



Local Economic Implications of Bioenergy Production

CrossOver 2007

Bioenergy: From Fields to Wheels

Penn State University
September 4-5, 2007

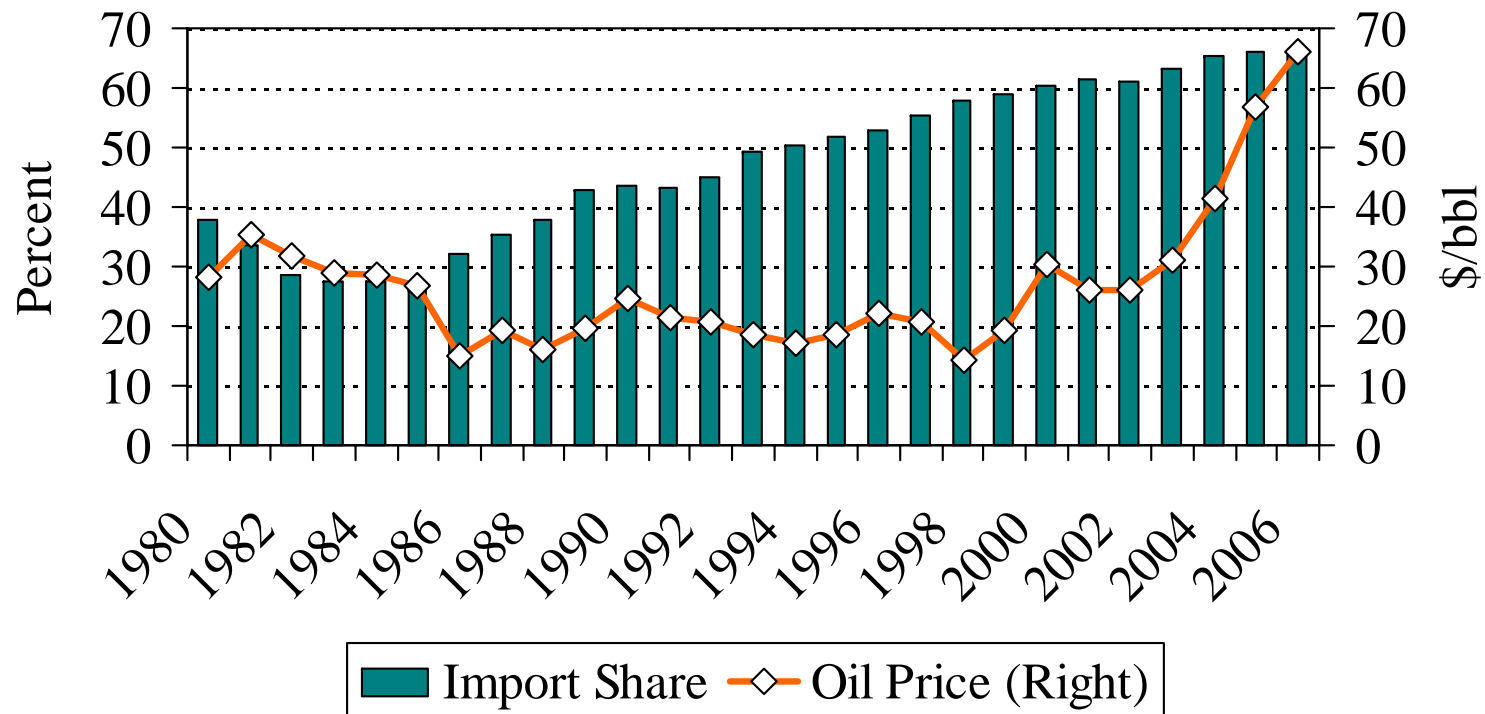
