



Steven Chu's Fourth Generation Biofuels

Posted by [Gail the Actuary](#) on April 1, 2009 - 10:36am

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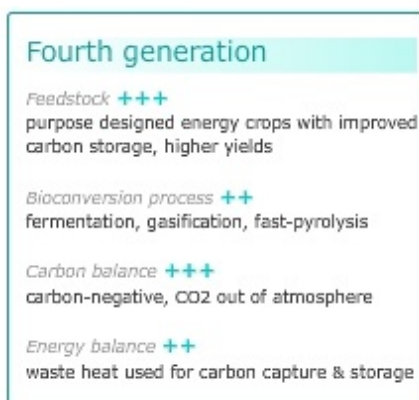
I was trying to think of a suitable topic for April Fools Day, and for some reason Steven Chu's Helios project and Fourth Generation Biofuels came to mind.

[According to Dave Cohen](#), Steven Chu sees no particular urgency to our current problems. His way of dealing with potential shortfalls is described as follows:

The answer is *let efficiency take care of it*, at least in the foreseeable future 5, 10 or 15 years from now. Chu's reasoning is based on his miscalculation that we have between 10 and 40 years before oil & natural gas production, taken together, will peak and decline. Efficiency is supposed to double the time we have to find replacement fuels, so Chu has recast the problem to give himself the 20 to 80 years he requires to find a way to replace oil.

Chu's long range solution involves applications of synthetic biology to create 4th generation biofuels (Biopact, October 8, 2007).

The problem with Fourth Generation Biofuels is that they are way, way, way off in the future, if they can be done at all. This is a graphic from [Biopact description of fourth generation biofuels](#).



The plan is to somehow improve the whole process through bioengineering to do what nature does not do now. Is this a sensible way to approach a very real current fuel problem?

[According to Dave Cohen](#), "Chu wants nothing less than to alter the Earth's primary productivity, its energy flows, to achieve greater efficiency in the conversion of sunlight to chemical energy

than Nature has after 3.5 billion years of evolution." How likely is this to happen, especially in the timeframe we need to solve our problems?

Chu's confirmation testimony indicates that the research is not very far along. According to [an account of testimony](#) at Chu's Senate confirmation hearing:

Chu explained that the two-year-old program is striving to develop fourth-generation biofuels. To date, researchers at the lab have "trained" bacteria and yeast to take simple sugars and produce "not ethanol, but gasoline-like substitutes, diesel-fuel substitutes and jet [fuel] substitutes." He says a cadre of "brilliant" scientists who had previously spent most of their careers in basic research is now "very focused on making this technology commercially viable." . .

Currently, no particular plants are being focused on, but they could include anything from algae and corn stover to grasses and lumber-mill dust and scrap. So Chu reassured Lincoln that her state grows suitable raw materials.

But the real key to making these next-gen biofuels, Chu says, will be figuring out how to design feedstock plants that would grow using fewer energy inputs and prove more robust in the field. The program's also investigating pretreatments for plant-based cellulosic feedstocks. Their goal: to facilitate the ability of single-cell organisms to break these materials down by separating out and discarding the molecules that plants make to protect themselves from attack by microbes and fungi.

Such a multi-pronged approach looks to optimize all phases of biofuels production with no preconceived idea of which area is likely to offer the biggest payoff. And that, Chu said, "is why I'm so optimistic some real progress can be made." And rapidly.

This is a link to the [Helios](#) research center at Berkley lab, that Chu was formerly the head of. According the website, the goal of Helios is

The primary goal of this effort is to develop methods to "store" solar energy in the form of renewable transportation fuel. Several approaches under investigation include the generation of biofuels from biomass, the generation of biofuels by algae, and the direct conversion of water and carbon dioxide to fuels by the use of solar energy.

This is a link to a speech by Steven Chu called [The Energy Problem: What the Helios Project Can Do About It](#).

If we had 20 to 80 years to solve our problem, there is at least a remote chance the research into fourth generation biofuels and the Helios project would be helpful. But in the timeframe we are talking about, it seems to me that we should not be putting many eggs in this basket.



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