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Pavel Molchanov, (713) 278-5270, Pavel.Molchanov@RaymondJames.com

Energy: Stat of the Week

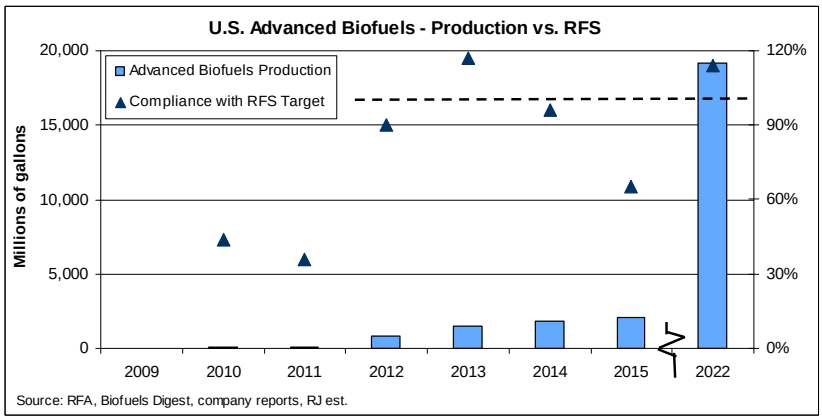
Gen2 Biofuels: Despite Growing Pains, Billion-Gallon Milestone Within Reach

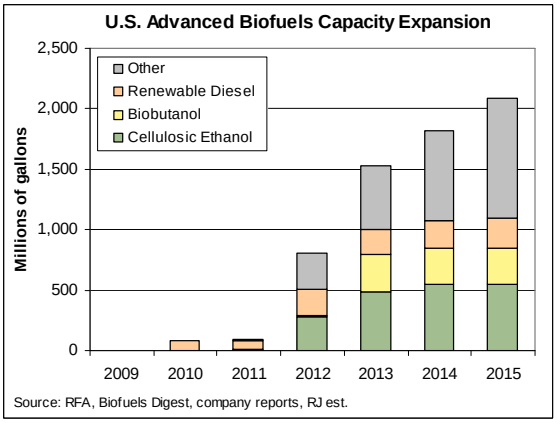
This week, we will be attending the Advanced Biofuels Markets conference in San Francisco, a major gathering of public and private companies in an industry that should over time become a real "game-changer" for U.S. and global fuel markets – next-generation (Gen2) biofuels. In our report from April 25, "Gen2 Biofuels Get Ready for Prime Time," we discussed the torrent of activity in the space – project announcements, industry partnerships and joint ventures, policy developments, and capital markets activity. Ahead of the conference, today we provide an update. Amid volatile commodity and equity markets, and despite some growing pains along the way, the industry continues to develop. We expect 2012 to be a critical period as a wide variety of Gen2 biofuels approach commercialization, and companies increasingly "graduate" from the pre-revenue stage to full commercial operations.

Slow scale-up means Gen2 RFS targets won't be met until at least 2013

Here is something that has **not** changed since April: the industry is behind on meeting its federal targets. When Congress enacted the Renewable Fuels Standard's Gen2 provisions in 2007, the cellulosic target for 2010 was set at 100 million gallons. The actual figure was… practically zero. For 2011, the target is 250 million, but the EPA has essentially waived it, cutting it to a measly 6 million (or 0.0003% of the fuel mix). For 2012, the EPA is not much more optimistic: its proposal calls for requiring less than 13 million gallons. (As a side note, our definition of "Gen2 biofuels" – which varies slightly from the formal EPA definition of "advanced biofuels" – covers just about everything other than conventional ethanol, derived from sugarcane or corn, and conventional biodiesel, derived from soybean oil or other plant oils. Cellulosic biofuels are a subset of Gen2 biofuels.)

So how long will the market have to wait? For this analysis, we used the latest company-level data from the *Biofuels Digest*, which helped organize this week's conference. Based on the U.S. capacity expansion timelines of Gen2 biofuel producers, there will be de minimis volumes (under 100 million gallons) until the end of 2012. The first real growth spurt comes in 2013, with capacity jumping to ~800 million gallons, and then it's set to roughly triple by year-end 2015. (For some perspective, corn ethanol capacity is currently at ~14.7 billion gallons, and while it won't grow much in the coming years, it will exceed Gen2 until well into the second half of this decade.) Bottom line: Gen2 production could reach the RFS target in 2013 (consistent with our expectations from April) but will remain a marginal component of the overall fuel mix until 2015+. To be clear, these numbers only take into account Gen2 capacity located in the U.S. Including Brazilian and other projects, total global capacity should reach ~1.5 billion gallons by the end of 2012, and the 2015 figure would be over 4 billion gallons. That said, it's unlikely that large volumes from abroad would make their way into the U.S. market. Furthermore, as we discuss later in the report, a meaningful portion of Gen2 volumes will be sold into the chemicals market, so volumes available for use as fuel will inherently be less than the "best-case" assumptions shown below.