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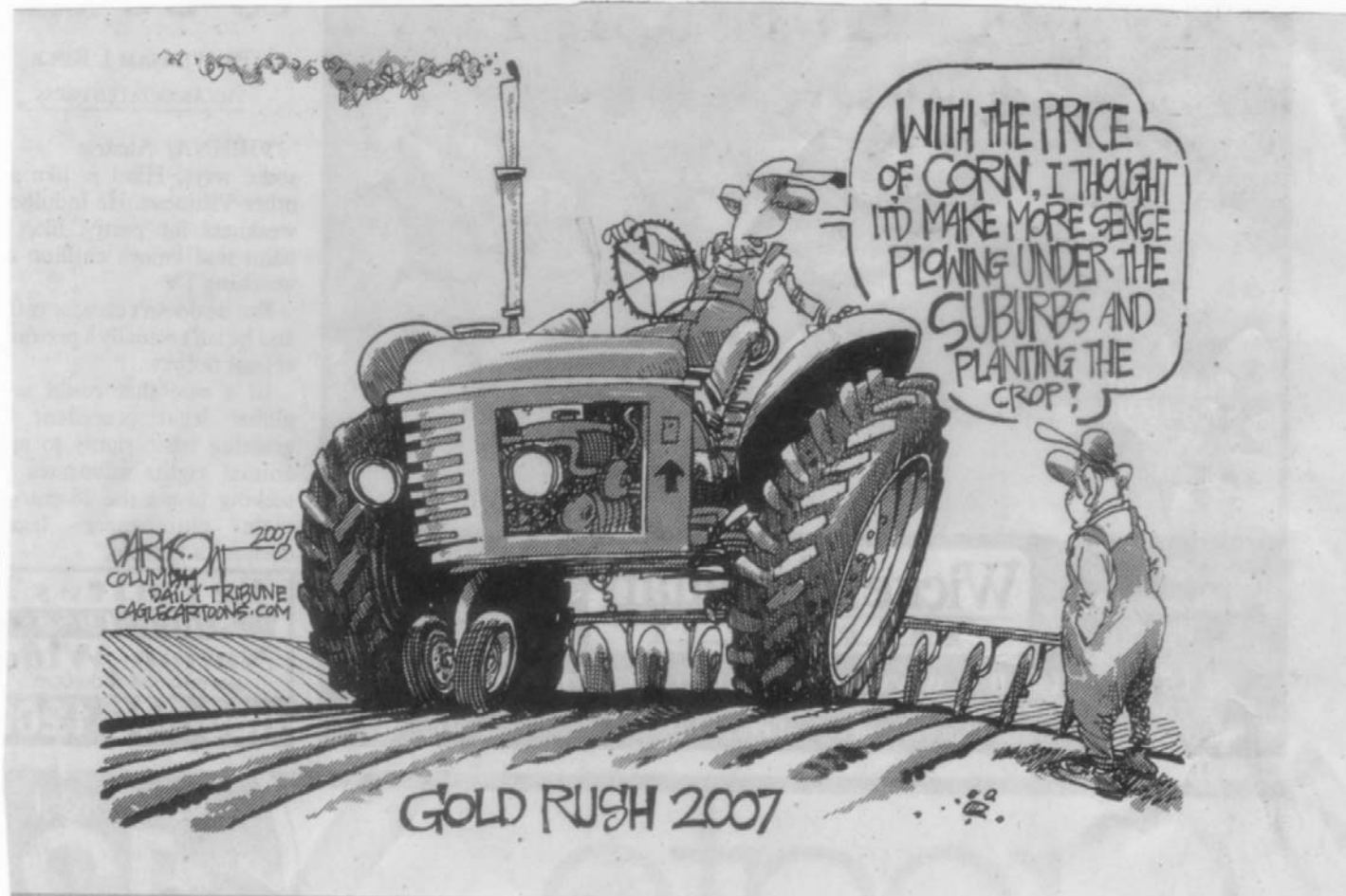
Why biofuels? Our dependence on imported oil continues to grow.

