and thermo	Ethanol	0.04	0.04	0.04	0.04	0.04	Multiple
Coskata	Southeast	Commercial	Hybrid: Bio and thermo	Ethanol				50	50	Multiple
DuPont Danisco	Vonore, TN	Pilot	Bio	Ethanol	0.25	0.25	0.25	0.25	0.25	Ag residue/energy crops
Dynamic Fuels	Geismar, LA	Commercial	Hydro	Petroleum equivalents		75	75	75	75	Animal fat, veg. and other oils
Enerkem	Pontotoc, MS	Commercial	Thermo	Ethanol				10	20	Multiple
Fiberight	Blairstown, IA	Demo	Bio	Ethanol		2	2	2	8.6	Municipal Solid Waste
Flambeau River	Park Falls, WI	Demo	Thermo	Petroleum equivalents					8	Wood waste
Fulcrum Bioenergy	Storey County, NV	Demo	Thermo	Ethanol				10.5	10.5	Municipal Solid Waste

Source: USDA, Economic Research Service, U.S. Environmental Protection Agency, ThinkEquity, Industry Sources
Note: (1) Production in Brazil; capacity of demonstration plant is 10,000 gallons per year; commercial output from various plants could be as much as 200 million gallons per year after 2012. (2) Limited information about feedstock used; capacity has been estimated at 20 million gallons per year.

Figure 12: Selected Companies Developing Next-Generation Biofuels in the U.S. (Cont.)

Company	Plant location	Plant type	Technology	Biofuel	Production Capacity (million gallons per year)					Feedstock
					2009	2010	2011	2012	2012+	
Gevo	St. Joseph, MO	Demo	Bio	Biobutanol	1	1	1	1	1	Crops
Gevo	Various locations	Commercial	Bio	Biobutanol			50	50	50	Crops
Gulf Coast Energy	Livingston, AL	Demo	Thermo	Ethanol	0.2	0.2	0.2	0.2	0.2	Wood waste
ICM	St. Joseph, MO	Pilot	Bio	Ethanol			0.5	0.5	0.5	Ag residue/energy crops
Inbicon	Spiritwood, ND	Commercial	Bio	Ethanol					20	Ag residue
INEOS Bio	Fayetteville, AR	Pilot	Thermo	Ethanol	0.04	0.04	0.04	0.04	0.04	Municipal Solid Waste
INEOS Bio-New Planet Energy	Florida	Commercial	Thermo	Ethanol			8	8	8	Multiple/ Non ag
LS9, Inc.	San Francisco, CA	Pilot	Bioengineered	Petroleum equivalents			Lab scale			Multiple
LS9, Inc.	Okeechobee, FL	Demo	Bioengineered	Petroleum equivalents			0.05	0.05	0.1	Multiple
Mascoma	Rome, NY	Demo	Bio	Ethanol	0.2	0.2	0.2	0.2	0.2	Wood waste
Mascoma (Frontier Renewable Resources)	Kinross, MI	Commercial	Bio	Ethanol				20	20	Wood waste
Ohio River Clean Fuels/Baard	Wellsville, OH	Commercial	Thermo	Petroleum equivalents					17	Multiple
Pacific Ethanol	Boardman, OR	Demo	Bio	Ethanol					2.7	Multiple
POET	Scotland, SD	Pilot	Bio	Ethanol	0.02	0.02	0.02	0.02	0.02	Ag residue
POET	Emmetsburg, IA	Commercial	Bio	Ethanol	25	25	25	25	25	Ag residue
Qteros	Springfield, MA	Pilot	Bio	Ethanol	Small pilot under construction					Multiple
Range Fuels	Soperton, GA	Commercial	Thermo	Methanol, ethanol		4	4	30	30	Wood waste
Rentech	Commerce City, CO	Demo	Thermo	Petroleum equivalents	0.15	0.15	0.15	0.15	0.15	Multiple
Rentech	Rialto, CA	Demo	Thermo	Petroleum equivalents				9.2	9.2	Multiple
Terrabon	Bryan, TX	Pilot	Bio	Petroleum equivalents	0.11	0.11	0.11	0.11	0.11	Multiple
Verenium	Jennings, LA	Pilot	Bio	Ethanol	0.05	0.05	0.05	0.05	0.05	Ag residue
Verenium	Jennings, LA	Demo	Bio	Ethanol	1.4	1.4	1.4	1.4	1.4	Ag residue
Verenium	Highlands County, FL	Commercial	Bio	Ethanol				36	36	Energy crops
Virent	Madison, WI	Demo	Bioengineered	Petroleum equivalents		0.01	0.01	0.01	0.01	Crops
Western Biomass Energy/KL Energy	Upton, WY	Demo	Bio	Ethanol	1.5	1.5	1.5	1.5	1.5	Wood waste
ZeaChem	Boardman, OR	Demo	Hybrid: Bio and thermo	Ethanol		0.25	0.25	0.25	0.25	Poplars

Source: USDA, Economic Research Service, U.S. Environmental Protection Agency, ThinkEquity, Industry Sources
Note: (1) Production in Brazil; capacity of demonstration plant is 10,000 gallons per year; commercial output from various plants could be as much as 200 million gallons per year after 2012. (2) Limited information about feedstock used; capacity has been estimated at 20 million gallons per year.

Top Alternative Fuels News

Analysis: Think $100 U.S. oil is bad? It's really much worse

Source: Reuters – March 9th, 2011

Although $100 oil is the headline in U.S. newspapers, most refineries that supply fuel to service stations are paying the equivalent of a much higher price -- and those costs are already being felt when consumers fill up their vehicles. The cause is an unprecedented disconnect between the most visible price of oil -- crude oil futures contracts on the New York Mercantile Exchange (NYMEX) -- and the real cost of physical barrels pumped from the Gulf of Mexico, Saudi Arabia and elsewhere. This gap is caused by oil traders' growing realization that inventories at the small Oklahoma town of Cushing -- the delivery point for the NYMEX contract -- will likely be awash with crude for months to come due to booming production from Canada and shale oil producing states such as North Dakota.