Please read domestic and foreign disclosure/risk information beginning on page 10 and Analyst Certification on page 10.

Why have Gen2 biofuels been so slow to scale up?

The Gen2 space encompasses a wide variety of products. As a very brief primer, here is a look at the main categories.

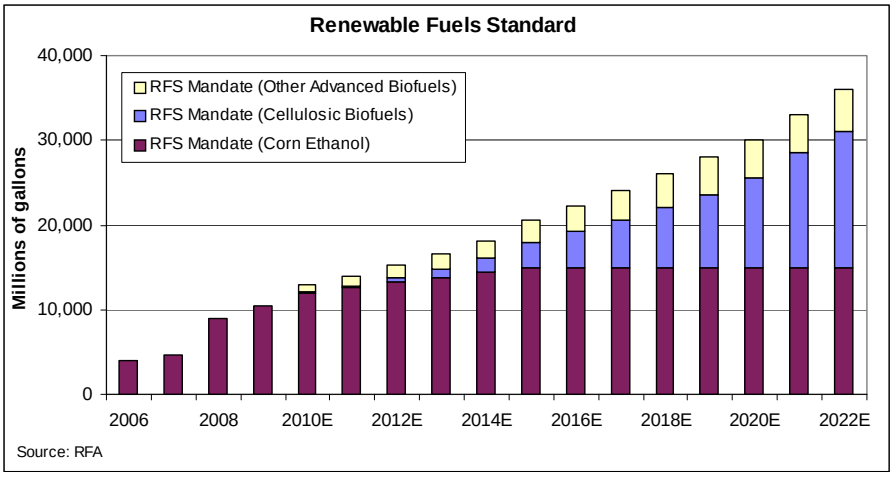
- **Cellulosic ethanol:** An oxygenate that is blended into gasoline. Produced from non-food feedstocks, such as wood chips.
- **Biobutanol:** A drop-in fuel that can be blended into gasoline (in conjunction with, or as a substitute for, ethanol) and can be used as an input for diesel or jet fuel. Produced from food and non-food feedstocks.
- **Renewable diesel:** A drop-in fuel that has several advantages over conventional biodiesel, for example the ability to be used in cold climates. Produced from food and non-food feedstocks.
- **Renewable jet fuel (biojet):** A drop-in fuel that can be blended into jet fuel. Produced from food and non-food feedstocks.
- **Biocrude:** A drop-in fuel that can be processed (using standard refinery infrastructure) into gasoline, diesel or jet fuel. Produced from food and non-food feedstocks.

There are two primary reasons behind the delays in Gen2 scale-up. First, the commercialization roadmap entails significant execution risks. This is true both for companies using a biochemical production process (fermentation), which involves a large element of biotech R&D, as well as for those using a thermochemical process. For example, biochemical production of cellulosic biofuels typically requires enzymes for breaking down biomass. While such enzymes exist in carefully calibrated lab settings, applying them in 20+ million gallon plants is not trivial. There are entire companies devoted to extraction of sugars from biomass, such as HCL CleanTech and Renmatix. On a related point, because local supply of biomass can be constrained, there is a growing need for energy crops (developed by, among others, Agrivida and SG Biofuels). Algae technology – a platform to make renewable diesel, among other products – carries its own challenges, such as optimizing nutrient solutions. As seen with the technical problems at cellulosic ethanol developer Range Fuels, thermochemical biofuel production is by no means immune to operational risks.

Second, Gen2 capacity expansion is highly capital-intensive. As a rule of thumb, plants with lower cash production costs (e.g., able to use cheap feedstock) tend to require higher upfront capital. For example, KiOR, which is developing cellulosic biocrude, projects the cost of its first commercial plant at ~$200 million (~$160 million not including a hydrotreater). Based on the expected initial yield, annual production would be ~13 million gallons, equating to a capital cost of ~$15/gal (~$12/gal ex-hydrotreater). To put this in context, modern corn ethanol plants have been built for around $2/gal. Venture funding can get companies to the proof-of-concept stage but is rarely enough to pay for major scale-up, so other capital must be accessed. In the rest of this report, we will look at Gen2 financing options: government funding, strategic partnerships, and the capital markets.

