



Studies on Biofuels, Fossil Fuels & the Greenhouse Gas Factor - 2007

Fort Collins, Colorado [RenewableEnergyAccess.com] 2007-04-11 Researchers at Colorado State University and the U.S. Department of Agriculture, Agricultural Research Service have completed an analysis of greenhouse gas emissions from biofuel production. Study results revealed that when compared with the life cycle of gasoline and diesel, ethanol and biodiesel from corn and soybean rotations reduced greenhouse gas emission by nearly 40 percent, reed canarygrass by 85 percent, and switchgrass and hybrid poplar by 115 percent. Hybrid poplar and switchgrass were found to offset the largest amounts of fossil fuels and therefore reduced emissions the most out of the studied crops.

"Biofuels have a great potential to reduce our dependence on imported gasoline and diesel fuel," said William Parton, researcher from Colorado State's Natural Resource Ecology Laboratory (NREL). "We have performed a unique analysis of the net biofuel greenhouse emissions from major biofuel cropping systems by combining ecosystem computer model data with estimates of the amount fossil fuels used to grow and produce crops for biofuels."

Parton, along with Stephen Del Grosso, USDA scientist and NREL researcher; and Paul Adler from the USDA used the DAYCENT biogeochemistry model, developed by Parton and Del Grosso, to assess soil greenhouse gas fluxes and biomass yields for corn, soybean, alfalfa, hybrid poplar, reed canarygrass and switchgrass.

"Although fossil fuel inputs are required to produce and process biofuels, hybrid poplar and switchgrass converted to ethanol compensate for these emissions and actually remove greenhouse gasses from the atmosphere when the benefits of co-products are included. Greenhouse gas savings from biomass gasification for electricity generation are even greater. This research provides the basis for evaluating net biofuel greenhouse gas emissions and highlights the need to improve the technologies used for large scale conversion of biomass to energy and to more fully exploit agricultural co-products," Del Grosso said.

Ethanol and biodiesel from corn and soybean are currently the main biofuel crops in the U.S., but the perennial crops alfalfa, hybrid poplar, reed canarygrass and switchgrass have been proposed as future dedicated energy crops.

Bioenergy crops are able to offset carbon dioxide emissions by converting atmospheric carbon dioxide into organic carbon in biomass and soil, but the production of biofuels requires fossil fuels and impacts greenhouse gas fluxes.

The primary sources of greenhouse gas emissions associated with crop production are soil nitrous oxide emissions and the CO₂ emissions from farm machinery, farm inputs and

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agricultural processes. Colorado State and USDA scientists quantified all of these factors to determine the net effect of several bioenergy crops on greenhouse gas emissions.

Researchers found that, once the DAYCENT results were combined with estimates of the amounts of fossil fuels used to provide farm inputs and operate agricultural machinery and the amount of fossil fuel offsets from biomass yields, they were able to calculate the net greenhouse gas fluxes for each cropping system.

"We used extensive observed greenhouse gas flux and crop yield data to verify DAYCENT model predictions of crop yields and net greenhouse gas fluxes from all of the biofuel crop rotations. DAYCENT model results were combined with life cycle analyses of crop production, conversion to biofuel, and fossil fuel displaced to estimate net greenhouse gas emissions," said Parton.

This study was a unique and complete analysis of bioenergy cropping for several reasons. Different crops vary with respect to length of plant life cycle, yields, biomass conversion efficiencies, required nutrients, net soil carbon balance, nitrogen losses and other characteristics which in turn impact management operations. Additionally, crops have different requirements for farm machinery inputs from planting, growing, soil tillage, applying fertilizer and pesticide and finally harvesting.

The researchers were able to use life cycle analyses and the DAYCENT model to account for all of these factors as well as integrate climate, soil properties and land use to accurately evaluate the impact of bioenergy cropping systems on crop production, soil organic carbon and greenhouse gas fluxes.

The study was published in the April 2007 issue of Ecological Applications.