Complete Article: http://www.reuters.com/article/2011/03/09/us-usa-oil-idUSTRE7284LG20110309

Obama vows to stabilize fuel prices, calls for reform

Source: Reuters – March 11th, 2011

The United States cannot drill its way out of its energy problems and must begin reforms now to reduce oil dependence, President Barack Obama said on Friday, pledging to do all he could to stabilize fuel prices. Obama, whose prospects for re-election in 2012 may hinge partly on gasoline prices and their effect on the economy, said the world could manage oil supply disruptions stemming from unrest in Libya and across the Middle East and North Africa. In a White House news conference aimed at calming U.S. consumers' fears of high gas prices, Obama stressed that he could tap U.S. strategic oil reserves quickly if necessary. But he declined to say what price threshold would trigger such intervention. Republicans, many of whom rallied around the call "drill, baby, drill" in the 2008 presidential election, accuse the administration of neglecting domestic oil production -- a theme that is likely to resurface in next year's election, too.

Complete Article: http://www.reuters.com/article/2011/03/11/us-oil-obama-idUSTRE72A5UN20110311

BP expands in Brazilian biofuels with $680 million buy

Source: Reuters – March 11th, 2011

Oil major BP has agreed to buy a Brazilian sugar and ethanol group for $680 million, expanding its presence in the country's biofuels industry in what it said was the largest deal to date for its alternative energy unit. The deal accents big oil's diversification into Brazil's ethanol sector as economies rethink their dependence on fossil fuels, especially following the political unrest in the Middle East that has driven oil prices to the highest since 2008. BP, which has spent recent months reshaping its portfolio as it looks to put the Gulf of Mexico oil spill behind it, said on Friday it would have an 83 percent stake in cane milling group Companhia Nacional de Acucar e Alcool (CNAA). It will refinance 100 percent of CNAA's long-term debts, which were included in the $680 million but not disclosed.

Complete Article: http://www.reuters.com/article/2011/03/11/us-bp-idUSTRE72A4BX20110311

Google backs biomass fuel firm CoolPlanetBiofuels

Source: Reuters – March 18th, 2011

The venture capital arm of Google Inc has invested in a start-up that is developing technology to produce fuel from inedible biomass such as grass and wood chips. The process, deployed by CoolPlanetBiofuels, also produces a byproduct that can capture carbon and also be added to soil to improve crop yields, leading to what Google Ventures described as a "negative carbon fuel." "While we have made significant progress over the past couple of years, this new infusion of capital, coupled with the expertise of the Google Ventures team, enables our team to scale even faster," Mike Cheiky, chief executive of Camarillo, California-based CoolPlanet, said in a statement on Thursday.

Complete Article: http://www.reuters.com/article/2011/03/18/us-google-biofuel-idUSTRE72H45720110318

Clean Energy Signs Contract with Dillon Transport to Build & Operate Natural Gas Fueling Station to Support Freight Carrier's New LNG-Powered Texas Truck Fleet

Source: Clean Energy Fuels – March 18th, 2011

Clean Energy Fuels Corp. (Nasdaq: CLNE) has signed an agreement with major contract freight carrier Dillon Transport to build, operate and supply an LNG/CNG fueling station on Dillon-owned property in Dallas, Texas. The new Clean Energy natural gas fueling facility, also available 24/7 for public access, will support the expanding Dillon fleet of clean-burning, LNG-powered tanker trucks. Dillon Transport's temperature-sensitive tanker truck fleets operate throughout the U.S. and Canada, with contract services concentrated east of the Rocky Mountains. The new Dallas Clean Energy station will support Dillon LNG trucks to be deployed in the near future to deliver raw materials to the Owens Corning shingle production plant in Irving, Texas. Owens Corning is a leading global producer of residential and commercial building materials. Along with Owens Corning, Dillon is an active member of the U.S. Environmental Protection Agency's SmartWay™ Transport Partnership, a voluntary alliance of freight industry organizations that establishes incentives for fuel efficiency and greenhouse gas reductions.

Complete Article:
http://www.businesswire.com/news/home/20110318005148/en/Clean-Energy-Signs-Contract-Dillon-Transport-Build

Polypore further expands Li-ion battery separator capacity for electric drive vehicles

Source: Green Car Congress – March 16th, 2011

Polypore International, Inc. has approved additional capital expenditures of approximately $65 million to expand its lithium-ion battery separator capacity for electric drive vehicles. This capacity, which is scheduled to begin ramping up in late 2012, is being added to the company's facility currently under construction in Concord, North Carolina. This represents

the fourth automotive-targeted expansion since August 2009. When this capacity expansion reaches full production levels in 2013, the Company will have increased lithium-ion battery separator capacity by more than 200% compared to the run rate experienced during the second half of 2010.

Complete Article: http://www.greencarcongress.com/2011/03/polypore-20110316.html#more

Renault apologises to managers wrongly sacked for spying electric cars

Source: REVE – March 16th, 2011

Renault publicly apologised on Monday to three top managers it fired for allegedly selling key electric vehicles secrets to China. Boss Carlos Ghosn went on prime time television to apologise "personally and in Renault's name," but said he had turned down an offer by his number two, operations chief Patrick Pelata, to resign over the debacle. Renault officials quickly sacked the three managers in January, saying publicly they had proof they had been selling secrets on the electric technology which is expected to change the car industry.

Complete Article: http://www.evwind.es/noticias.php?id_not=10829

Solazyme and Dow Form an Alliance for the Development of Micro Algae-Derived Oils for Use in Bio-Based Dielectric Insulating Fluids

Source: Business Wire – March 9th, 2011

Solazyme, Inc., a leading renewable oils and bioproducts company, announced today the execution of both a joint development agreement (JDA) and a letter of intent (LOI) with The Dow Chemical Company (NYSE: DOW) to advance the development of Solazyme's algal oils for use in next generation, bio-based dielectric insulating fluids key to transformers and other electrical applications. "Solazyme is a leading company in the industrial biotechnology space and its renewable oil technology platform provides a unique opportunity to significantly improve the next generations of chemical solutions." Under the terms of the joint development agreement, Dow will combine its extensive knowledge of specialty fluid formulations and dielectric insulation capabilities with Solazyme's unique feedstock capabilities to develop of a new class of algal oils tailored for optimized performance and cost in dielectric insulating fluid applications. The non–binding LOI provides that Dow may obtain up to 20 million gallons of Solazyme's oils for use in dielectric insulating fluids and other industrial applications in 2013 and up to 60 million gallons in 2015.

