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# Next Generation Biofuels: Five Challenges and Five Positive Notes

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The U.S. Department of Agriculture (USDA) has just issued a report detailing the outlook and challenges of next generation biofuels. I provided some input during the drafting of the report, which hopefully was of some use. Here I select five pessimistic projections and five optimistic projections from the report.

The report is: Next-Generation Biofuels: Near-Term Challenges and Implications for Agriculture

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Here are five findings from the report that promise to strongly influence the country's direction on next generation fuels.

## 1. Production and Capital Costs

***"Estimated production and capital costs for next-generation biofuel production are significantly higher than for first-generation biofuels."*** The report quotes costs for a 100 million gallon biochemical conversion plant (e.g., cellulosic ethanol) at $320 million, and the costs for a 100 million gallon thermochemical conversion plant (e.g., gasification and conversion to liquid fuels) at $340 million. The report states that this is ***"more than three or four times those for corn ethanol plants."***

## 2. Biomass Feedstock Costs

The report suggests that the presumed costs for purpose grown biomass have likely been underestimated. It cites POET, for instance, as assuming a $40 to $60 per ton price for corn cobs. But the report states

> the range of prices may underestimate the cost of increasing biomass yields on marginal lands and the incentives required for harvesting, gathering, and delivering bulky material to the biorefinery

and

> dedicated energy crops would need to compete with the lowest value crop such as hay which has had a price exceeding $100 per ton since 2007.

In a previous essay I identified this as one of the bad assumptions many biofuel producers today are making: That biomass costs will be low or even negative in the future as demand ramps up.

## 3. Algae Conversion Costs

The report repeats the mantra that you have heard from me many times:

> Production cost estimates (net of capital costs) for growing and converting algae to fuel are significantly higher than for first- and next-generation biofuels, ranging from $9 per gallon to $35 per gallon.

As I have noted before, I think people confuse the ease of growing algae with the ease of growing it commercially and turning it into fuel.

## 4. Support for Cellulosic Ethanol May Be Short-Lived


The report suggests that support for cellulosic ethanol may be short-lived:

> Given the limited market for ethanol as a gasoline additive (due to the E10 "blend wall") and as a gasoline substitute (because of slow development of the E85 market), developers and investors may turn away from cellulosic ethanol in favor of production of another class of next-generation biofuels, petroleum substitute fuels. These so-called 'drop in' fuels can be used as gasoline or diesel substitutes in current vehicles without limit and distributed seamlessly in the existing transportation fuel infrastructure.

The report further states

> There may be a shift in favored technologies underway. Several companies planning to be operational with some of the larger plants in the next several years plan to use thermochemical approaches or other processes that produce biobased petroleum-equivalent.

My position on this is clear: I believe that thermochemical approaches are more scalable and less energy intensive than most biochemical approaches.

## 5. Scale

Fiberight is forecast to be the leading cellulosic ethanol producer for 2010 – with a production capacity of 130 barrels per day. To put that into perspective, the very small oil refinery I used to work at in Billings, Montana had a capacity of 60,000 barrels per day.

The bits I extracted are all themes that I have addressed here many times. In a nutshell, they relate to the fact that many would-be next generation fuel producers are making unrealistic assumptions about things like feedstock costs. Thus, where they project falling costs based on their optimistic projections, the USDA report forecasts that their biomass costs will be much

higher than expected.

Here are five positive notes from the report:

## 1. Renewable Diesel Plant Capacity

***"Next-generation U.S. biofuel capacity should reach about 88 million gallons in 2010..."*** This is primarily a result of the expected start-up of a next-generation renewable diesel plant. I have reported on this technology before, as well as the efforts of first-generation biodiesel producers to slow it down and protect their own interests. My guess is that unlike the ConocoPhillips project that was killed after Congress voted to deny them the full tax credit, this project will receive the same tax credit as a conventional biodiesel producer. On a level playing field, I believe the hydrocracking approach is superior to first generation biodiesel, but our political leaders will need to stop playing games with the tax credits in order for next generation diesel to realize its potential. (For a complete explanation of the different kinds of renewable diesel, see my Renewable Diesel Primer).