Demand-Side Management and Energy Efficiency Revisited

Maximilian Auffhammer, Carl Blumstein, and Meredith Fowlie

Abstract: The key finding of an influential paper that received the International Association for Energy Economists' Best Paper Award (2004) is that utilities have been overstating electricity savings and underestimating costs associated with energy efficiency demand side management (DSM) programs. This claim is based on point estimates of average DSM-related savings and costs implied by an econometric model of residential electricity demand. In this response we first argue that the choice of test statistics, by not weighting estimated savings and costs by utility electricity sales and DSM expenditures respectively, biases results in favor of rejecting the null hypothesis that utility-reported electricity savings reflect true values. We also note that utility estimates of average program savings and costs are rejected based on point estimates alone; no

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attempt is made to evaluate the uncertainty surrounding these estimates. We use the same data and econometric model to estimate the appropriate test statistics. We then construct nonparametric bootstrap confidence intervals. We fail to reject the average electricity savings and DSM program costs reported by utilities using both the weighted and unweighted test statistics. Our results suggest that the evidence for rejecting utility estimates of DSM savings and costs should be re-interpreted.

Download this paper in Adobe Acrobat format:
<http://www.ucei.berkeley.edu/PDF/csemwp165.pdf>

CONCENTRATED SOLAR

CSP - DESSERT (N AFRICA)

Every year, each square kilometer of desert receives solar energy equivalent to 1.5 million barrels of oil, said Franz Trieb, project manager of the study. "Multiplying by the area of deserts world-wide, this is nearly a thousand times the entire current energy consumption of the world."

He added, "We can tap in to this energy by using mirrors to concentrate sunlight and create heat ... to raise steam and drive a generator in the conventional way. This kind of 'concentrating solar power' -- which is very different from the better-known photovoltaic 'solar panels' -- has been producing electricity successfully in California for nearly 20 years."

The report is available at <http://www.dlr.de/tt/trans-csp>

RENEWABLE ENERGY PORTFOLIO STANDARDS

State RPSs

State Renewable Portfolio Standards

A growing portion of U.S. states' electricity is being provided by renewable energy according to a study released by the Pew Center on Global Climate Change. To access the study, "Race to the Top: The Expanding Role of U.S. State Renewable Portfolio Standards", see:
http://www.pewclimate.org/press_room/sub_press_room/2006_releases/rps_release.cfm
or <http://tinyurl.com/zm9rl>
<http://www.pewclimate.org/>

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SOLAR PHOTOVOLTAICS

Solar Industry Report [Jesse Pichel]

Jesse Pichel, Senior Research Analyst at Piper Jaffray, has made his solar industry report available via the following link:

http://www1.pjc.com/private/pdf/solar_powered_oct05.pdf

He is interested in comments and can be reached at 212-284-9301 or Jesse.W.Pichel@pjc.com
Piper Jaffray: <http://www.piperjaffray.com/>

WORLD RENEWABLE ENERGY USE

You can download the report from the REN21 web site, www.ren21.net, along with a press release and other information. The report is also posted at www.martinot.info/re2005.htm, along

CLIMATE CHANGE - EFFICENCY and RENEWABLES

Energy Revolution

A new report, “Energy Revolution: A Blueprint for Solving Global Warming” details a worldwide energy scenario where nearly 80% of U.S. electricity can be produced by renewable energy sources. See RenewableEnergyAccess at:

<http://www.renewableenergyaccess.com/rea/news/infocus/story?id=47208>

Report: <http://www.greenpeace.org/usa/press/reports/energy-r-evolution-a-bluepr>

GEOHERMAL (1\07)

A comprehensive new MIT-led study of the potential for geothermal energy within the United States has found that mining the huge amounts of heat that reside as stored thermal energy in the Earth's hard rock crust could supply a substantial portion of the electricity the United States will need in the future, probably at competitive prices and with minimal environmental impact.

The Future of Geothermal Energy – Impact of Enhanced Geothermal Systems (EGS) on the United States in the 21st Century (14 Mb pdf) - Report prepared by an MIT-led interdisciplinary panel, was released to the public January 22, 2007. The report suggests that 100,000 MWe of electrical generation capacity can be met through EGS within 50 years with a modest investment in R&D.

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CAMBRIDGE, MASS., USA -- A comprehensive new MIT-led study of the potential for geothermal energy within the United States has found that mining the huge amounts of heat that reside as stored thermal energy in the Earth's hard rock crust could supply a substantial portion of the electricity the United States will need in the future, probably at competitive prices and with minimal environmental impact.

