



# **Making Cellulosic Ethanol Happen:**

## **Good and Not So Good Public Policy**

**David Morris  
Vice President  
Institute for Local Self-Reliance**

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### **Executive Summary**

A viable cellulosic ethanol industry depends on successfully achieving two objectives: commercializing the technology to produce large quantities of ethanol from cellulose, and creating an infrastructure that can deliver large quantities of new cellulosic materials to these new production plants. In the initial version of the 2005 Energy Policy Act (EPAAct), Congress designed a simple and likely quite effective policy to achieve the first objective: a large mandate for ethanol specifically made from cellulose. At the last minute, Congress added to EPAAct a provision intended to encourage ethanol plants to rely on renewable fuels rather than fossil fuels.

Although well-intentioned, the added provision undermines the nation's ability to achieve the first objective--rapidly and cost-effectively commercializing cellulose to ethanol technology, while at the same time doing nothing to effect the second objective-- creating an infrastructure that delivers large quantities of new cellulosic material. Congress has the opportunity to remedy the problems created by this added provision, while developing new incentives to encourage the use of renewable fuels for heat, as well as electricity and transportation.

## Introduction

To produce the quantities of biofuels necessary to displace more than 10 percent of the nation's gasoline requires a shift from a reliance on limited feedstocks (e.g. starch crops) to more abundant feedstocks (e.g. cellulosic crops).

At the current rate of expansion, within five years the capacity of starch crops to meet growing ethanol demand could be exhausted.

An understandable sense of urgency inspires policy initiatives to accelerate the introduction of cellulosic biofuels. But Congress and the White House should take care to design policies that are mutually reinforcing and maximize the return on the taxpayer's investment.

A viable cellulosic ethanol industry rests on two building blocks:

**1) Commercial technologies that produce ethanol from cellulose**

**2) A cultivation/transportation/storage infrastructure that delivers cellulose to biorefineries**

## The Good

To date, the federal government has focused on one building block--commercializing cellulosic ethanol conversion technologies. The centerpiece of its efforts is a large set-aside mandate for cellulosic ethanol.

The Energy Policy Act of 2005 created two ethanol mandates. The more widely known is the 2012 mandate for 7.5 billion gallons of ethanol derived from any feedstock.

Lesser known is a 2013 mandate for 250 million gallons of cellulosic ethanol.

The cellulosic ethanol mandate establishes a market large enough to accommodate five to ten competitors. A premium price may be

needed because ethanol made from cellulose is likely to be more expensive than ethanol derived from starch or sugar crops, at least for the first wave of cellulosic ethanol plants. But competition will minimize the premium, and second generation plants should be able to compete with starch-derived ethanol.

Congress has done relatively little to enable the second building block: a cellulosic cultivation and delivery infrastructure. Yet such an infrastructure is a necessary condition for achieving the 2013 mandate, and arguably must be in place before the first wave of large cellulosic ethanol plants become operational.

In the 1990s, Congress did establish a pilot program to encourage the cultivation of cellulosic energy crops by allowing planting on Conservation Reserve Program (CRP) land. The 2002 farm bill effectively foreclosed those embryonic projects.

Members of Congress are discussing a major new program that would offer farmers incentives for planting cellulosic energy crops. Such an initiative is welcome, especially because it can encourage the planting of crops that maximize yield while also maximizing the environmental benefit to the land and wildlife.

But cultivation by itself is not enough. Increasing cultivation must be accompanied by increasing near term(2008-2012) markets for cellulosic crops. This market will not use the cellulose as a feedstock for producing ethanol but as a fuel to provide thermal energy for ethanol plants.

An attractive near term fuel market for cellulose is to displace natural gas used in corn-derived ethanol plants. Natural gas provides more than 90 percent of the energy used in a typical corn dry mill. Ethanol plants are located in agricultural areas, near potentially large sources of cellulosic energy

crops and agricultural residue. To provide all of its thermal energy needs, a typical 40 million gallon ethanol plant could require 100,000 tons of cellulosic material, which would come from 15,000-50,000 acres.

Replacing natural gas with cellulose dramatically improves the net energy ratio and greenhouse gas reduction impact of corn-derived ethanol.

## **The Not So Good**

In the Energy Policy Act, Congress introduced a policy to encourage the substitution of renewable fuels for fossil fuels used in ethanol plants. Fashioned in haste, that policy creates more problems than it solves.