Crude Oil Import Share and Prices





Bioenergy is a growth industry





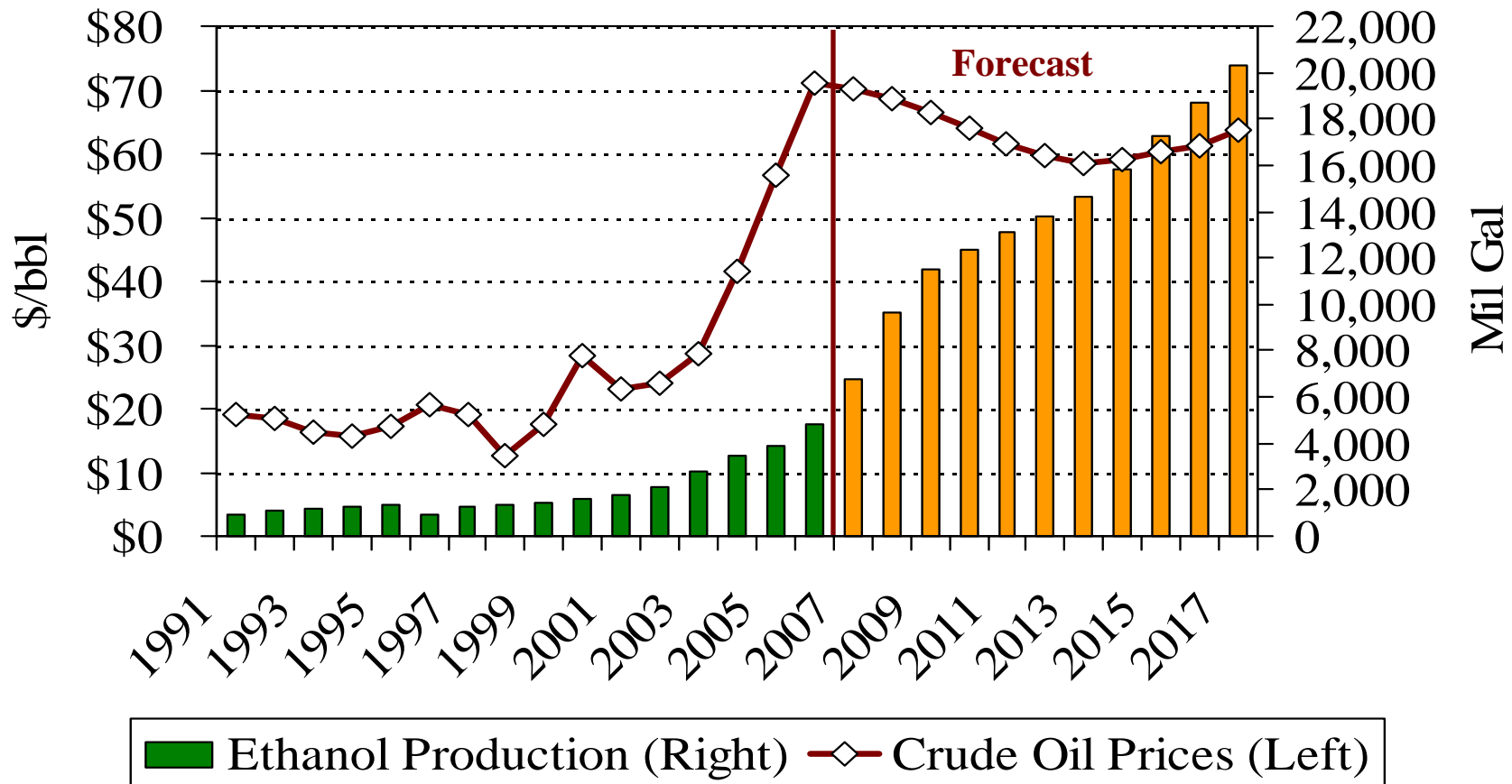
Why are biofuels desirable?

- ❖ Biofuels are renewable, have a significant positive net energy balance and provide important environmental benefits.
- ❖ Increased demand for grain and oilseeds improves farm revenues and reduces the cost of government programs.
- ❖ Biofuels reduce America's dependence on imported oil, expands the economy, creates jobs, and generates income.





Biofuel demand will increase as oil prices stay high.



Source: Ethanol: LECG. Oil prices: EIA Annual Energy Outlook 2007, Reference Case

Pennsylvania will participate in the expansion of biofuels.

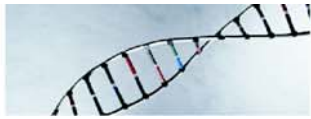
- ❖ The PennSecurity Fuels Initiative (“PFI”) would replace one billion gallons of petroleum-based transportation fuel with domestically produced renewables within 10 years.
- ❖ Eligible renewables include:
 - Ethanol (from grain and cellulose)
 - Biodiesel
 - Coal-derived liquid transportation fuels
 - Methane from landfills and coal mines

Why Pennsylvania? The market is here.