An 18-member panel led by MIT prepared the 400-plus page study, titled "The Future of Geothermal Energy." Sponsored by the U.S. Department of Energy, it is the first study in some 30 years to take a new look at geothermal, an energy resource that has been largely ignored. (http://geothermal.inel.gov/publications/future_of_geothermal_energy.pdf)

CLIMATE CHANGE - EFFICIENCY and RENEWABLES (US)

<http://www.ases.org/climatechange/toc.htm>

Limiting CO2 levels in the atmosphere to 450-500 ppm means:
"Estimates are that industrialized nations must reduce emissions about 60% to 80% below today's values by mid-century."

"The carbon-reduction potentials for the year 2030 total between 1,000 and 1,400 MtC/yr, or an average of about 1,200 MtC/yr based on a mid-range value for electricity-to-carbon conversion. This would put the U.S. on target to achieve the necessary carbon-emissions reductions by mid-century."

"Renewable energy has the potential to provide approximately 40% of the U.S. electric energy need projected for 2030 by the Energy Information Administration (EIA). After we reduce the EIA electricity projection by taking advantage of energy efficiency measures, renewables could provide about 50% of the remaining 2030 U.S. electric need."

Potential carbon reductions (in MtC/yr in 2030) based on the middle of the range of carbon conversions.

Energy efficiency	688
Concentrating solar power	63
Photovoltaics	63
Wind	181
Biofuels	58
Biomass	75
Geothermal	83

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ENERGY INFORMATION ADMINISTRATION (US Department of Energy)

Subject: New EIA Renewable Energy Portfolio Standard study out
Date: 3/7/2002 5:20 PM

Link included below. Bottom-line conclusions:

- * 2020 electricity price - business as usual - 6.5 cents/kWh
- * 2020 electricity price - Daschle 10% RPS - 6.6 cents/kWh
- * 2020 electricity price - 20% RPS - 6.7 cents/kwh

- * 2020 electricity price - Daschle 10% RPS - "High Renewable Technology"scenario - [5 labs Clean Energy Futures renewable energy cost assumptions - 6.5 cents/kWh -- NO IMPACT

- * Additional natural gas savings from 10% RPS:
 - * \$534 millin to residential gas customers
 - * \$387 million to commercial customers (2% lower gas prices)
 - * \$1.4 billion to industrial customers (4% lower gas costs) (p. 21)

U.S. Department of Energy

*Energy Information Administration *

EIA, the Nation's clearinghouse for energy statistics.

The Energy Information Administration (EIA), an independent statistical and analytical agency in the U.S. Department of Energy, released the study entitled "Impacts of a 10-Percent Renewable Portfolio Standard" on March 7, 2002, in PDF format. This service report addresses the renewable portfolio standard provision of S. 1766. At Senator Murkowski's request it also includes an analysis of the impacts of a renewable portfolio standard patterned after the one called for in S. 1766, but where the required share is based on a 20 percent RPS by 2020 rather than the 10 percent RPS called for in S. 1766.

The PDF format of this report can be [viewed at:](http://www.eia.doe.gov/oiaf/servicerpt/rps/pdf/sroiaf(2002)03.pdf)
[http://www.eia.doe.gov/oiaf/servicerpt/rps/pdf/sroiaf\(2002\)03.pdf](http://www.eia.doe.gov/oiaf/servicerpt/rps/pdf/sroiaf(2002)03.pdf)

NATIONAL ACADEMY OF SCIENCES: With a bleak assessment of the health of the planet, the president of the nation's largest scientific organization opened its 168th annual meeting here with a ringing call for conservation of resources and expanded use of renewable energy. In remarks prepared for delivery yesterday evening, Peter Raven, president of the American

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Association for the Advancement of Science, warned that the affluent lifestyle of Western society is increasingly unsustainable and unattainable for most of the world's teeming population of 6.1 [billion](#).

<http://www.sfgate.com/cgi-bin/article.cgi?f=/chronicle/archive/2002/02/15/MN217283.DTL>

NATIONAL LABORATORIES: A study by five federal laboratories found that a strong national commitment to efficiency and renewable energy sources would provide net benefits of \$128 billion a year, about one percent of current GDP - by the year 2020; households would see savings of \$1,000 apiece

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