Complete Article:
http://www.businesswire.com/news/home/20110309005503/en/Solazyme-Dow-Form-Alliance-Development-Micro-Algae-Derived

Better Place to Start 10 Israeli Battery Charging Stations, TheMarker Says

Source: Bloomberg – March 3rd, 2011

Better Place LLC, a U.S. start-up, is seeking to open as many as 10 commercial battery charging stations in order to serve electric cars on Israeli roads, TheMarker said. The company, which is partly held by Israel Corp., expects to add about 50 stations by 2016, the newspaper reported, without saying where it obtained the information.

Complete Article: http://www.bloomberg.com/news/2011-03-03/better-place-to-start-10-israeli-battery-charging-stations-themarker-says.html

Better Place and Renault Launch Electric vehicles Fluence Z.E.

Source: REVE – March 3rd, 2011

The electric car will offer Danish drivers a range of up to 185 kilometers, measured on the New European Driving Cycle (NEDC) with a fully charged battery. Better Place opened today, together with its partner Renault, Europe's first Better Place center. Visitors will now be able to experience sustainable mobility and will have the opportunity to place an order for a Renault Fluence Z.E. with the Renault staff and sign up with the Better Place team for a subscription of mobility services – conveniently packaged for consumers, fleet managers and the public sector.

Complete Article: http://www.evwind.es/noticias.php?id_not=10576

Smith Electric Vehicles Completes $58 Million Private Placement

Source: REVE – March 8th, 2011

Smith Electric Vehicles U.S. Corp., a U.S. manufacturer of plug-in battery powered electric trucks, sold $58 million of shares privately to unidentified investors. Smith Electric Vehicles U.S. Corporation ("Smith") announced the issuance and sale of $39 million of Series B Convertible Preferred Stock and the conversion of Bridge Notes and the exercise of related Warrants into $19 million of Series B Convertible Preferred Stock. As previously announced, the company acquired Smith Electric Vehicles UK effective January 1, 2011. The purchase consideration was largely deferred with the balance due as a series of monthly cash payments. Per the purchase agreement, $5 million of proceeds from this equity raise will be used as a prepayment of the monthly installments. This prepayment will result in a payment holiday of approximately seven months.

Complete Article: http://www.evwind.es/noticias.php?id_not=10669

Tampa the First Florida Airport to Implement CNG

Source: NGV Global – March 4th, 2011

Tampa International Airport (TPA)'s governing authority has entered into a lease and concession agreement with California-based Clean Energy Fuels Corp., a provider of natural gas (CNG and LNG) for transportation, granting them the right to develop, design, construct, operate and maintain a "turnkey" Compressed Natural Gas (CNG) fuel facility at the airport for a term of 20 years. The CNG facility, part of TPA's green technology initiative, is expected to result in fuel cost savings for the Authority of over one million dollars in the first five years.

Complete Article: http://www.ngvglobal.com/tampa-the-first-florida-airport-to-implement-cng-0304

Qteros gets positive nod on cost-reduction drive for cellulosic ethanol

Source: Biofuels Digest – March 7th, 2011

In Massachusetts, Qteros received a positive review from an investment analyst, in which the advanced biofuels company was compared to three newly-public advanced bhifuels companies, Amyris, Codexis, and Gevo. "Qteros, for example, achieved a total cash production cost of $2.40/gal last year," writes the analyst, "and is targeting $1.50/gal by mid-2011 and $1.00/gal by 2013. By comparison, at current corn prices of ~$7.00/bushel, just the corn itself equates to $2.50/gal (before netting out co-product revenue)…Qteros has a capital-light commercialization strategy, aimed at technology licensing."

Complete Article: http://biofuelsdigest.com/bdigest/2011/03/07/qteros-gets-positive-nod-on-cost-reduction-drive-for-cellulosic-ethanol/

200 Mgy corn ethanol plant under development in Florida

Source: Tampa Bay – March 4th, 2011

The empty field off U.S. 41 doesn't look like much. But if all goes as planned, the 100-acre chunk of land between Symmes and Big Bend roads will soon house one of the largest ethanol plants in the country. Capable of churning out 200 million gallons of renewable fuel each year, in addition to creating about 400 local jobs, county officials say the future Sunshine Way Ethanol plant is a much-needed asset. "It certainly has the potential to be a very good, very big project," said Jerry Campbell, director of the county's Environmental Protection Commission's air management division. "It's not something we typically see coming in here." Campbell's office is so supportive of the project that it's working with developers of the Sunshine Way Ethanol plant to expedite the permitting process.

Complete Article: http://www.tampabay.com/news/growth/article1154785.ece?

Dayton Power & Light Seeks Bids for Renewable Fuel Sources

Source: Business Wire – March 3rd, 2011

The Dayton Power and Light Company (DP&L), a subsidiary of DPL Inc. (NYSE: DPL), has issued a request for proposals (RFP) for biofuels for use at its generating stations. "Biofuels are just one way DP&L is incorporating renewable energy resources into our generation portfolio," said Paul Barbas, DPL president and chief executive officer. "We continue to seek environmentally responsible and cost-effective ways to comply with legislative requirements and to meet our customers' energy needs." DP&L is requesting proposals for biofuel sources for the next three years, in keeping with Ohio energy legislation, Ohio Amended Substitute Senate Bill 221. All biofuel products submitted must meet the requirements set forth by the Ohio Revised Code and as defined in the RFP. Biofuels are organic and biodegradable materials derived from renewable sources.

Complete Article:
http://www.businesswire.com/news/home/20110303006588/en/Dayton-Power-Light-Seeks-Bids-Renewable-Fuel

Biofuel appeal stokes bullish palm price outlook

Source: Reuters – March 8th, 2011

Malaysian plans to subsidize biofuel and the launch of the world's biggest biodiesel plant in Singapore promise to give a fillip to the renewable fuel industry worldwide, planters and traders in the Malaysian capital said on Tuesday. The moves come as key feedstock palm oil soars to multi-year highs, riding crude oil prices driven higher by concerns of spreading unrest in the Middle East that has cut Libyan exports.

