Sustainable Biofuel Production

A U.S. Department of Energy Perspective

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A Sustainable Biofuels Industry

**Economic**
- Lowered costs and enhanced economic opportunities
- Improved fuel properties
- Decreased production costs

**Social**
- Promotes social goals
- Rural livelihoods
- Oil import reduction, etc.

**Environmental**
- Reduced environmental effects
- Greenhouse gases, biodiversity, fertilizer runoff, land use change

**Equitable**

**Habitable**

**Feasible**

**SUSTAINABLE**
Our Vision

• A viable, sustainable domestic biomass industry that
  – Produces renewable biofuels, bioproducts and biopower,
  – Enhances U.S. energy security
  – Reduces our dependence on oil
  – Provides environmental benefits including reduced greenhouse gas emissions, and
  – Creates economic opportunities across the nation.
Sustainability a focus of OBP

- *Renewable* energy
- Movement away from starch and toward cellulosic feedstocks
- Enzyme development for cheaper, more efficient cellulose degradation
- Integration of conversion platforms and focus on integrating products and high-efficiency heat and power production systems
- Focus on high efficiency and low waste technologies
EERE/Biomass Program Priorities
Our Commitment to Sustainability

DOE’s Biomass Program is committed to developing the resources, technologies, and systems needed for biofuels to grow in a way that enhances the health of our environment and protects our planet. To that end, we are working to…

- Develop diverse, non-food feedstocks that require little water or fertilizer
- Foster sustainable forestry practices to enhance forest health
- Selectively harvest biomass components while leaving adequate soil nutrients
- Assess life-cycle impacts of major scale-up in biofuels production, from feedstocks to vehicles, addressing:
  - land use and soil health
  - water use
  - air quality issues
  - impacts on greenhouse gas (GHG) emissions
DOE Biomass Program’s Current Work on Sustainability

• Indirect Land Use
  In response to Science articles and EISA Sec. 232, Argonne National Laboratory and Purdue University working jointly to refine models that can analytically address international land use change issues due to increasing growth of biofuels

• Climate Change
  NREL is conducting a life cycle assessment (LCA) of the Advanced Energy Initiative performed for the 60 billion gallon 30x30 scenario (a scenario for supplying 30% of 2004 motor gasoline demands by 2030)

• Biodiversity
  OBP is working with Conservation International to --
  – Identify land that should not be developed into biofuel crops globally;
  – Pilot studies to identify best land to locate biofuel crops (Indonesia and Brazil)
  – Utilize standards for biofuel crop production to maintain biodiversity.
DOE Biomass Program’s Current Work on Sustainability (continued)

• **Water**
  Argonne and NREL are conducting LCA of water demand for biofuels production over the lifecycle in comparison to corn ethanol, sugar cane ethanol, and competing petroleum fuels

• **Standards Development**
  Participating in the Council for Sustainable Biomass Production aimed at developing principles and standards for second generation bioenergy feedstocks

• **Feedstock Production**
  - Conducting in-field studies to determine best location for energy crops; done in collaboration with USDA, the Sun Grant Initiative universities, and other regional partners
  - Developing a tool to identify the amount of corn stover that should be left on the field to maintain soil carbon and biomass yields
Sustainable Feedstock Production

Regional Biomass Energy Feedstock Partnership
2008 Bioenergy Crop Trials

[Map showing various universities and locations in the US for bioenergy crop trials, including planted and planned field trials.]
Current Cross-Cutting Efforts

- **National Bioenergy GIS**
  - ORNL, ANL, INL, UC-Davis and others are developing a national scale GIS-based framework to assist in the analyzing the economic and environmental impacts of feedstock, biorefinery, and infrastructure development options.

- **Great Lakes Bioenergy Research Center Sustainability Efforts**
  - Field-based research on novel feedstock production systems
  - Lab-based research on microbial-plant interactions
  - Evaluation of biogeochemical, biodiversity, and socioeconomic responses to expansion and intensification of agriculture
  - Analysis of biomass cropping in reference to land use requirements, environmental consequences and competing energy technologies
Six Commercial-Scale Biorefinery Projects: up to $385 million
Four Small-Scale (10%) Biorefinery Projects: up to $114 million (first round)
Three Bioenergy Centers: up to $405 million
Four Thermochemical Biofuels Projects: up to $7.7 million
Four Improved Enzyme Projects: up to $33.8 million
Five Projects for Advanced Ethanol Conversion Organisms: up to $23 million
We Need Balanced Analysis, Constructive Dialogue, and Smart Policies

• DOE and the recently passed *Energy Independence and Security Act of 2007* call for sustainable biofuels.
  – EISA requires GHG reductions and periodic reevaluation.

• The US can encourage land use policies that restrict development of ecologically-sensitive and carbon-rich lands.

• DOE and the State Department are working to address global sustainability issues with international partners, including environmental organizations, industry, and others.
  – Sustainability requires careful assessment of all environmental impacts, including water, land use, GHG, fertilizer use, and socio-economic issues.
  – Global standards for sustainable development, if well crafted, could promote adherence to best practices in developing biofuels industries,

• We welcome open discourse on all topics of concern and encourage broad dissemination of plans and ideas.