



U.S. Department of Energy  
Energy Efficiency and Renewable Energy

*biomass program*

# University of Illinois at Urbana-Champaign

John Ferrell

Office of the Biomass Program

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- Biomass R&D Act of 2000  
(<http://www.brdisolutions.com/default.aspx>)
  - Interagency coordination of biomass efforts, specifically between DOE and USDA
  - Annual DOE/USDA joint solicitation
  - Creation of the Biomass R&D Technical Advisory Committee and Interagency Board
- 2002 Farm Bill - Energy Title (Sections 9006 & 9008)
- Energy Policy Act of 2005



- **Advanced Energy Initiative**
  - Reduce dependence on foreign sources of oil by addressing how we power our automobiles and homes
  - Make cellulosic ethanol cost competitive by 2012
  - Includes vehicle efficiency and solar components (i.e. Solar America Initiative)
- **20 in 10**
  - Increase supply of renewable and alternative fuels
    - Set Alternative Fuels Standards (AFS) at 35 billion gallons per year by 2017
      - 5X the current Renewable Fuels Standard for 2012
      - **15%** of projected annual gasoline use in 2017
  - Increase vehicle efficiency
    - Reform and modernize CAFÉ
      - **5%** of projected annual gasoline use in 2017



## U.S. Domestic Impacts from Solar PV Market Penetration

### By 2015\*:

- PV electricity will be cost-competitive in all sectors without government support.
- PV will provide approximately **5 GW** of electricity generating capacity – displacing roughly the equivalent of 5 coal-fired power plants – enough to power **1.25 million households**. This is equivalent to 10 times the amount of PV installed today.
- Roughly **2 million metric tons** per year of carbon emissions will be avoided.

### By 2030\*:

- PV will provide approximately **70 GW** of electricity generating capacity – displacing roughly the equivalent of 70 coal-fired power plants – enough to power **17.5 million households**.
- Roughly **27 million metric tons** per year of carbon emissions will be avoided.
- PV systems could provide roughly up to **35% of all new electric capacity** in the U.S.

*\* Rough estimates based on modeling by NREL Energy Analysis Group. Estimates include SAI-PV benefits only (no CSP included).*



- Energy Policy Act of 2005 (EPAAct)
  - Section 932: **Commercial Integrated Biorefinery**
    - Secretary Bodman recently announced six awards
    - \$53 million in FY 2007 budget request
  - Section 941: **Revisions to Biomass R&D Act of 2000**
    - *Vision* document released November 2006; updated *Roadmap* due May 2007
  - Sections 1510, 1511, and Title XVII: **Loan Guarantees**
    - DOE issued guidelines for the first Loan Guarantees under Title XVII in August 2006
    - Loans for conversion of Municipal Solid Waste and cellulosic biomass to fuel ethanol and other commercial byproducts also considered under this offering



*“[Congress needs] to pass meaningful energy legislation as soon as possible, all aiming at making sure that we promote technologies that, for the sake of our national security and for the sake of environmental policy...reduce the usage of gasoline.” – President Bush, 3/27/07*

- Alternative Fuel Standard Act of 2007
- S. 987: Biofuels for Energy Security & Transportation Act  
([http://www1.eere.energy.gov/office\\_eere/congressional\\_test\\_041207\\_senate.html](http://www1.eere.energy.gov/office_eere/congressional_test_041207_senate.html))
- New Farm Bill  
([http://www.usda.gov/wps/portal/usdafarmbill?navtype=SU&navid=FARM\\_BILL\\_FORUMS](http://www.usda.gov/wps/portal/usdafarmbill?navtype=SU&navid=FARM_BILL_FORUMS))



## Biomass Program

Develop cost competitive biomass technologies to enable the production of biofuels nationwide and reduce dependence on oil through the creation of a new domestic bioindustry supporting the President's goal to reduce gasoline use 20 percent by 2017.

### Feedstocks

In partnership with USDA and other key stakeholders, develop sustainable technologies to provide a secure, reliable and affordable cellulosic and sustainable biomass supply for the U.S. bioindustry.

### Conversion

Develop technologies for converting feedstocks into cost-competitive commodity liquid fuels, like ethanol, as well as bioproducts and biopower.

### Integrated Biorefineries

Through public-private partnerships, demonstrate and validate technologies that can be integrated into processes and achieve commercially accepted cost and performance proforma targets.

### Infrastructure

Enable the deployment of ethanol through a nationwide strategy for a higher ethanol blend (minimum E15) and regional E85.

**Cross-cutting** Form alliances with USDA, other federal and state agencies, and stakeholder organizations to improve understanding of biofuel technologies; conduct outreach to foster market transformation; and understand and address issues of environment, health and safety. Provide underlying research to enable codes and standards development for the safe use of renewable fuels in all applications.



## Collaborative R&D

- **Feedstocks:** integration of feedstocks with conversion processes
- **Conversion Technologies:** biochemical and thermochemical
- **Integrated Biorefineries:** systems integration, demonstrations, infrastructure development

## Integrated Biorefineries

- **Systems Integration:** feedstocks, conversion, biopower, infrastructure
- **Demonstration:** pilot scale, commercial scale



DOE efforts are paving the way for a strong, domestic bioenergy industry—  
with commercial success possible in the next six years.