Complete Article: http://www.reuters.com/article/2011/03/08/us-asia-palm-oil-idUSTRE7271N220110308

Climate change, biofuels threaten food security

Source: Reuters – March 7th, 2011

Climate change bringing floods and drought, growing biofuel demand and national policies to protect domestic markets could drive up global food prices and threaten long-term food security, the United Nations said. High and volatile food prices are a growing global concern, partly fuelling the protests that toppled the rulers of Tunisia and Egypt this year.

Complete Article: http://www.reuters.com/article/2011/03/07/us-food-fao-idUSTRE7261M520110307

Qantas in talks with two other biofuel producers

Source: Flight Global – March 4th, 2011

Qantas is in discussions with two additional alternative fuel producers with a view to entering arrangements similar to the pacts it recently signed with U.S. renewable energy companies Solazyme and Solena. It hopes to be sourcing as much as 5% of its jet fuel from sustainable sources by 2016 says the airline's chief risk officer Rob Kella. The carrier in February entered a 12-month agreement with California-based Solazyme to develop a business case for the introduction of algae-based aviation fuel technology to Australia. This followed a similar arrangement with Washington DC-based Solena to look into converting biomass from municipal waste into aviation biofuel. Kella says the airline is in talks with two other organisations and might make another similar announcement soon.

Complete Article: http://www.flightglobal.com/articles/2011/03/04/353850/qantas-in-talks-with-two-other-biofuel-producers.html?

More investments to boost Dubai's CNG project

Source: NGV Journal – March 2nd, 2011

Emirates Gas LLC (Emgas), a wholly owned subsidiary of the government-owned energy group Enoc, has invested USD 30 million into the first phase of its infrastructure building programme for the distribution of compressed natural gas, reported local news site The Eye of Dubai. This initial stage will take place between 2011 and 2014 and will focus on building two CNG main stations connected to the existing natural gas pipeline as well as four to five sub stations. "In this phase we are trying to focus on the Dubai region because of the availability of gas and the infrastructure and we will be converting municipality's taxis and Road and Transport Authority (RTA) fleets," said Zaid Al Qufaidi, managing director of marketing of Enoc.

Complete Article: http://www.ngvjournal.com/en/markets/item/4343-more-investments-to-boost-dubais-cng-project

Dow Kokam to provide Li-ion packs to Motiv Power and ZeroTruck for medium-duty electric commercial vehicles

Source: Green Car Congress – March 7th, 2011

Dow Kokam has signed two agreements to provide lithium-ion battery solutions to power electric medium-duty commercial vehicles with Motiv Power Systems and ZeroTruck, all designated for fleet operations. Made with nickel metal cobalt technology, Dow Kokam battery cells are designed with a patented Z-fold process and currently feature an energy density of 14 Wh/kg, a good energy/power balance (14 kW peak power), and offer a cycle life of 2,000 cycles at 80% discharge. Dow Kokam says that the design of the cells results in lower impedance and heat generation, with improved lifetime and faster charge and discharge. Motiv Power Systems, an electric drive power control system provider, with funding from the California Energy Commission, is using Dow Kokam's battery system to convert a Class 4, Ford E-450 diesel chassis to a completely electric system for a passenger shuttle bus. The fully-electric, 20-passenger shuttle bus has a 100-mile (161-kilometer) range.

Complete Article: http://www.greencarcongress.com/2011/03/dowkokam-20110307.html#more

Amprius raises $25M to support commercialization of Li-ion batteries with silicon nanowire anodes

Source: Green Car Congress – March 3rd, 2011

Amprius has raised $25 million to commercialize next-generation lithium ion batteries leveraging Amprius' proprietary silicon-based anode technology. Major new investors include IPV Capital (Shanghai, China), Kleiner Perkins Caufield & Byers (Menlo Park, CA), and Qian Neng Fund (Wuxi, China). Also participating in this round are previous investors Trident Capital, VantagePoint Venture Partners, Dr. Eric Schmidt, and Stanford University. Amprius' technology was initially developed at Professor Yi Cui's laboratory at Stanford University; Cui is a founder of the company. Amprius' first generation of silicon nanowire product can enable a battery with a 4x smaller anode that balances with a 40% larger cathode, resulting in a practically usable energy density increase of 40% compared to today's best lithium-ion batteries, the company says. Amprius says that there is clear potential to reach increases of up to 200% or more in the future.

Complete Article: http://www.greencarcongress.com/2011/03/amprius-raises-25m-to-support-commercialization-of-li-ion-batteries-with-silicon-nanowire-anodes.html

USABC awards Maxwell Technologies and partners $7.01M for ultracap energy storage system for power-assist hybrids

Source: Green Car Congress – March 3rd, 2011

The United States Advanced Battery Consortium LLC (USABC) has awarded Maxwell Technologies, Inc. a $7.01 million cost-shared technology development contract to develop an advanced energy storage system for power-assist hybrid electric vehicles (PAHEVs). USABC will provide more than $2.8 million directly to Maxwell and approximately $3.5 million in total, including payments to technology development partners, over the course of the 24-month program. The goal of the project is to develop technology that will double existing capacitor power density from 10 to 20 kilowatts per kilogram (kW/kg) and double existing energy density from 15 to 30 watt-hours per kilogram (Wh/kg). The advanced ultracapacitors then will be integrated into modules that will be evaluated against the USABC goals for Lower Energy-Energy Storage System (LEESS) applications.

Complete Article: http://www.greencarcongress.com/2011/03/usabc-20110303.html

Berlin demands clarity over new biofuel phase-in

Source: Reuters – March 3rd, 2011

The German government demanded clarity from the biofuel industry on whether it will continue with a planned roll-out of gasoline with a higher biofuel content after its association sent mixed messages about a halt. "The confusion that the biofuel industry is causing is not acceptable," Environment Minister Norbert Roettgen told journalists on Thursday after the MWV association denied a media report that the roll-out of the fuel, known as E10, would be temporarily halted. Economy Minister Rainer Bruederle said he would invite industry participants to a 'biofuel summit' to explain their plans.