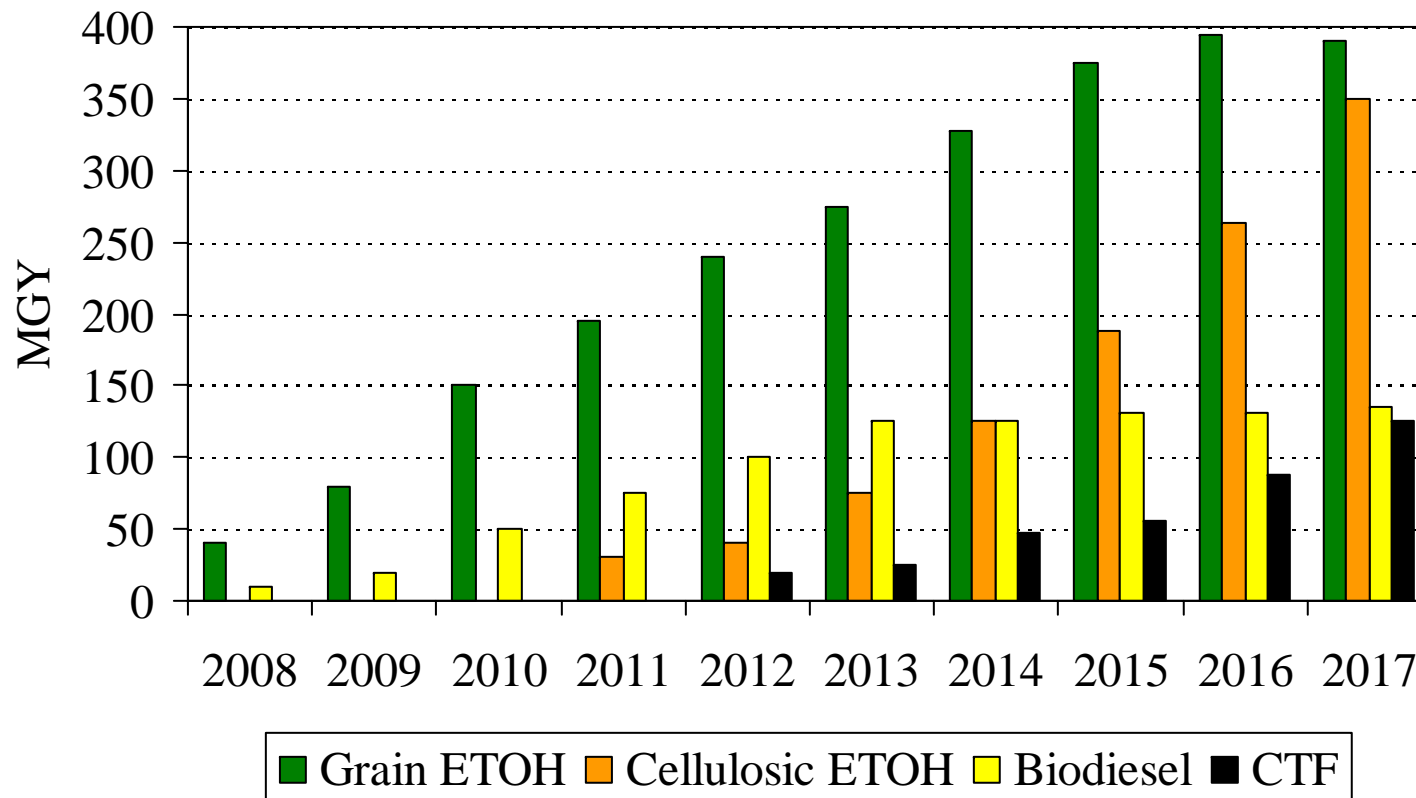
2005 Prime Supplier Sales

	Mil Gallons	% of U.S.
Conventional Gasoline	3,856	4.4%
Reformulated Gasoline	1,281	2.7%
Total Gasoline	5,137	3.7%
No. 2 Diesel	1,796	3.7%
Total Highway	6,933	3.7%

Source: EIA 2005 Petroleum Marketing Annual



How is the PA RFS likely to be distributed?