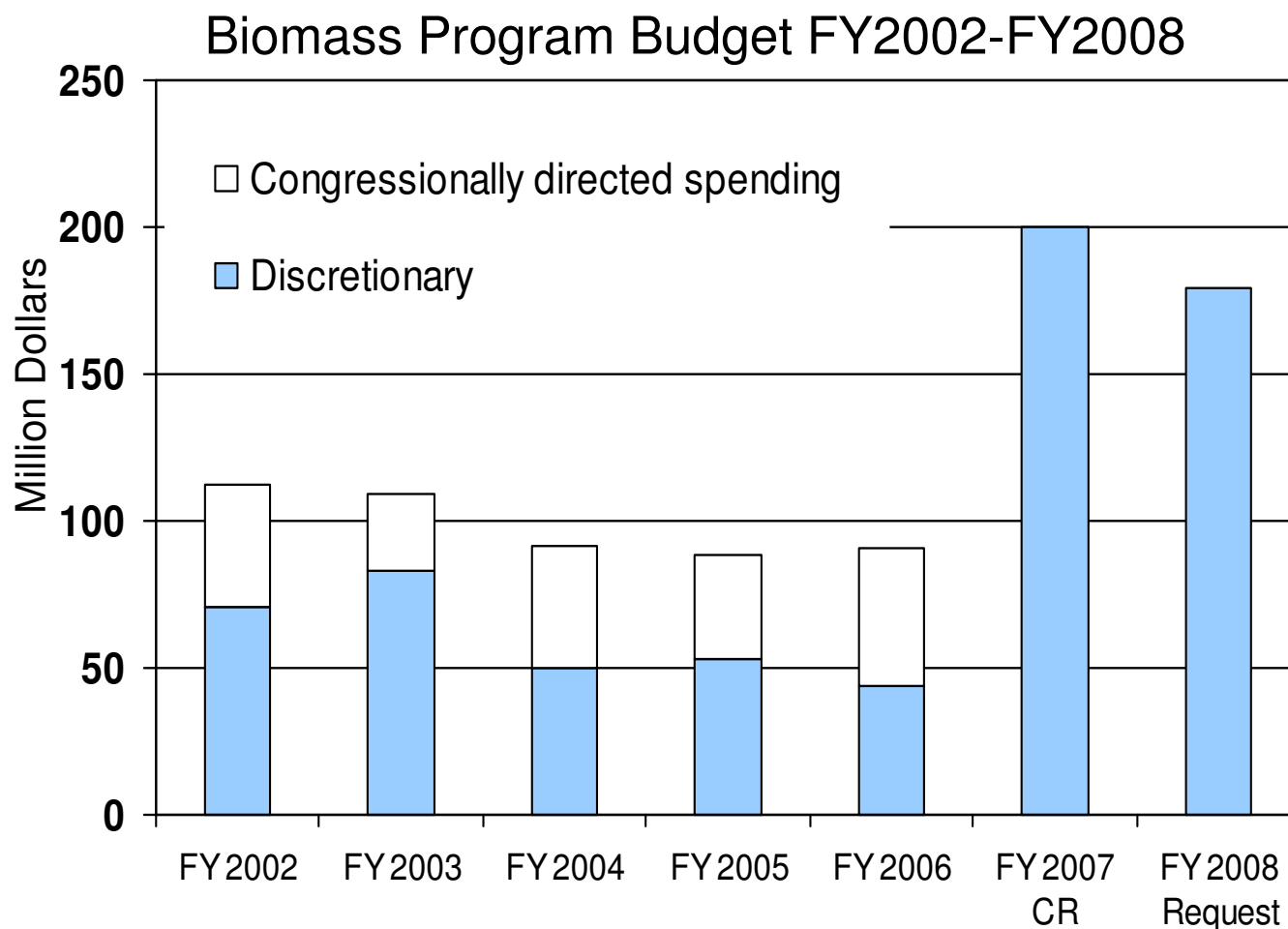
## Barriers

- High cost of enzymatic conversion
- Inadequate technology for producing ethanol from sugars derived from cellulosic biomass
- Limitations of thermochemical conversion processes
- Demonstration/integration of technology in biorefineries
- Inadequate distribution infrastructure for expanding markets

## Solutions

- ➔ • R&D to improve effectiveness and reduce costs of enzymatic conversion
- ➔ • R&D on advanced micro-organisms for fermentation of sugars
- ➔ • Re-establish thermochemical conversion as a second path to success
- ➔ • Fund loan guarantees, Section 932 biorefinery demonstrations, and 10% scale validation projects
- ➔ • Form interagency infrastructure team and Regional Feedstock Partnerships

The expertise of the national laboratories and cutting-edge industrial partners is helping to solve major challenges to domestic biofuels.





- 932 Awards (<http://www.doe.gov/news/4827.htm>)
- Ethanologen Solicitation Awards (<http://www.doe.gov/news/4896.htm>)
- Office of Science Biomass to Biofuels (<http://genomicsgtl.energy.gov/biofuels/b2bworkshop.shtml>)
- Brazil MOU
- Regional Feedstock Partnerships (<http://bioenergy.ornl.gov/>, see Regional Partnership tab)
- E85 Vehicle Optimization Solicitation (<http://www1.eere.energy.gov/vehiclesandfuels/financial/index.html>)



- **Enzyme Solicitation: Second phase of cellulase development collaborations with cost-sharing industry partners.**
  - Expected to be announced in FY07
  - Create commercially available, highly effective & inexpensive enzyme systems for biomass hydrolysis
- **10% Validation Solicitation: One-tenth to one-fifth of the projected scale of a first-commercial facility**
  - Expected to be announced in FY07
  - Integrated biorefinery demonstrations using cellulosic feedstocks and producing a combination of fuels, chemicals, and substitutes for petroleum-based feedstocks and products
- **Thermochemical Conversion Solicitation: Integration of gasification and catalytic development**
  - Expected to be announced in FY07



- Office of the Biomass Program Website:  
<http://www1.eere.energy.gov/biomass/>
- John Ferrell:
  - [John.ferrell@ee.doe.gov](mailto:John.ferrell@ee.doe.gov)
  - 202-586-6745