



# ***ARS Bioenergy Research: Enabling The Next Generation Bio-refineries***

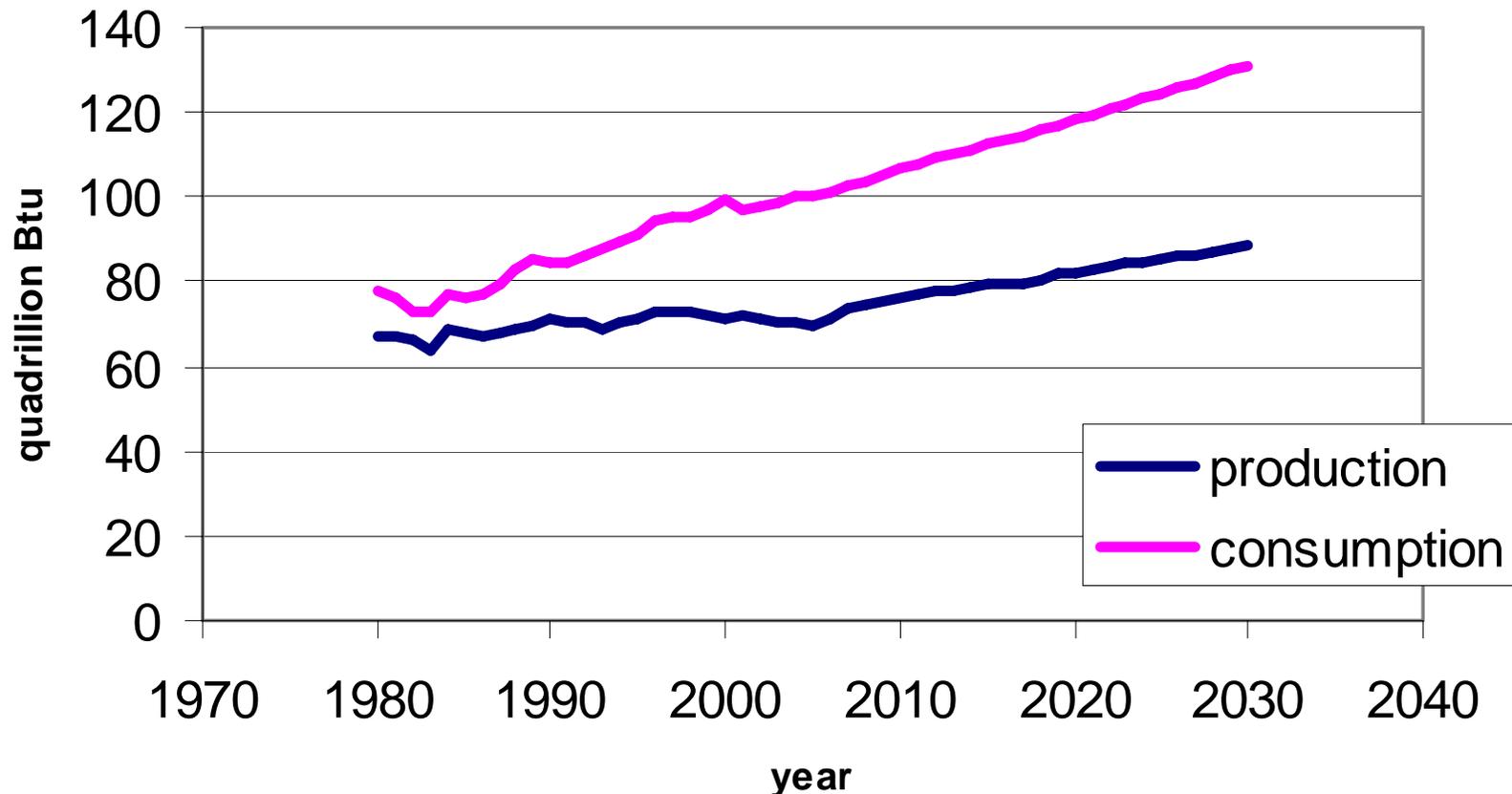


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# Energy Security and Energy Consciousness - *Achieving balance to ensure progress*