Feedstock and energy costs are the key to biofuel profitability

- ❖ Feedstocks typically account for 60% of operating costs for ethanol and 80% for biodiesel.
- ❖ Co-product credits (distiller's grains and CO₂ for ethanol and glycerin for biodiesel) are crucial to controlling feedstock costs.
- ❖ Energy costs are a close second in importance.
 - Using co-generated power from waste-coal or landfill gas as a boiler fuel can cut production costs.



Feedstocks

❖ Ethanol from grain

- 390 mil gal would require 140 mil bu of corn, about half could come from PA.
- Distiller's grains would replace any loss of grain for livestock, dairy, and poultry.

❖ Biodiesel

- 110 mil gal would require nearly 1 billion lbs of fats and oils
- PA has the equivalent of 201 mil lb of soybean oil and 117 mil lb of yellow grease.

❖ Cellulose feedstocks and coal are no problem

Technology and cost

- ❖ Not a problem for grain ethanol and biodiesel
- ❖ Cellulose ethanol is another matter. Enzymatic process holds promise for lower costs, but is not yet commercialized.
 - Capital costs are estimated at least twice that of dry mill ethanol.
 - Operating costs are expected to be about a third lower than corn dry mill costs.
 - Big question is what feedstocks will be used: stover, grasses, woody crops, or forest residue.
- ❖ CTF technology also is expensive and yields are low.



Where does the economic impact come from?

- ❖ Spending on goods and services for construction and annual operations.
 - Every dollar spent represents the purchase of final demand from other industries.
 - These dollars circulate through the Commonwealth economy several times.
 - The effects are measured by applying Pennsylvania-specific impact multipliers for the relevant supplying industries.

Pennsylvania Multipliers

	Output	Earnings	Employment
Construction	2.5949	0.7835	21.5
Grain farming	1.8165	0.2867	14.9
Oilseed farming	1.8071	0.2894	11.8
Corn wet milling	2.1038	0.3635	9.6
Oilseed processing	1.8185	0.2872	11.6
Fats and Oils refining and blending	1.8036	0.2940	7.5
Power generation and Supply	1.8989	0.4223	8.7
Natural gas distribution	1.8338	0.3378	7.3
Water, sewer and other systems	1.8492	0.5297	13.1
Basic organic chemical mfg	2.4144	0.4457	9.8
Facilities support services	2.0443	0.7316	21.3
Households	1.5551	0.4203	13.7

Source: BEA RIMS II



Bioenergy pumps \$\$\$ into the economy.

Ten Year Total Spending

	Construction (Mil 2007\$)	Production (Mil 2007\$)
Ethanol	\$788	\$2,853
Biodiesel	\$153	\$1,045
Cellulose	\$1,645	\$1,926
CTL	\$540	\$256
Total	\$3,125	\$6,085



The combination of this direct spending and the indirect impacts will:

- ❖ Add nearly \$2 billion (2007\$) annually to the PA economy over the 10-year period, making the State's economy \$19.5 billion (2007\$) larger by 2017.
- ❖ Put an additional \$786 million (2007\$) annually in the pockets of Pennsylvania households over the 10-year period.
- ❖ Create as many as 13,600 new jobs in all sectors of the State economy by 2017.
- ❖ Generate \$1.2 billion (2007\$) in new tax revenue over the ten year period.



Biofuels also will have significant positive implications for the nation's energy balance.

- ❖ The production and use of Bioenergy in PA will displace nearly 200 million barrels of crude oil between 2008 and 2017.
- ❖ This displacement will reduce the outflow of dollars largely to foreign oil producers by \$12.2 billion (2007\$) over the 10-year period. These dollars will remain in the U.S. and Pennsylvania and will help finance the needed capital expansion.