Washington has a role to play in moving Gen2 biofuels forward, but the RFS alone is not enough

The longest-standing federal policy in support of biofuels is the RFS. Aggregating both conventional and Gen2 biofuels, the RFS targets a gradual climb from 13.95 billion gallons in 2011 to 36 billion gallons in 2022. For the time being, the corn ethanol mandate represents the vast majority of the total RFS (90% in 2011), but it will plateau at 15 billion gallons starting in 2015. To be clear, this isn't to say that corn ethanol usage can't ultimately top 15 billion gallons, but the driver of demand for those "excess" gallons shifts solely to blending economics. Furthermore, significantly wider penetration would hinge on breaking through the "blending wall." This could be accomplished in two ways. First, the EPA could allow the use of E15 in all vehicles. At present, E15 is only allowed for certain newer-model vehicles, with the rest still limited to E10. A second factor could be major expansion in flex-fuel vehicles (which can run on E85), currently less than 5% of U.S. vehicles on the road (though a somewhat higher percentage of new vehicle sales).



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Unlike the flattening corn ethanol requirement, the RFS-mandated growth curve for advanced biofuels ramps up massively over time, from 1.35 billion gallons in 2011 to 21 billion gallons in 2022 – a more than 15x increase. In particular, the cellulosic mandate reaches 15 billion gallons in 2022, i.e., matching corn ethanol in size. While there is no realistic way for the Gen2 industry to meet the RFS's targets until 2013 at the earliest, there is no reason why the targets will not ultimately be surpassed when enough companies scale up. The question therefore becomes: what can Washington do to support the industry's commercialization roadmap?

The USDA and DoE haven't been especially generous in their support of biofuels, but the Pentagon is stepping up

Although relevant research at the National Renewable Energy Laboratory, among other agencies, can contribute to breakthroughs on the R&D side, the government is much better positioned to help the private sector by doing what it does best: writing big checks. Federal loan guarantees are key sources of funding for many clean energy companies, but it's particularly critical for Gen2, because these technologies have historically been almost entirely in the R&D stage. Mainstream adoption of wind, solar and geothermal power in the U.S. is far ahead of Gen2, and thus commercial funding options (e.g. traditional bank loans) are more widely available. The Department of Agriculture (USDA) has a long history of giving both grants and loan guarantees to Gen2 developers. For example, Range Fuels' cellulosic ethanol plant in Georgia (which is now shut down) was funded partly by a USDA grant. In September 2011, ZeaChem, also a cellulosic ethanol developer, received a $40 million grant together with its partners. Coskata and Canadian-based Enerkem, among others, have been offered USDA loan guarantees for their cellulosic ethanol projects.

The Department of Energy has historically been less active in handing out biofuel loan guarantees – to the industry's considerable disappointment – and lest you blame that on Solyndra, keep in mind that Section 1705 of the DoE's clean energy loan guarantee program expired on September 30, 2011, just a few weeks after that ill-fated solar company filed for bankruptcy. (There is also funding available under Section 1703, which has no sunset date.) The DoE's first-ever Gen2 loan guarantee came in January 2011; the recipient was Diamond Green Diesel, a joint venture between Valero Energy (the largest U.S. independent refiner) and Darling International, which will use the $241 million loan for a renewable diesel plant in Louisiana. Another recipient has been Abengoa Bioenergy, part of a large Spanish conglomerate. Notice that both of these projects are backed by companies that don't particularly need DoE financing. While a number of early-stage developers received term sheets, some decided that the DoE's conditions were excessively stringent. KiOR, which aims to build four biocrude plants in Mississippi, Georgia and Texas – in aggregate, costing well over a billion – opted to turn down the DoE (at least in the 2011 round). Above and beyond the often-onerous equity contribution requirements, the length and complexity of the DoE loan process has been a textbook example of Washington red tape for practically all companies that have gone through it.

That the USDA and (half-heartedly) the DoE are supporting Gen2 commercialization is intuitive. What we find more interesting is that arguably the most proactive stance toward Gen2 companies is coming from the Department of Defense (DoD). For the military, diversifying the energy mix is a tangible policy priority that is being acted on. As detailed in our industry brief from September 17, 2010, the DoD is the largest consumer of energy in the U.S., accounting for ~2% of nationwide energy consumption. While civilian politicians are dithering over energy policy, the DoD has actually done something about it, adopting a formal target of sourcing 25% of its energy consumption from renewables by 2025. En route to its target, the DoD is emerging as a leader in the early adoption of Gen2.

The Air Force and Navy account for ~64% and ~19% of the DoD's total fuel costs, respectively. The Navy and Marine Corps have the goal of sourcing 50% of all (non-nuclear) fuels from renewable sources by 2020, which includes marine fuel for the conventionally powered surface fleet as well as jet fuel for naval aviation. Similarly, the Air Force aims to acquire 50% of its jet fuel for domestic operations from alternative blends by 2016. To achieve these targets, the Navy and Air Force have implemented test programs for alternative fuels, and the Defense Logistics Agency is signing contracts (and expanding existing ones) with Gen2 biofuel developers to secure supply for testing. In 2009, for example, the Navy ordered 20,000 gallons of Solazyme's algae-based HRF-76 Naval Distillate. One year later, an order was placed for an additional 150,000 gallons, a 7.5x increase. Other biofuel companies working with the DoD include Rentech and Accelergy, both of which can use coal and biomass to produce synthetic fuels; Gevo, a developer of isobutanol; and Cobalt Biofuels, a developer of n-biobutanol. In August 2011, the DoD, USDA and DoE jointly announced plans to spend $510 million over a three-year period to support scale-up of drop-in aviation and marine fuels.

