Growing Energy

How Biofuels Can Help End America's Oil Dependence

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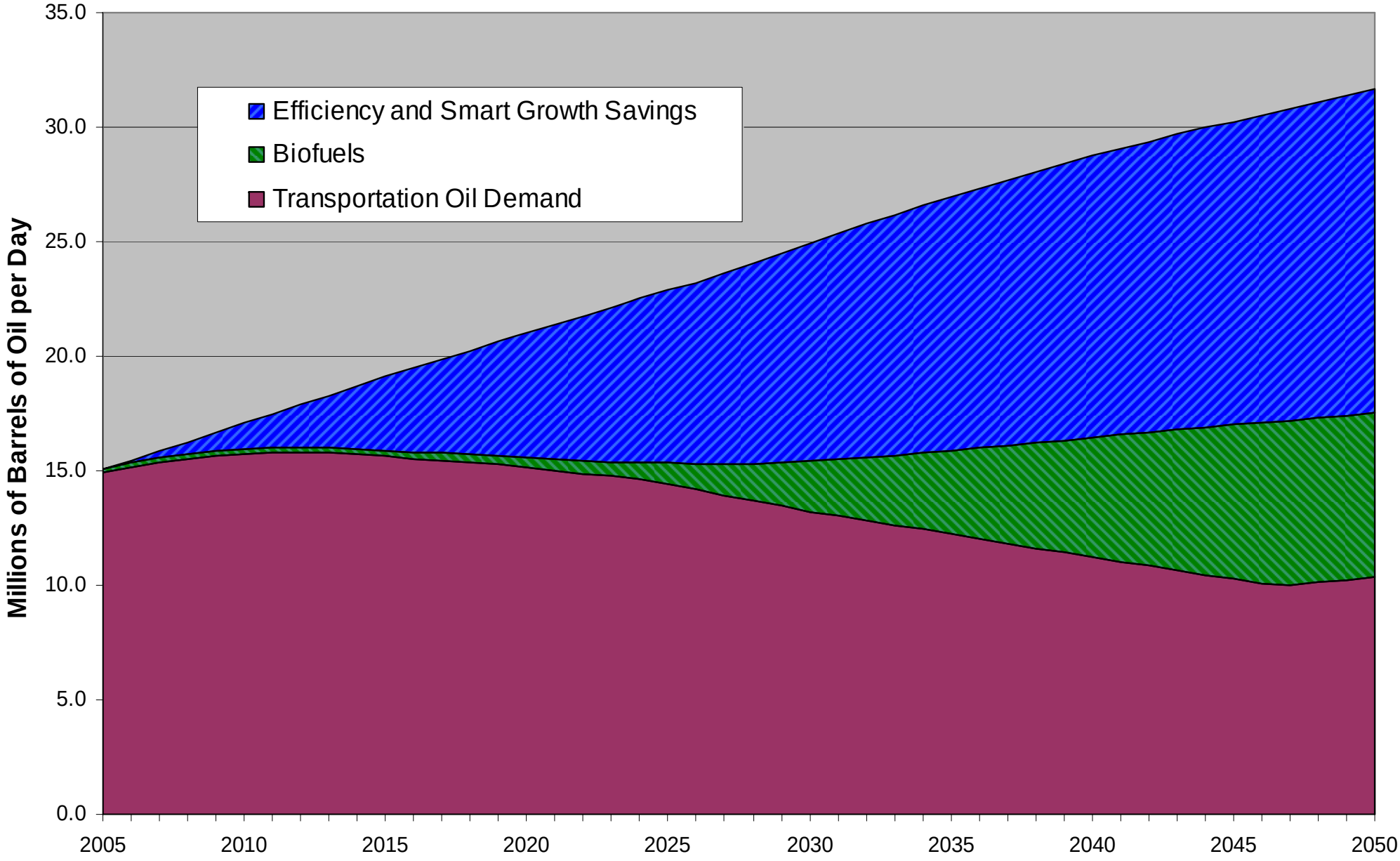
Background

- Funded by National Commission on Energy Policy and Energy Foundation
  - Nathanael Greene, NRDC
- Coordinated with DOE-funded research by:
  - Bruce Dale & Fuat Celik, Michigan State
  - Eric Larson, Princeton University
  - Mark Laser & Lee Lynd, Dartmouth College
  - 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