## 2. Competitive Race


Companies are taking a number of different approaches to coming up with next-generation solutions, increasing the chances that a dark horse will arise as a contender: ***"There are about 30 next-generation companies in the United States developing biochemical, thermochemical, and other approaches, and experimenting with a variety of feedstocks, some of which are directly linked to agriculture.."***

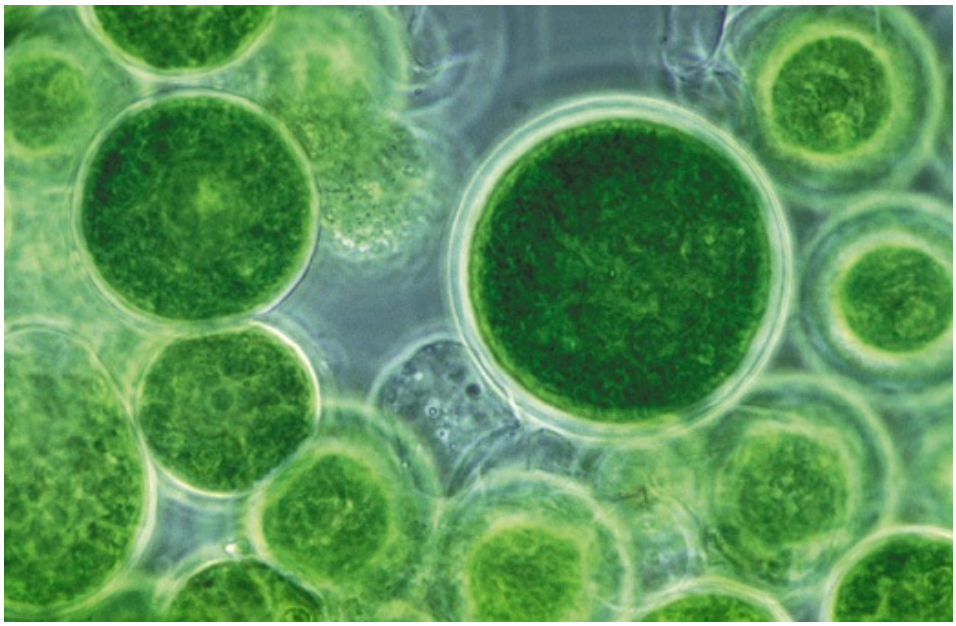
## 3. Open for Business

The first next-generation plants are expected to come online in 2010: ***"Range Fuels and Dynamic Fuels are expected to complete the first commercial next-generation biofuel plants in 2010."*** I have certainly given Range Fuels a hard time over their public statements – especially in light of recent reports which this USDA report also flagged: ***"According to the EPA, however, the plant's initial capacity has been reduced***

***from 10 million to 4 million gallons per year and initial output will be methanol."*** However, readers should not mistake my position as hoping that they fail. To the contrary, I hope they succeed, because we are going to need a lot of successes. I am just skeptical that they will achieve commercial (unsubsidized) success, and unhappy that they sucked up a lot of taxpayer funds based on their initial promises that clearly did not materialize.

I would further note, however, that Range Fuels and Dynamic Fuels may be the first U.S. plants that could be classified as next-generation commercial plants (although as I have pointed out, we had commercial cellulosic ethanol plants in the U.S. by 1920), but such plants do already exist overseas. Neste Oil, in fact, has built several plants based on the same sort of technology that Dynamic Fuels is employing. There are also other overseas companies doing gasification (the Range approach) that are further along than Range is.

## 4. Algae Research



Just as there are many different approaches to next-generation fuels, there are many companies taking many different approaches to producing fuel from algae: ***"More than 30 U.S. companies currently are experimenting with different approaches to producing algae-based fuels."*** Some of these approaches are unconventional: ***"Although the majority of algae-to-biofuel companies are focusing on producing algae oil for traditional biodiesel production, some companies are using algae to produce ethanol (Algenol), or petroleum-equivalent fuels (UOP and Sapphire)."*** The challenge of course will be to drastically reduce production costs, but the potential is too great to ignore.

## 5. Production Costs Decrease


Both production and capital costs for cellulosic ethanol are falling. The report noted ***"POET recently reported it had lowered production costs for cellulosic ethanol, including capital expenses, from $4.13 to $2.35 per gallon in a year as of November 2009 at its South Dakota pilot plant."*** The report further notes that estimates for a 100 million gallon cellulosic ethanol facility have fallen from the $650 million to $900 million range (2004 estimate) to $320 million (2009 estimate). However, the report notes that these estimates should still be considered speculative, since ***"there are no actual cost data for commercial operations since none are yet operational."***

As a body of work, I highly recommend you read the USDA report if you are interested in the status of next generation biofuel facilities. It is a sober, objective assessment of the challenges and opportunities that lie ahead as next generation fuel technologies continue to develop.