Strategic partnerships: Energy companies and plenty of others are jumping on the Gen2 bandwagon

Uncle Sam is not rich enough to fund every Gen2 company – certainly not the way its balance sheet is looking these days. And even if it could, access to market requires collaboration with private-sector industry partners. For Gen2 developers, the most common scale-up model involves "big brother" partnerships. These partnerships, which can include direct equity stakes, provide financial support for R&D, production scale-up and/or distribution. While some partnerships involve leading oil and gas companies and aim at traditional fuel markets (with a view to compliance with the RFS and analogous policies abroad), others focus on more specialized, even "niche," applications. And while most partnerships are on the downstream end of the value chain (i.e., focused on end users), plenty of others are on the upstream end (i.e., with feedstock suppliers).

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Integrated majors and refiners. These are the most obvious partners for Gen2 developers, though they also tend to be conservatively run businesses that are slow to adopt new technologies. Some companies are taking a focused approach; for example, ExxonMobil is investing $600 million over a 10-year period in algae-based biofuels, with $300 million going to Synthetic Genomics. Others are taking more of a portfolio approach; Shell has four full-fledged biofuel partnerships: Cosan (ethanol in Brazil), Codexis (biocatalysts for cellulosic biofuels), Iogen (cellulosic ethanol), and Virent Energy (biogasoline). Given the inherent power imbalance between multinationals and Gen2 start-ups, key issues to resolve in negotiations include exclusivity and intellectual property rights. Of course, not all partnerships end up bearing fruit; in January 2011, Shell exited its joint venture with algae developer HR BioPetroleum (now called Cellana) to refocus on its other biofuel initiatives.

Chemical companies. As discussed later in the report, renewable chemicals are a major market opportunity for Gen2 developers. For chemical producers, renewables provide an opportunity to diversify inputs (i.e., hedge against a spike in oil and natural gas prices), potentially achieve cost savings, and (if they have a retail customer base) create a greener corporate image. Procter & Gamble, for example, has partnered with Amyris and LS9 to develop products aimed at the consumer market. Dow Chemical and Solazyme are working to create algae-based dielectric insulating fluids for transformers – a niche market that is nevertheless estimated at 500 million gallons per year. Gevo plans to focus on selling to two major chemical companies – Lanxess (which holds an equity stake in Gevo) and Sasol – once its isobutanol production scales up in 2012. (It goes without saying that some chemical companies also have partnerships with renewable chemical pure-plays, such as Dow's collaboration with OPX Biotechnologies on bio-acrylic, an $8 billion addressable market.)

Cosmetics and fragrance companies. The flavors and fragrances market offers ultra-premium, high-end sales opportunities. For example, Amyris has partnered with Swiss-based Givaudan to develop a proprietary fragrance ingredient using Amyris' farnesene. The personal care / cosmetics industry is similar conceptually in the sense of being a high-ASP (average selling price), retail-oriented market. Examples of industry collaborations here include Amyris' partnership with French-based Soliance to produce squalane, an ingredient used in cosmetics; and Solazyme's collaboration with Sephora on an algae-based skincare line. If these partnerships seem light years away from what you normally think of as biofuels, that's the whole point. For 2011, for example, Amyris has been guiding to ASPs in excess of $20/gal on the back of its presence in the market for squalane.

Airlines. As detailed in our industry brief from February 14, 2011, the market for renewable jet fuel (biojet) is in its infancy – and regulatory hurdles are not trivial – but the long-term opportunity is very real. With this in mind, some leading airlines are forming partnerships with Gen2 developers. These typically start with R&D collaboration (at the current stage) while also providing for offtake agreements upon commercialization. For example, the partnership between Australia's Qantas and Solazyme aims at commercial production of Solazyme's algae biojet. Qantas' CEO has said that his goal is 2-3% biojet use by 2015. This is Qantas' second biofuel partnership, the other being with Solena Group (which is also a partner of British Airways). United has a letter of intent for an offtake agreement with Gevo, calling for up to 200 million gallons of annualized isobutanol sales by 4Q12, ramping up six-fold by 2020. Virgin Atlantic has partnered with New Zealand-based LanzaTech. In Brazil, Azul Linhas Aéreas has partnered with both Embraer (the country's leading aircraft manufacturer) and Amyris.

