Growing Energy

How Biofuels Can Help End America’s Oil Dependence

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Background

• Funded by National Commission on Energy Policy and Energy Foundation
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• Coordinated with DOE-funded research by:
  – Bruce Dale & Fuat Celik, Michigan State
  – Eric Larson, Princeton University
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  – Jason Mark, Union of Concerned Scientists
  – Samuel McLaughlin, Oak Ridge National Laboratory
  – John Sheehan, National Renewable Energy Laboratory
  – Michael Wang, Argonne National Laboratory
Cellulosic Has A Realistic Future

• Land is not a constraint
• Economics are promising
• Environmental benefits
  – Caveat: Air quality concerns with low ethanol blends
• Energy/oil security benefits
• Major new crop for farmers
• Policies are needed to achieve potential:
  – R&D funding
  – Pre-commercial deployment subsidies
  – Production incentives
# Land Is Not A Constraint

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<td><strong>Status Quo 2050</strong></td>
<td>289</td>
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<td><strong>Production and Efficiency Gains</strong></td>
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<td>Switchgrass Yield</td>
<td>108</td>
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<td>114</td>
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### Alternative Sources of Land and Biomass

- **Protein Recovery**: Replace 50-100% of 73 million acres of soybean
  - 41 - 77
- **Corn Stover**: Collect 75% of 323 million tons of corn stover
  - 21 - 58
- **CRP Land**: Convert 33-50% of CRP acreage into switchgrass
  - 6 - 48
Economics Are Promising

The graph shows the economic feasibility of ethanol production as a function of plant scale (dry ton/day). The blue line represents Ethanol/GTCC, while the yellow line represents Ethanol/Protein/Rankine. The graph indicates that as plant scale increases, the wholesale price of ethanol decreases, suggesting promising economics.

Key points:
- Gasoline: 2002-2004
- Decatur, IL ADM Plant

The graph is labeled with the ERDC logo at the top right.
What It Means For Farmers

• Biomass can be a major, valuable crop:
  – 107 M acres in switchgrass by 2050
  – $200-500/acre: 4-10 times CRP contract payment
  – Regionally diverse sources

• Proactive response to emerging policy drivers:
  – Energy security: diversified, domestic sources
  – Mandatory climate policies
  – WTO pressure on support for traditional crops

• Managing the transition:
  – Equipment, knowledge, markets…?
  – Protect investments in corn ethanol
You **CAN** Get There From Here

- **Where’s “There”?**
  - Cellulosic ethanol cost competitive with gasoline
  - 1 Billion Gallons of production capacity by 2015
  - R&D: $1.1B
    - Biomass conversion; co-products; feedstock production
  - Pre-commercial deployment: $900 M
    - Maintain private sector due diligence, financing
    - Phase out over time, leaving self-sufficient industry
Commercial Production Incentives

- Provide **consistent** driver for biofuels:
  - RFS that includes cellulosic biofuels
    - Recognize that all biofuels are not created equal
  - Oil savings/energy security
    - Vehicle efficiency and smart growth are key
  - Climate policies. GHG limits:
    - Internalize GHG incentive in fuels market
    - Other Ag options also rewarded: C sequestration, on-farm wind, methane capture, reduced nitrogen runoff
Parting Thoughts

• This isn’t about corn vs. cellulosic ethanol
  – Corn (starch) ethanol is the present technology
  – Cellulosic has big long-term potential
    • Energy and environmental goals
    • New, major, regionally diverse agricultural market
  – Opportunities for achieving joint objectives

• Inevitability of oil dependence, climate policies
  – Miss the boat without 10 year R&D, deployment
More Parting Thoughts

• Ag – Enviro Cooperation Possible

• Managing the transition is key for all sides
  – Environmental performance
    • Air quality backsliding
    • Level playing field for cellulosic
  – Integration with corn/corn ethanol production

• Cooperation Takes Work