Complete Article: http://www.reuters.com/article/2011/03/03/us-germany-biofuel-idUSTRE72260Y20110303

Coda to sell China-made electric vehicles in U.S. in 2011

Source: REVE – March 5th, 2011

U.S. electric car maker Coda Holdings will make its first electric car sedan in China and start selling it in the United States in the second half of this year. The firm is also in talks with its main Chinese manufacturing partner Hafei Motor about selling electric cars in China, the world's biggest auto market, the Wall Street Journal said, citing Coda chief executive Philip Murtaugh. The California-based company, which also has a joint venture with Tianjin Lishen Battery Joint-Stock Co, expects to sell 10,000-14,000 sedans in the first 12 months after its launch in the United States, the newspaper said.

Complete Article: http://www.evwind.es/noticias.php?id_not=10579

KiOR lands buyer for renewable oil to be produced in Miss.

Source: Clarion Ledger – March 8th, 2011

Texas-based biofuel company KiOR has found a buyer for renewable oil produced at its Columbus plant under construction. KiOR signed an agreement Tuesday with Hunt Refining Co. of Tuscaloosa. KiOR announced last year it would build three plants in Mississippi that will convert wood chips into renewable crude oil. The Columbus plant, where site work has begun, is slated to open in 2012. "(Tuesday's) announcement is an important milestone for the development of our commercial facilities in Mississippi and furthers KiOR's progress towards the commercialization of gasoline and diesel blendstocks from renewable crude," Fred Cannon, president and CEO of KiOR, said in a statement. Hunt Refining, founded by the late oil tycoon H.L. Hunt in 1946, operates a 52,000-barrel-per-day refinery. The company also operates transportation and storage facilities in western and eastern Mississippi.

Complete Article:
http://www.clarionledger.com/article/20110309/NEWS/103090343/KiOR-lands-buyer-renewable-oil-produced-Miss-?odyssey=tab|topnews|text|Home

FutureFuel launches NYSE IPO

Source: Biofuels Digest – March 8th, 2011

On March 8, 2011, FutureFuel Corp. announced the pending listing of its common stock on the New York Stock Exchange ("NYSE"). The Company expects its common stock to begin trading on the NYSE on or about March 23, 2011, trading under the symbol "FF". The Company's common stock will continue to be quoted on the Over-the-Counter Bulletin Board under the symbol "FTFL" until the transfer is completed. FutureFuel Corp. was created in 2005. In October 2006, the Company purchased FutureFuel Chemical Company (formerly named "Eastman SE, Inc."), the owner and operator of a chemical and biodiesel manufacturing facility located near Batesville, Arkansas. Since then, the Company has worked to become a leader in the U.S. biofuel industry, while maintaining the Batesville facility's status as a world-class specialty chemical manufacturer.

Complete Article: http://www.prnewswire.com/news-releases/futurefuel-corp-plans-to-list-shares-on-the-new-york-stock-exchange-117602078.html

Verenium Announces Debt Repurchase

Source: Verenium – March 11th, 2011

Verenium Corporation (Nasdaq: VRNM), a leading industrial biotechnology company focused on the development and commercialization of high-performance enzymes, today announced that it repurchased $28.4 million in principal amount of its outstanding convertible notes in a series of privately-negotiated transactions. As part of these transactions, the Company repurchased $19.9 million in principal amount of its 5.5% Notes and $8.5 million in principal amount of its 9% Notes, leaving an aggregate of $46.3 million in principal amount of 5.5% and 9% Notes outstanding. To effect this repurchase, the Company paid a total of $27.6 million in cash to a group of institutional investors, excluding accrued interest as of the closing date. The Company has repurchased $49.4 million in convertible notes since September 2010. "We are very pleased to have completed these

repurchases, and believe this is another important step in creating a capital structure that supports the continued growth and success of Verenium as we focus on building the next leading industrial enzymes company," said Jeffrey Black, Senior Vice President and Chief Financial Officer Designate at Verenium. "We believe that we have now reduced our debt to a more appropriate level for the Company given our size and stage of development."

Complete Article: http://ir.verenium.com/releasedetail.cfm?ReleaseID=556248

Analysis: U.S. corn yield growth must quicken

Source: Reuters – March 11th, 2011

For decades, U.S. farmers have helped feed the world by sowing some of the most versatile cropland, adjusting each year to grow a bit more of this and less of that, to replenish those crops in greatest shortage. This year, however, even with farmers planting nearly every acre of arable land, it won't be enough to tame prices and replenish stocks. The price of almost every major crop is at or near record highs; competition -- between farmers and between crops -- has never been more intense; and Midwestern property values have surged. With arable land near its max for the world's top exporter, productivity becomes paramount. Whether it can improve quickly enough to meet rising global demand is hotly debated.

Complete Article: http://www.reuters.com/article/2011/03/11/us-crops-usda-corn-idUSTRE72A6PO20110311

Liberty Electric Cars seeks to assist failed Modec

Source: Green Car Congress – March 13th, 2011

Liberty Electric Cars, a UK company formed in 2008 to re-engineer large luxury cars and SUVs into electric vehicles, has stated that it is seeking a way to rescue electric commercial vehicle maker Modec, which recently entered administration. Liberty Electric Cars CEO, Barry Shrier, has committed significant resources within the Liberty organization to see how to help Modec. Speaking earlier in the week, Shrier said that he believes Modec needs to be rescued by a UK firm to secure jobs and retain engineering expertise in this country.

Complete Article: http://www.greencarcongress.com/2011/03/liberty-20110313.html#more

Builders erect ZeaChem's cellulosic ethanol plant at Port of Morrow

Source: East Oregonian – March 13th, 2011

ZeaChem's cellulosic ethanol demonstration plant is more than one-third finished. Builders erected three 40,000-gallon fermentation tanks this week and continued bolting together the steel structure for the two-story operations building. Excavation began last fall, and contractors poured a concrete pad for the building and other components in November. "We really got going in late fall," said Craig Spidle, director of the construction/design-build group for Burns & McDonnell of Chesterfield, Mo. He said the structure is 35 percent complete and should be finished by October. ZeaChem's 8-acre site is along Rail Loop Road on Port of Morrow land between Pacific Ethanol and Cargill.

Complete Article: http://www.eastoregonian.com/news/builders-erect-cellulosic-ethanol-plant-at-port-of-morrow/article_48088dac-4d5a-11e0-b98b-001cc4c002e0.html

Standards roadmap on the way for EV deployment

Source: Smart Grid News – March 15th, 2011

Standards for the safe mass deployment of EVs have been conspicuously missing from the equation – but help is on the way. The American National Standards Institute (ANSI) is creating an Electric Vehicles Standards Panel (EVSP) to guide a coordinated and collaborative effort between major public and private stakeholders to ensure that EV rollouts happen smoothly. The decision to set up the panel came as the result of suggestions that a coordinated approach is needed in the U.S. to keep up with EV standards efforts in other countries, according to a news report from Metering.com.