Feedstock suppliers. Amid a global bull market for virtually all commodities, access to attractively priced feedstock is a key theme across the biofuel industry. In a synergistic deal, a feedstock supplier can partner with a Gen2 developer, and the two share the economics. A common partnership model is for a Gen2 developer to leverage existing infrastructure, as Amyris and Solazyme are both doing in Brazil (building plants next to sugarcane mills) and Gevo in the U.S. (retrofitting corn ethanol plants). Why would their partners want to do this? Because at today's sugarcane and corn prices, it's practically impossible to make money with conventional ethanol, and Gen2 companies offer a platform to sell premium-priced products using the exact same feedstock. Feedstock partnerships can also involve non-food feedstocks. Waste Management, the world's largest solid waste services provider, is working with Enerkem on waste-to-ethanol projects. A particularly unique example of leveraging waste feedstocks is LanzaTech, which has partnered with multiple steel companies – including Chinese giant Baosteel Group – to produce ethanol and other biofuels from steel mill off-gases.

Renewable chemicals: just in case a multi-trillion dollar global fuel market isn't enough

As noted above, to get a complete picture of the Gen2 arena, it is not enough to understand the fuel market – investors have to look at chemicals as well. Just as biofuels are a substitute for petroleum-based transportation fuels, renewable chemicals are a substitute for traditional chemicals, which are derived from either petroleum or natural gas. Raw materials can comprise up to 60% of the total cost of chemicals production. The ~$3 trillion chemicals sector can be subdivided into three broad categories. Basic chemicals, also known as commodity chemicals, include various polymers and other building blocks for making more specialized products. This includes seven products with a global market of $20-150 billion each (averaging ~$38 billion). Specialty chemicals, also called fine chemicals, comprise a wide range of high-value products, such as industrial solvents, oilfield chemicals, and household detergents. Intermediate chemicals, as the name suggests, can be found between the other two categories, including ~30 products with a global market of $3-10 billion each (averaging ~$9 billion). Per-unit pricing and profitability of chemicals generally exceed those of

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transportation fuels, particularly for intermediate and specialty chemicals. Renewable substitutes already exist, or are being developed, in all three categories of chemicals. Similar to biofuels, renewable chemicals can be produced from a variety of feedstocks, such as corn, sugarcane, plant oils, and, longer term, cellulosic biomass.

While a number of the major chemical producers have in-house renewable initiatives, for purposes of this discussion we will focus on smaller players that focus on renewable solutions. The space can be broadly subdivided into two groups. First, there are renewable chemical pure-plays. Public companies in this group include Cereplast and Metabolix; private companies include Draths, Novomer, OPX Biotechnologies, Rennovia, and Segetis. The second group comprises companies that are pursuing opportunities in both renewable chemicals and Gen2 biofuels. Many of these companies are initially targeting chemicals but plan to diversify into fuels once they can sufficiently bring down costs, and each company strikes a slightly different balance between the two sets of opportunities. Public companies in this group include Amyris, Codexis, Gevo, and Solazyme; private companies include Algenol, Aurora, Cobalt, LS9, Verdezyne, and Virent.

How can U.S. investors play Gen2 biofuels and renewable chemicals?
There are more investable Gen2 options than ever before, but it's still a limited set of companies. Most Gen2 pure-plays remain privately held. Outside the realm of penny stocks, there are nine publicly traded U.S. pure-plays, totaling ~$3.5 billion in market cap. This includes two biofuel-only companies (KiOR and Syntroleum); two chemical-only companies (Cereplast and Metabolix); three "hybrid" biofuel/chemical companies (Amyris, Gevo and Solazyme); and two Gen2 derivatives (Codexis and Verenium). Five of these companies went public between April 2010 and June 2011, and the list should expand further, given the large number of pending IPOs in the space: at least ten as of this writing. It's interesting to note that this space comprises roughly two-thirds of all the pending IPOs in the clean tech sector. Below, we summarize our thoughts on the companies we have under coverage.

Amyris, Inc. (AMRS/Strong Buy). Amyris, which went public in September 2010, uses a fermentation platform to produce farnesene, a building block for renewable chemicals and biofuels. The company is focusing on Brazilian sugarcane as the primary feedstock and is partnering with sugar and ethanol mills in the country to establish production, thereby lowering capital costs vs. greenfield projects. The French supermajor Total holds an equity stake in Amyris and is collaborating on a renewable diesel JV; other industry partners include Cosan and Grupo São Martinho (two leading sugar and ethanol producers in Brazil) and Procter & Gamble. The company is currently producing in limited quantities via contract manufacturing. The first commercial-scale plant (the São Martinho JV) is on track to start up by mid-2012, though last week management noted that timing may be adjusted as the company looks to secure debt financing for future expansion. In September 2011, Amyris expanded its footprint into isoprene, the main ingredient in the production of synthetic rubber, as part of a partnership with Michelin. The high degree of visibility for Amyris' scale-up includes the most rapid timeline to profitability within the public peer group – we think it's plausible (on a non-GAAP basis) by year-end 2012.