Added at the last minute in conference committee, Congress created an alternative legal definition of “cellulosic ethanol.” As a result, Title XV, Section 1501, defines cellulosic ethanol not only as ethanol made from cellulose, but “any ethanol produced in facilities where animal wastes or other waste materials are digested or otherwise used to displace 90 percent or more of the fossil fuel normally used in the production of ethanol.”

Displacing fossil fuels with cellulosic biomass is a worthy objective. But this particular legislative strategy for achieving that objective has three fundamental problems.

### ***1. It undermines the 2013 cellulosic ethanol mandate.***

The original 2013 mandate established a set aside for ethanol derived from cellulose instead of starch. The new definition eliminates the set aside. The ethanol industry can meet the 250 million gallon goal either by using waste materials to fuel any of the 150 or more corn-derived ethanol plants that will be operating by 2012, or by using cellulose as a feedstock in a new first generation cellulosic ethanol plant. It will always be cheaper to do the former than the latter. Even if the 2013 mandate were doubled to 500 million gallons,

the inherent problem would remain. Ethanol plants can always meet the mandate less expensively by replacing natural gas with waste materials than by replacing corn with cellulose.

### ***2. It substantially increases the public cost of achieving a true cellulosic ethanol industry.***

Under the current dual definition of cellulosic ethanol, the 2013 mandate can, and almost certainly will be met by using wastes as a fuel rather than cellulose as a feedstock. True cellulosic ethanol plants will not have a set aside market as the original legislation created. Thus, rather than competing solely with other cellulosic ethanol plants, they will compete with starch to ethanol plants. Unless customers are willing to pay a premium for “greener” ethanol, Congress may have to offer large financial incentives to allow these cellulosic ethanol plants to compete.

Indeed, currently pending is a legislative proposal to offer ethanol produced from cellulose an incentive 76.5 cents per gallon greater than the current 51 cent per gallon incentive offered ethanol. It is far more efficient to allow any additional cost of cellulosic ethanol to be determined by a healthy competition among cellulosic ethanol producers, as the original legislation did rather than for Congress to estimate the additional cost.

Indeed, it is very unclear what level of incentives or price premium will be required by cellulosic ethanol. If the price of corn rises beyond \$4.25 per bushel and the delivered price of cellulose is \$50 per ton, cellulosic ethanol may be able to compete with corn-derived ethanol with no incentives.

### ***3. It does little to accelerate a cellulosic cultivation and delivery infrastructure.***

The alternative definition of cellulosic ethanol doesn't use the word “cellulose”. It uses the word “wastes,” It was tailored to encourage the use of methane from livestock manure.

The text's focus on wastes has led the EPA, in draft rules issued in late 2006, to propose that waste heat from coal fired power plants be eligible.

Thus the alternative definition does little to accelerate the cultivation or harvesting of new cellulosic materials. Indeed, new cellulosic energy crops may be excluded by the current wording of the alternate definition.

## **Making the Not-So-Good Better**

### ***1. Eliminate the alternative definition of cellulosic ethanol in Title XV, Section 1501***

This would reaffirm Congress' original intent to create a set-aside mandate of 250 million gallons for ethanol derived from cellulose in 2013. It would avoid the need for cellulose as a feedstock to compete with cellulose as a fuel. It would also eliminate the need for ethanol derived from ethanol to compete with starch-derived ethanol, a competition that may require additional public incentives for cellulosic ethanol. A set-aside mandate would embed any incentives in a transparent market price developed through competition.

### ***2. Create an incentive that genuinely spurs a cellulosic infrastructure.***

By not using the word cellulose, but rather the word "wastes", the alternative definition of

"cellulosic ethanol" does little or nothing to create a cultivation and delivery infrastructure for new cellulosic material.

Congress could, for example, offer a \$2 per million Btu incentive to ethanol plants that used agricultural residues or cellulosic energy crops as their primary fuel source. Since the incentive is designed to encourage the cultivation, harvesting, storage and transportation of new cellulosic materials, the incentive should not be available for wood wastes.

### ***3. Create a new incentive for renewable heat energy***

Congress has enacted incentives for renewable electricity and renewable transportation fuel, but not for renewable heat, either low or high temperature heat. This oversight should be addressed. There are many opportunities for solar and biofuels to displace fossil fuels used for generating thermal energy.

However, it is unclear why such heat-related incentives would be restricted to ethanol facilities. If the objective is to displace fossil fuels with renewable fuels, all end-users should be eligible.

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1313 Fifth Street SE, Suite 303  
Minneapolis, MN 55414  
612.379.3815

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