Complete Article: http://www.smartgridnews.com/artman/publish/news/Standards-roadmap-on-the-way-for-EV-deployment-3563.html

Chromatin launches new SweetFuel sorghum hybrids at BioPro

Source: Biofuels Digest – March 15th, 2011

Chromatin announced its dual□purpose SweetFuel sorghum hybrids, which combine High yields of both fermentable sugar and biomass per acre. Chromatin's SweetFuel hybrids are ideal for capturing the value of sugars produced in sorghum juice as well as the additional value of the energy stored in biomass or bagasse. Jessen's presentation at the session on Transformative Technologies at the BioPro Expo also emphasized the potential for future sorghum improvements, including near□term advances from breeding, as well as next□generation designs that will deploy Chromatin's proprietary gene stacking technology.

Complete Article: http://biofuelsdigest.com/bdigest/2011/03/15/chromatin-launches-new-sweetfuel-sorghum-hybrids-at-biopro/

Smith Electric Vehicles Completes $58M Private Placement

Source: REVE – March 16th, 2011

Smith Electric Vehicles U.S. Corp., a maker of battery-powered electric trucks, has raised $58 million from unidentified investors. The financing includes $39 million in Series B convertible preferred stock, as well as $19 million in bridge notes and warrants converted into Series B preferred shares. The proceeds will be used for working capital, the company said in a statement.

Complete Article: http://www.evwind.es/noticias.php?id_not=10828

Renault in Deal to Provide Electric Cars to Ex-Soviet Republic of Georgia

Source: Bloomberg – March 18th, 2011

Renault SA (RNO) signed an agreement to provide electric cars to Georgia starting next year, the former Soviet republic's economic development ministry said today. The French carmaker will initially conduct feasibility studies and help develop infrastructure, the statement said.

Complete Article: http://www.bloomberg.com/news/2011-03-18/renault-in-deal-to-provide-electric-cars-to-ex-soviet-republic-of-georgia.html

Lignol Develops Cellulosic Ethanol Project with Novozymes

Source: The Bioenergy Site – March 18th, 2011

Advanced biofuels technology and renewable chemicals company Lignol Energy Corporation's subsidiary, Lignol Innovations Ltd, has completed a major body of work with Novozymes in producing cellulosic ethanol at Lignol's pilot-scale biorefinery. Lignol and Novozymes had previously announced a joint research and development agreement to make biofuel from wood chips and forestry waste with the aim of producing biofuel (cellulosic ethanol) at production costs competitive with gasoline and corn ethanol. The first phase of the project, which included producing cellulosic ethanol from hardwood at Lignol's pilot-scale biorefinery, has been successfully completed. These joint efforts have resulted in the achievement of interim targets, establishing baseline production costs for the next phase of the project which will focus on enzyme and substrate optimisation with the objective of achieving the overall cost reduction targets.

Complete Article: http://www.thebioenergysite.com/news/8366/lignol-develops-cellulosic-ethanol-project-with-novozymes

ANALYST(S) CERTIFICATION(S)

I, Vishal Shah, hereby certify (1) that the views expressed in this research report accurately reflect my personal views about any or all of the subject securities or issuers referred to in this research report and (2) no part of my compensation was, is or will be directly or indirectly related to the specific recommendations or views expressed in this research report.

IMPORTANT DISCLOSURES

For current important disclosures, including, where relevant, price target charts, regarding companies that are the subject of this research report, please send a written request to: Barclays Capital Research Compliance, 745 Seventh Avenue, 17th Floor, New York, NY 10019 or refer to http://publicresearch.barcap.com or call 1-212-526-1072.

The analysts responsible for preparing this research report have received compensation based upon various factors including the firm's total revenues, a portion of which is generated by investment banking activities.

On September 20, 2008, Barclays Capital acquired Lehman Brothers' North American investment banking, capital markets, and private investment management businesses. All ratings and price targets prior to this date relate to coverage under Lehman Brothers Inc.

Barclays Capital produces a variety of research products including, but not limited to, fundamental analysis, equity-linked analysis, quantitative analysis, and trade ideas. Recommendations contained in one type of research product may differ from recommendations contained in other types of research products, whether as a result of differing time horizons, methodologies, or otherwise.

Materially Mentioned Stocks (Ticker, Date, Price)

Codexis, Inc. (CDXS, 18-Mar-2011, USD 10.99), 2-Equal Weight/2-Neutral

Guide to the Barclays Capital Fundamental Equity Research Rating System:

Our coverage analysts use a relative rating system in which they rate stocks as 1-Overweight, 2-Equal Weight or 3-Underweight (see definitions below) relative to other companies covered by the analyst or a team of analysts that are deemed to be in the same industry sector (the "sector coverage universe").

In addition to the stock rating, we provide sector views which rate the outlook for the sector coverage universe as 1-Positive, 2-Neutral or 3-Negative (see definitions below). A rating system using terms such as buy, hold and sell is not the equivalent of our rating system. Investors should carefully read the entire research report including the definitions of all ratings and not infer its contents from ratings alone.

Stock Rating

1-Overweight - The stock is expected to outperform the unweighted expected total return of the sector coverage universe over a 12-month investment horizon.

2-Equal Weight - The stock is expected to perform in line with the unweighted expected total return of the sector coverage universe over a 12-month investment horizon.

3-Underweight - The stock is expected to underperform the unweighted expected total return of the sector coverage universe over a 12-month investment horizon.

RS-Rating Suspended - The rating and target price have been suspended temporarily due to market events that made coverage impracticable or to comply with applicable regulations and/or firm policies in certain circumstances including when Barclays Capital is acting in an advisory capacity in a merger or strategic transaction involving the company.

Sector View

1-Positive - sector coverage universe fundamentals/valuations are improving.

2-Neutral - sector coverage universe fundamentals/valuations are steady, neither improving nor deteriorating.

3-Negative - sector coverage universe fundamentals/valuations are deteriorating.