Codexis, Inc. (CDXS/Market Perform). Codexis, which went public in April 2010, provides specialty enzymes called biocatalysts. Having commercialized its biocatalysts for pharmaceuticals, Codexis is focused on developing biocatalysts for cellulosic biofuels. At the core of the business model is a strategic partnership with Shell, which funds the bulk of Codexis' R&D expenses and also holds an equity stake. Shell's stake in Codexis is part of its JV with Brazil's Cosan, branded as Raizen. If Shell ultimately decides to commercialize the technologies that are being jointly developed, Codexis stands to receive two revenue streams – biocatalyst sales and royalties. The downside is that Codexis is heavily dependent on Shell, which – like all supermajors – tends to move slowly, especially with regard to new technologies. Within this context, the main risk we see is the lack of visibility on the timing of biofuels commercialization. To reduce its dependence on Shell, Codexis is targeting carbon management and chemicals opportunities. Earlier this year, the company announced a carbon-related partnership with aluminum giant Alcoa and a detergent alcohol partnership with Chemtex, part of Gruppo M&G.

Gevo, Inc. (GEVO/Outperform). Gevo, which went public in February 2011, uses a fermentation platform to produce isobutanol, a value-added fuel blendstock that, like ethanol, can be blended into gasoline. The advantage of isobutanol compared to ethanol is that it addresses the "blend wall" issue, i.e., it can be blended at levels above 10% in normal gasoline engines. Isobutanol can also be used as a building block for producing diesel and jet fuel, and it has chemical applications. Gevo's scale-up strategy is to retrofit U.S. corn ethanol facilities. The first commercial-scale plant, a wholly owned plant located in Minnesota, is expected to start up by mid-2012. Beyond this plant, Gevo is forming JVs with ethanol plant owners to avoid the expense of outright plant acquisitions. Gevo has offtake arrangements with Lanxess (the world's largest producer of butyl rubber), Sasol, United Air Lines, and others. Gevo also provides an illustration of intellectual property (IP) risk in this space: it is currently embroiled in a patent dispute with Butamax, a JV between BP and DuPont.

KiOR, Inc. (KIOR/Market Perform). KiOR, which went public in June 2011, is a true cellulosic biofuels company – i.e., it only uses non-food feedstocks, with a current focus on wood chips. KiOR's thermochemically produced biocrude is expected to be cost-competitive with petroleum, and the company has minimal interest in chemicals. In early 2011, KiOR received a term sheet for a sizable DoE loan guarantee, but management decided against it (at least in this year's round) in view of the onerous conditions

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imposed by the DoE. The company is currently building its first commercial-scale plant in Mississippi – with the help of an interest-free loan from the state – with start-up expected in 2H12. Subsequently, the plan is to build four even larger plants in Mississippi, Texas and Georgia, and international expansion is also being contemplated. The company is deliberately pursuing a fully own-and-operate business model, which maximizes value capture but is highly capital-intensive, raising project financing risks. While there are no strategic partners as such, there are offtake agreements with Hunt Refining, Catchlight Energy and FedEx.

Solazyme, Inc. (SZYM/Outperform). Solazyme, which went public in May 2011, uses a fermentation platform that is based on algae. By feeding plant sugars to its proprietary microalgae, Solazyme produces oils that can be processed into a wide range of end products: food ingredients, cosmetics, industrial chemicals, and biofuels. The company has a similarly diverse range of partners, including Chevron, Ecopetrol (Colombia's national oil company) and Qantas (Australia's largest airline) in the fuels arena; Dow Chemical in the specialty chemicals arena; and consumer products giant Unilever. Together with Ecopetrol and Bunge, a major Brazilian sugarcane processor, Solazyme is evaluating large-scale production options in Latin America, with completion of the first fuels/chemicals plant expected in 2013. In the meantime, the first phase of the company's nutrition products JV with Roquette, a French-based producer of starch derivatives, is set to start up in early 2012, with the follow-on phase coming in 2H12.