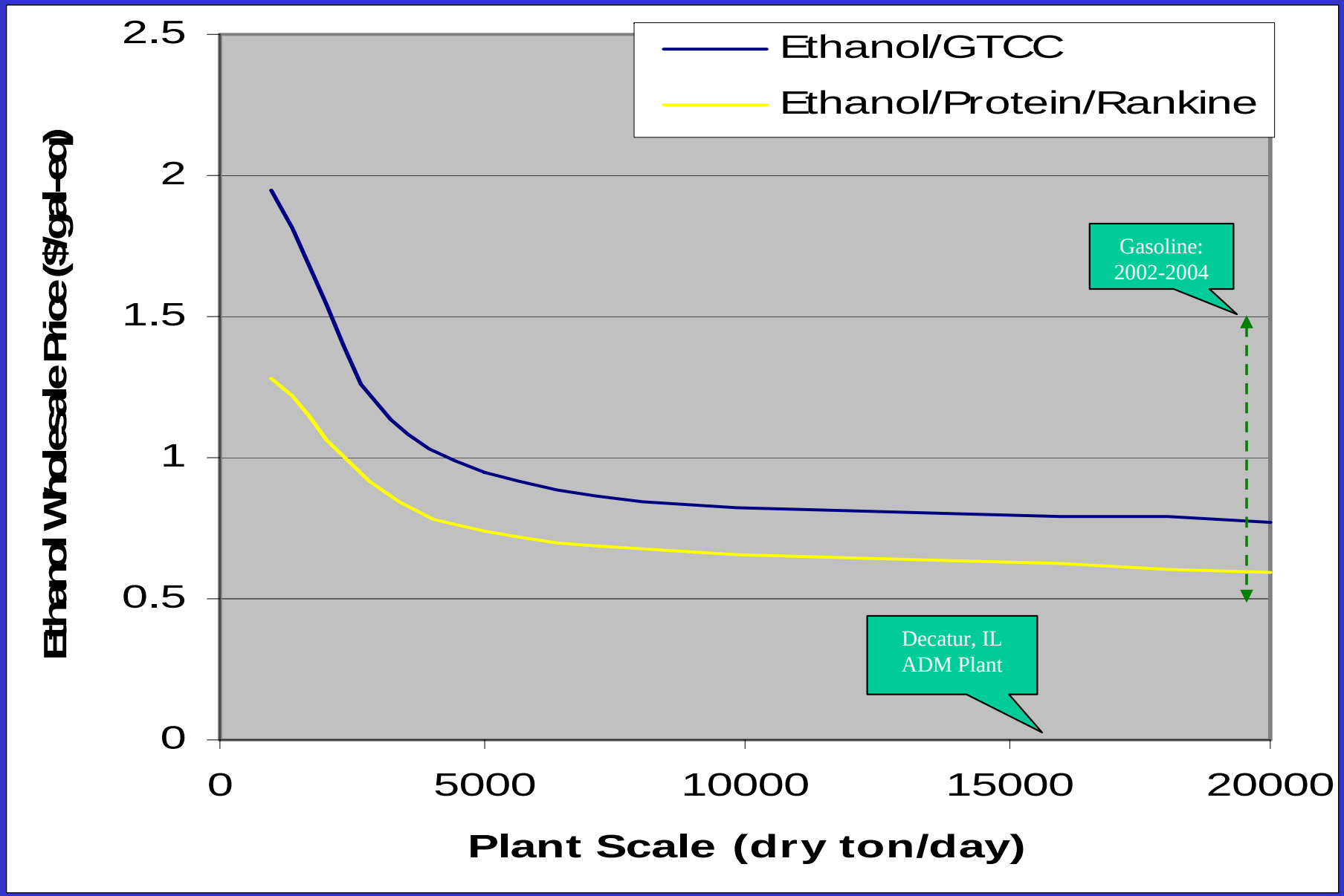
Reduced Oil Demand through Biofuels, Efficiency and Smartgrowth



Land Is Not A Constraint

	Gasoline Demand (B. Gal. Gas-eq.)	*Switchgrass Yield (dt/acre/year)*	*Conversion Efficiency (Gal. Gas-eq/dt)*	*Land Needed (Mill. Acres)*
Status Quo 2050	289	5	33	1753
Production and Efficiency Gains				
Smart Growth/Efficiency	108	5	33	657
Conversion Efficiency	108	5	69	313
Biofuels Coproduction	108	5	77	282
Switchgrass Yield	108	12.4	77	114
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



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
- How? $2B from 2006-2015
  - 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