Below is the list of companies that constitute the "sector coverage universe":

U.S. Clean Technology

A123 Systems Inc. (AONE)	American Superconductor Corp. (AMSC)	Canadian Solar Inc. (CSIQ)
China Sunergy Co., Ltd. (CSUN)	Clean Energy Fuels Corp. (CLNE)	Codexis, Inc. (CDXS)
Comverge Inc. (COMV)	Ener1, Inc. (HEV)	Energy Conversion Devices (ENER)
EnerNOC Inc. (ENOC)	First Solar Inc. (FSLR)	GT Solar International Inc. (SOLR)
Hanwha SolarOne Co., Ltd. (HSOL)	Itron Inc. (ITRI)	JA Solar Holdings Co., Ltd. (JASO)
LDK Solar Company Limited (LDK)	MEMC Electronic Materials (WFR)	Power-One Inc. (PWER)
ReneSola Ltd. (SOL)	SmartHeat Inc. (HEAT)	SunPower Corp. (SPWRA)
Suntech Power Holdings (STP)	Trina Solar Limited (TSL)	Yingli Green Energy Holding Co., Ltd. (YGE)

Distribution of Ratings:

IMPORTANT DISCLOSURES CONTINUED

Barclays Capital Inc. Equity Research has 1727 companies under coverage.

43% have been assigned a 1-Overweight rating which, for purposes of mandatory regulatory disclosures, is classified as a Buy rating; 54% of companies with this rating are investment banking clients of the Firm.

43% have been assigned a 2-Equal Weight rating which, for purposes of mandatory regulatory disclosures, is classified as a Hold rating; 46% of companies with this rating are investment banking clients of the Firm.

12% have been assigned a 3-Underweight rating which, for purposes of mandatory regulatory disclosures, is classified as a Sell rating; 36% of companies with this rating are investment banking clients of the Firm.

Guide to the Barclays Capital Price Target:

Each analyst has a single price target on the stocks that they cover. The price target represents that analyst's expectation of where the stock will trade in the next 12 months. Upside/downside scenarios, where provided, represent potential upside/potential downside to each analyst's price target over the same 12-month period.

Barclays Capital offices involved in the production of equity research:

London

Barclays Capital, the investment banking division of Barclays Bank PLC (Barclays Capital, London)

New York

Barclays Capital Inc. (BCI, New York)

Tokyo

Barclays Capital Japan Limited (BCJL, Tokyo)

São Paulo

Banco Barclays S.A. (BBSA, São Paulo)

Hong Kong

Barclays Bank PLC, Hong Kong branch (Barclays Bank, Hong Kong)

Toronto

Barclays Capital Canada Inc. (BCC, Toronto)

Johannesburg

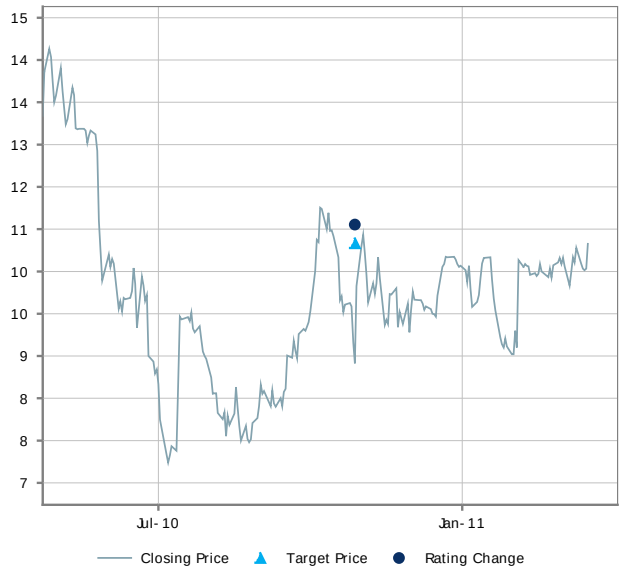
Absa Capital, a division of Absa Bank Limited (Absa Capital, Johannesburg)

IMPORTANT DISCLOSURES CONTINUED

Codexis, Inc. (CDXS)

	Stock Rating	Sector View
USD 10.99 (18-Mar-2011)	**2-EQUAL WEIGHT**	**2-NEUTRAL**

Rating and Price Target Chart - USD (as of 18-Mar-2011) **Currency=USD**



Date	Closing Price	Rating	Price Target
28-Oct-2010	8.87	2-Equal Weight	11.00

Link to Barclays Capital Live for interactive charting

Barclays Bank PLC and/or an affiliate trades regularly in the shares of Codexis, Inc..

Valuation Methodology: Our price target of $11 is based on a DCF analysis using the following framework: CAGR of 26% from 2011 through 2020, WACC of 6.4%, and a terminal value of 2%.

Risks which May Impede the Achievement of the Price Target: i) Lack of near-term profitability, possibly until 2013, ii) Shell R&D agreement could end earlier than expected, limiting main source of revenues, iii) Cosan & Shell joint venture may be delayed or cancelled, limiting long-term growth prospects and potential revenue source, iv) biofuels industry may not grow as expected, negatively affecting long-term growth potential.

This publication has been prepared by Barclays Capital, the investment banking division of Barclays Bank PLC, and/or one or more of its affiliates as provided below. It is provided to our clients for information purposes only, and Barclays Capital makes no express or implied warranties, and expressly disclaims all warranties of merchantability or fitness for a particular purpose or use with respect to any data included in this publication. Barclays Capital will not treat unauthorized recipients of this report as its clients. Prices shown are indicative and Barclays Capital is not offering to buy or sell or soliciting offers to buy or sell any financial instrument.

Without limiting any of the foregoing and to the extent permitted by law, in no event shall Barclays Capital, nor any affiliate, nor any of their respective officers, directors, partners, or employees have any liability for (a) any special, punitive, indirect, or consequential damages; or (b) any lost profits, lost revenue, loss of anticipated savings or loss of opportunity or other financial loss, even if notified of the possibility of such damages, arising from any use of this publication or its contents.

Other than disclosures relating to Barclays Capital, the information contained in this publication has been obtained from sources that Barclays Capital believes to be reliable, but Barclays Capital does not represent or warrant that it is accurate or complete. The views in this publication are those of Barclays Capital and are subject to change, and Barclays Capital has no obligation to update its opinions or the information in this publication.