Conclusion

The next-generation (Gen2) biofuel arena is a young industry that is just starting to gain commercial traction. An important differentiator of this industry compared to many other areas of clean tech is that economics of Gen2 biofuels do **not** depend on government subsidies. Gen2 companies that are using traditional feedstocks (sugarcane, corn, plant oils) tend to focus on high-value markets such as specialty chemicals – which are never subsidized – while those that are using cellulosic biomass and other low-value feedstocks can compete with petroleum directly on cost. Insofar as Washington has been offering policy support, it has mainly been via the Renewable Fuels Standard, which provides a guaranteed demand floor for cellulosic and other advanced biofuels through 2022. The industry's slower-than-expected scale-up – a function of technology hurdles, along with financing constraints – means that the RFS's Gen2 targets will not be fulfilled over the next few years. As production capacity moves higher, the Gen2 growth curve should accelerate markedly beyond 2012, with global capacity reaching an estimated 4+ billion gallons by year-end 2015 (roughly half of that in the U.S.). In the long run, in fact, the RFS should lose its relevance altogether – within the context of our bullish thesis on crude oil, including a long-term price forecast of $125/Bbl. For now, a key driver of scale-up and mainstream adoption will be collaboration between Gen2 developers and strategic partners (oil and gas majors, refiners, chemical companies, airlines, and/or feedstock suppliers). Government loan guarantees and military contract opportunities are a secondary scale-up driver. As companies move along their commercialization roadmaps, there will be increasing opportunities for equity investors – hence the recent wave of IPOs, with more to come – though, of course, with substantial risks inherent in an early-stage industry.

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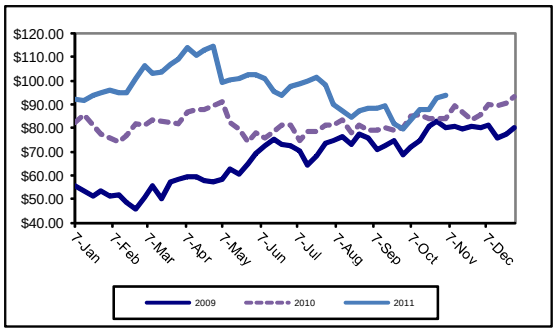
Raymond James Weekly Oilfield Review

For Week Ending: 11/4/2011

12 Month Oil Calendar Strip

West Texas Intermediate

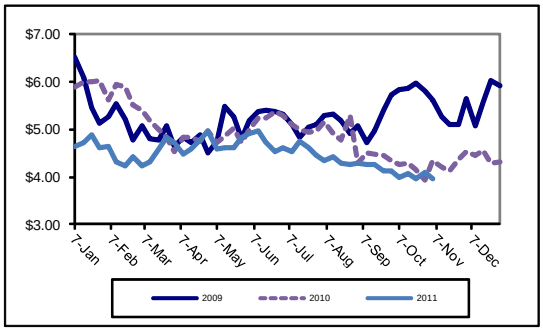


	This Week	Last Week	Beginning of Year	Last Year
Price	$94.01	$92.81	$91.97	$89.53
Percent Change		1.3%	2.2%	5.0%

Source: Bloomberg

12 Month Gas Calendar Strip

Henry Hub



	This Week	Last Week	Beginning of Year	Last Year
Price	$3.96	$4.09	$4.63	$4.22
Percent Change		-3.1%	-14.4%	-6.0%

Source: Bloomberg

	4-Nov-11 This Week	28-Oct-11 Last Week	5-Nov-10 Last Year	Change From: Last Week	Change From: Last Year
1. U.S.Rig Activity					
U.S. Oil	1,112	1,078	718	3.2%	54.9%
U.S. Gas	907	934	955	-2.9%	-5.0%
U.S. Miscellaneous	7	9	10		
U.S. Total	**2,026**	**2,021**	**1,683**	**0.2%**	**20.4%**
U.S. Horizontal	1,157	1,155	943	0.2%	22.7%
U.S. Directional	243	243	218	0.0%	11.5%
U.S. Offshore	34	35	23	-2.9%	47.8%
U.S. Offshore Gulf of Mexico					
Fleet Size	116	116	122	0.0%	-4.9%
# Contracted	65	65	63	0.0%	3.2%
Utilization	56.0%	56.0%	51.6%	0.0%	8.5%
U.S. Weekly Rig Permits *	1,352	1,476	1,095	-8.4%	23.5%
2. Canadian Activity					
Rig Count	476	499	417	-4.6%	14.1%
3. Stock Prices (11/4/11)					
OSX	233.3	242.0	222.6	-3.6%	4.8%
S&P 500	1,253.2	1,285.1	1,225.9	-2.5%	2.2%
DJIA	11,983.2	12,231.1	11,444.1	-2.0%	4.7%
S&P 1500 E&P Index	595.8	603.7	544.6	-1.3%	9.4%
Alerian MLP Index	371.0	374.8	361.4	-1.0%	2.6%
4. Inventories					
U.S. Gas Storage (Bcf)	3,794	3,716	3,821	2.1%	-0.7%
Canadian Gas Storage (Bcf)	674	672	634	0.2%	6.2%
Total Petroleum Inventories ('000 bbls)	856,085	853,563	913,204	0.3%	-6.3%
5. Spot Prices (US$)					
Oil (W.T.I. Cushing)	$94.26	$93.32	$86.85	1.0%	8.5%
Oil (Hardisty Med.)	$81.19	$80.88	$68.99	0.4%	17.7%
Gas (Henry Hub)	$3.44	$3.63	$3.47	-5.2%	-0.8%
Residual Fuel Oil (New York)	$16.77	$16.65	$12.27	0.7%	36.7%
Gas (AECO)	$3.40	$3.36	$3.29	1.2%	3.3%
UK Gas (ICE)	$9.47	$9.86	$7.82	-3.9%	21.0%