Biofuels have a significant net positive energy balance

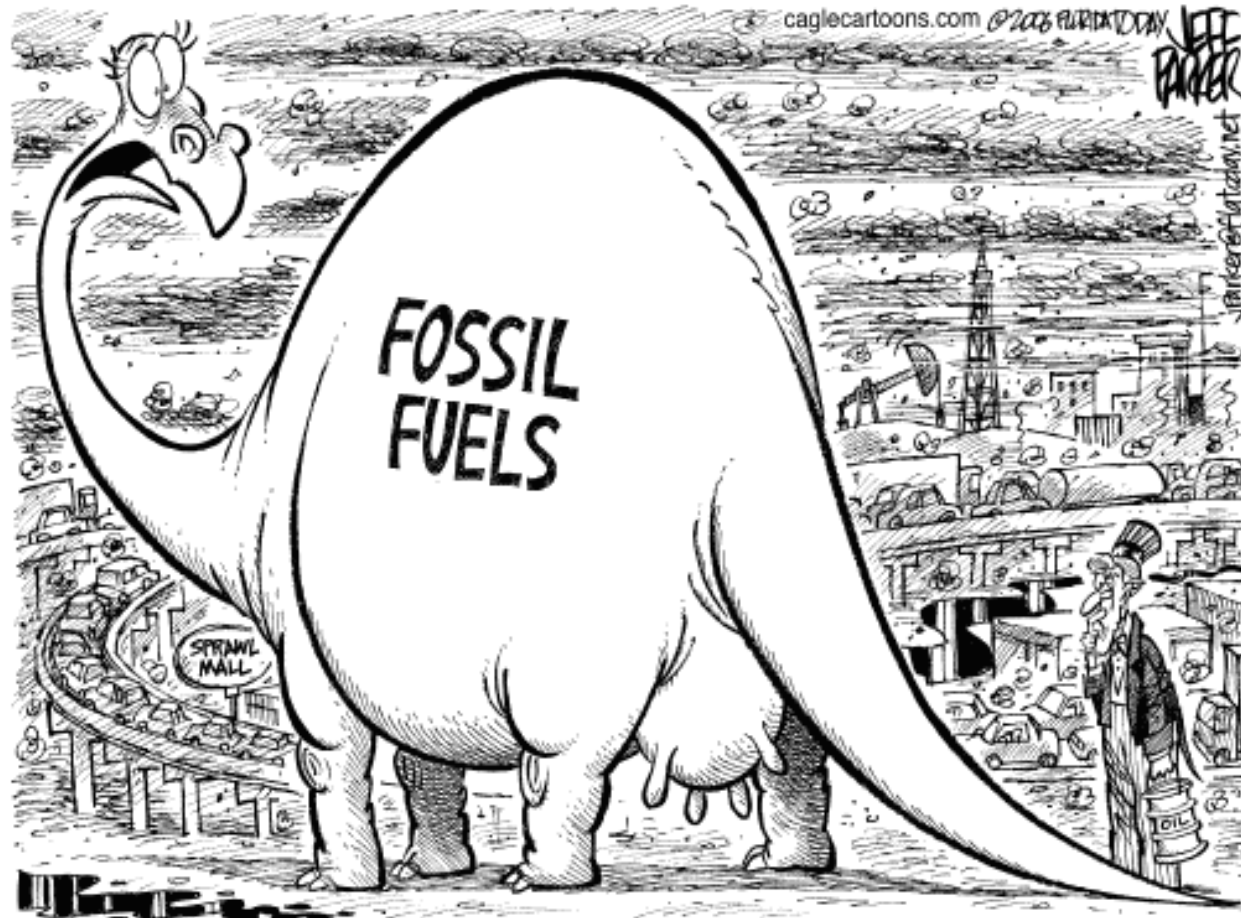
Net Energy Balance

Fuel	Energy Yield*	Net Energy (loss) or gain
Gasoline	0.805	(19.5 percent)
Diesel	0.843	(15.7 percent)
Ethanol	1.670	67 percent
Biodiesel	3.200	220 percent

*Life cycle yield in liquid fuel – Btus produced for each Btu of fossil fuel consumed

Sources: “Life Cycle Inventory of Biodiesel and Petroleum Diesel for Use in an Urban Bus”. NREL/SR 580-2409. USDA/OCE “The 2001 Net Energy Balance of Corn Ethanol”

This just could happen!



"JUST LIKE THAT? YOU'RE GOING TO WEAN YOURSELF OFF OIL? AND AFTER ALL I'VE DONE FOR YOU!"

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Thank you!

Questions?