The analyst recommendations in this publication reflect solely and exclusively those of the author(s), and such opinions were prepared independently of any other interests, including those of Barclays Capital and/or its affiliates. This publication does not constitute personal investment advice or take into account the individual financial circumstances or objectives of the clients who receive it. The securities discussed herein may not be suitable for all investors. Barclays Capital recommends that investors independently evaluate each issuer, security or instrument discussed herein and consult any independent advisors they believe necessary. The value of and income from any investment may fluctuate from day to day as a result of changes in relevant economic markets (including changes in market liquidity). The information herein is not intended to predict actual results, which may differ substantially from those reflected. Past performance is not necessarily indicative of future results.

This communication is being made available in the UK and Europe primarily to persons who are investment professionals as that term is defined in Article 19 of the Financial Services and Markets Act 2000 (Financial Promotion Order) 2005. It is directed at, and therefore should only be relied upon by, persons who have professional experience in matters relating to investments. The investments to which it relates are available only to such persons and will be entered into only with such persons. Barclays Capital is authorized and regulated by the Financial Services Authority ('FSA') and member of the London Stock Exchange.

Barclays Capital Inc., U.S. registered broker/dealer and member of FINRA (www.finra.org), is distributing this material in the United States and, in connection therewith accepts responsibility for its contents. Any U.S. person wishing to effect a transaction in any security discussed herein should do so only by contacting a representative of Barclays Capital Inc. in the U.S. at 745 Seventh Avenue, New York, New York 10019.

Non-U.S. persons should contact and execute transactions through a Barclays Bank PLC branch or affiliate in their home jurisdiction unless local regulations permit otherwise.

This material is distributed in Canada by Barclays Capital Canada Inc., a registered investment dealer and member of IIROC (www.iiroc.ca).

Subject to the conditions of this publication as set out above, Absa Capital, the Investment Banking Division of Absa Bank Limited, an authorised financial services provider (Registration No.: 1986/004794/06), is distributing this material in South Africa. Absa Bank Limited is regulated by the South African Reserve Bank. This publication is not, nor is it intended to be, advice as defined and/or contemplated in the (South African) Financial Advisory and Intermediary Services Act, 37 of 2002, or any other financial, investment, trading, tax, legal, accounting, retirement, actuarial or other professional advice or service whatsoever. Any South African person or entity wishing to effect a transaction in any security discussed herein should do so only by contacting a representative of Absa Capital in South Africa, 15 Alice Lane, Sandton, Johannesburg, Gauteng 2196. Absa Capital is an affiliate of Barclays Capital.

In Japan, foreign exchange research reports are prepared and distributed by Barclays Bank PLC Tokyo Branch. Other research reports are distributed to institutional investors in Japan by Barclays Capital Japan Limited. Barclays Capital Japan Limited is a joint-stock company incorporated in Japan with registered office of 6-10-1 Roppongi, Minato-ku, Tokyo 106-6131, Japan. It is a subsidiary of Barclays Bank PLC and a registered financial instruments firm regulated by the Financial Services Agency of Japan. Registered Number: Kanto Zaimukyokucho (kinsho) No. 143.

Barclays Bank PLC, Hong Kong Branch is distributing this material in Hong Kong as an authorised institution regulated by the Hong Kong Monetary Authority. Registered Office: 41/F, Cheung Kong Center, 2 Queen's Road Central, Hong Kong.

Barclays Bank PLC Frankfurt Branch distributes this material in Germany under the supervision of Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin).

This material is distributed in Malaysia by Barclays Capital Markets Malaysia Sdn Bhd.

This material is distributed in Brazil by Banco Barclays S.A.

Barclays Bank PLC in the Dubai International Financial Centre (Registered No. 0060) is regulated by the Dubai Financial Services Authority (DFSA). Barclays Bank PLC-DIFC Branch, may only undertake the financial services activities that fall within the scope of its existing DFSA licence.

Barclays Bank PLC in the UAE is regulated by the Central Bank of the UAE and is licensed to conduct business activities as a branch of a commercial bank incorporated outside the UAE in Dubai (Licence No.: 13/1844/2008, Registered Office: Building No. 6, Burj Dubai Business Hub, Sheikh Zayed Road, Dubai City) and Abu Dhabi (Licence No.: 13/952/2008, Registered Office: Al Jazira Towers, Hamdan Street, PO Box 2734, Abu Dhabi).

Barclays Bank PLC in the Qatar Financial Centre (Registered No. 00018) is authorised by the Qatar Financial Centre Regulatory Authority (QFCRA). Barclays Bank PLC-QFC Branch may only undertake the regulated activities that fall within the scope of its existing QFCRA licence. Principal place of business in Qatar: Qatar Financial Centre, Office 1002, 10th Floor, QFC Tower, Diplomatic Area, West Bay, PO Box 15891, Doha, Qatar.

This material is distributed in Dubai, the UAE and Qatar by Barclays Bank PLC. Related financial products or services are only available to Professional Clients as defined by the DFSA, and Business Customers as defined by the QFCRA.

This material is distributed in Saudi Arabia by Barclays Saudi Arabia ('BSA'). It is not the intention of the Publication to be used or deemed as recommendation, option or advice for any action (s) that may take place in future. Barclays Saudi Arabia is a Closed Joint Stock Company, (CMA License No. 09141-37). Registered office Al Faisaliah Tower | Level 18 | Riyadh 11311 | Kingdom of Saudi Arabia. Authorised and regulated by the Capital Market Authority, Commercial Registration Number: 1010283024.

This material is distributed in Russia by Barclays Capital, affiliated company of Barclays Bank PLC, registered and regulated in Russia by the FSFM. Broker License #177-11850-100000; Dealer License #177-11855-010000. Registered address in Russia: 125047 Moscow, 1st Tverskaya-Yamskaya str. 21.

This material is distributed in India by Barclays Bank PLC, India Branch.

This material is distributed in Singapore by the Singapore branch of Barclays Bank PLC, a bank licensed in Singapore by the Monetary Authority of Singapore. For matters in connection with this report, recipients in Singapore may contact the Singapore branch of Barclays Bank PLC, whose registered address is One Raffles Quay Level 28, South Tower, Singapore 048583.