Sources: Baker Hughes, ODS-Petrodata, API, EIA, Oil Week, Bloomberg

** Note: Weekly rig permits reflect a 1 week lag*

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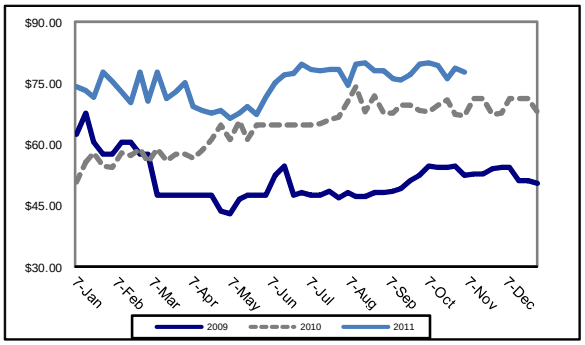
Raymond James Weekly Coal Review

For Week Ending: 11/4/2011

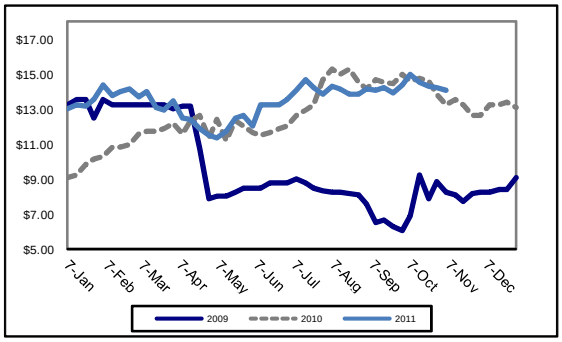
12 Month Big Sandy Barge Prices



	This Week	Last Week	Beginning of Year	Last Year
Price	$77.75	$78.80	$74.10	$66.90
Percent Change		-1.3%	4.9%	16.2%

Source: Bloomberg

12 Month Powder River Basin 8800 Prices



	This Week	Last Week	Beginning of Year	Last Year
Price	$14.05	$14.20	$13.00	$13.20
Percent Change		-1.1%	8.1%	6.4%

Source: Bloomberg

	4-Nov-11 This Week	28-Oct-11 Last Week	5-Nov-10 Last Year	Change From: Last Week	Change From: Last Year
1. Coal Prices					
Eastern U.S.					
CSX 1%	$77.75	$78.80	$66.90	-1.3%	16.2%
Western U.S.					
Powder River 8800	$14.05	$14.20	$13.20	-1.1%	6.4%
2. Production	**21-Oct-11**	**14-Oct-11**	**22-Oct-10**		
Eastern U.S.	8,563	8,594	8,571	-0.4%	-0.1%
Western U.S.	12,596	13,137	12,593	-4.1%	0.0%
Total	21,159	21,731	21,164	-2.6%	0.0%

Source: Bloomberg

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Company Citations

Company Name	Ticker	Exchange	Currency	Closing Price	RJ Rating	RJ Entity
Amyris, Inc.	AMRS	NASDAQ	$	14.05	1	RJ & Associates
Chevron Corp.	CVX	NYSE	$	106.43	1	RJ & Associates
Codexis, Inc.	CDXS	NASDAQ	$	5.20	3	RJ & Associates
Exxon Mobil Corp.	XOM	NYSE	$	78.52	3	RJ & Associates
FedEx Corporation	FDX	NYSE	$	82.01	2	RJ & Associates
Gevo, Inc.	GEVO	NASDAQ	$	7.32	2	RJ & Associates
KiOR, Inc.	KIOR	NASDAQ	$	15.70	3	RJ & Associates
Rentech, Inc.	RTK	AMEX	$	1.64	3	RJ & Associates
Solazyme, Inc.	SZYM	NASDAQ	$	9.91	2	RJ & Associates
Valero Energy Corp.	VLO	NYSE	$	25.80	3	RJ & Associates
Waste Management, Inc.	WM	NYSE	$	31.50	3	RJ & Associates

Notes: Prices are as of the most recent close on the indicated exchange and may not be in US$. See Disclosure section for rating definitions. Stocks that do not trade on a U.S. national exchange may not be approved for sale in all U.S. states. NC=not covered.

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Underperform (Sell)	5%	1%	8%	7%	0%	0%

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