US Production versus Consumption

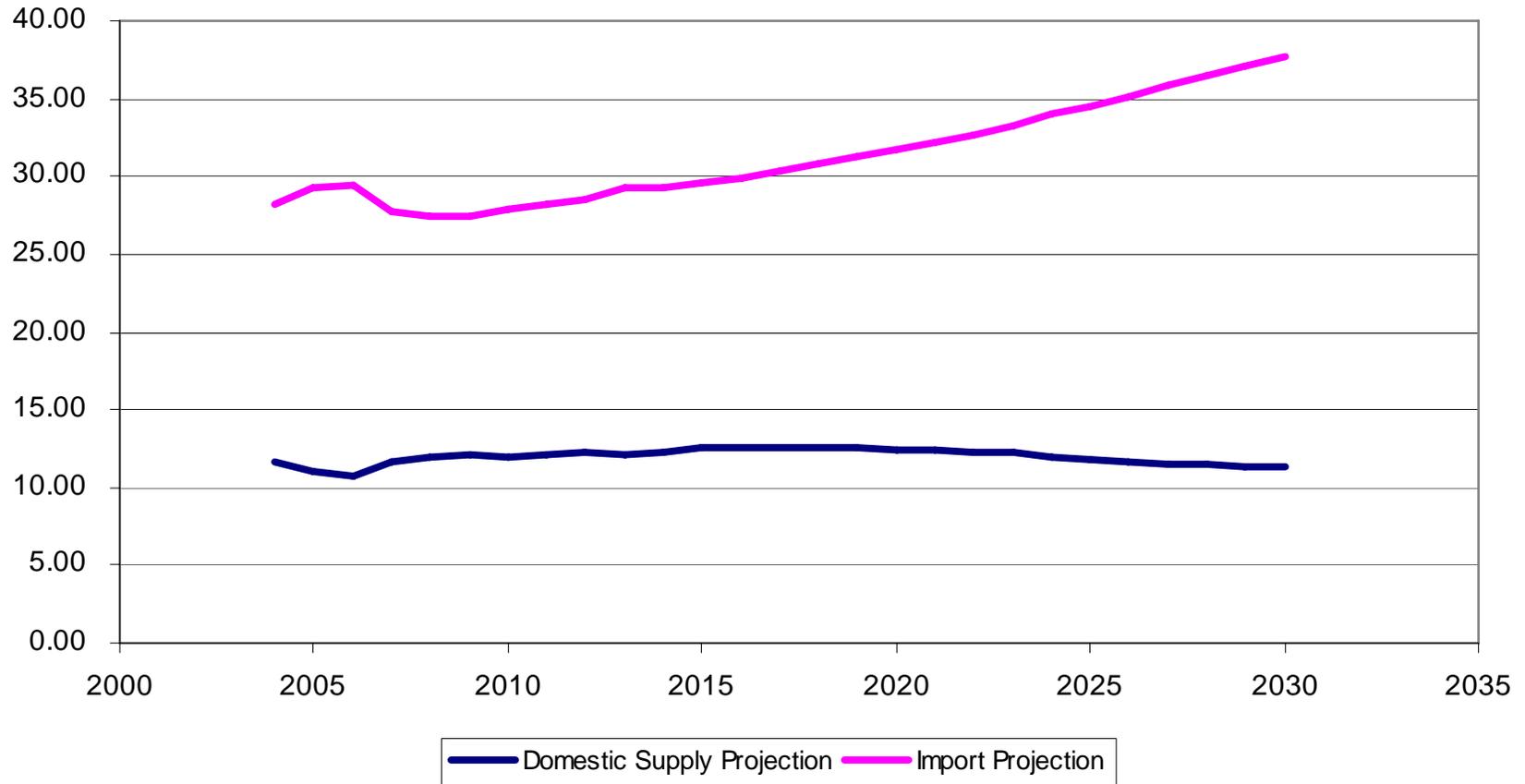


**Growing need for domestic and renewable energy**

Source: Energy Information Agency, DOE, Advanced Energy Outlook 2007 AEO 2007  
<http://www.eia.doe.gov/oiaf/aeo/index.html>

# Energy Security and Energy Consciousness - *Achieving balance to ensure progress*

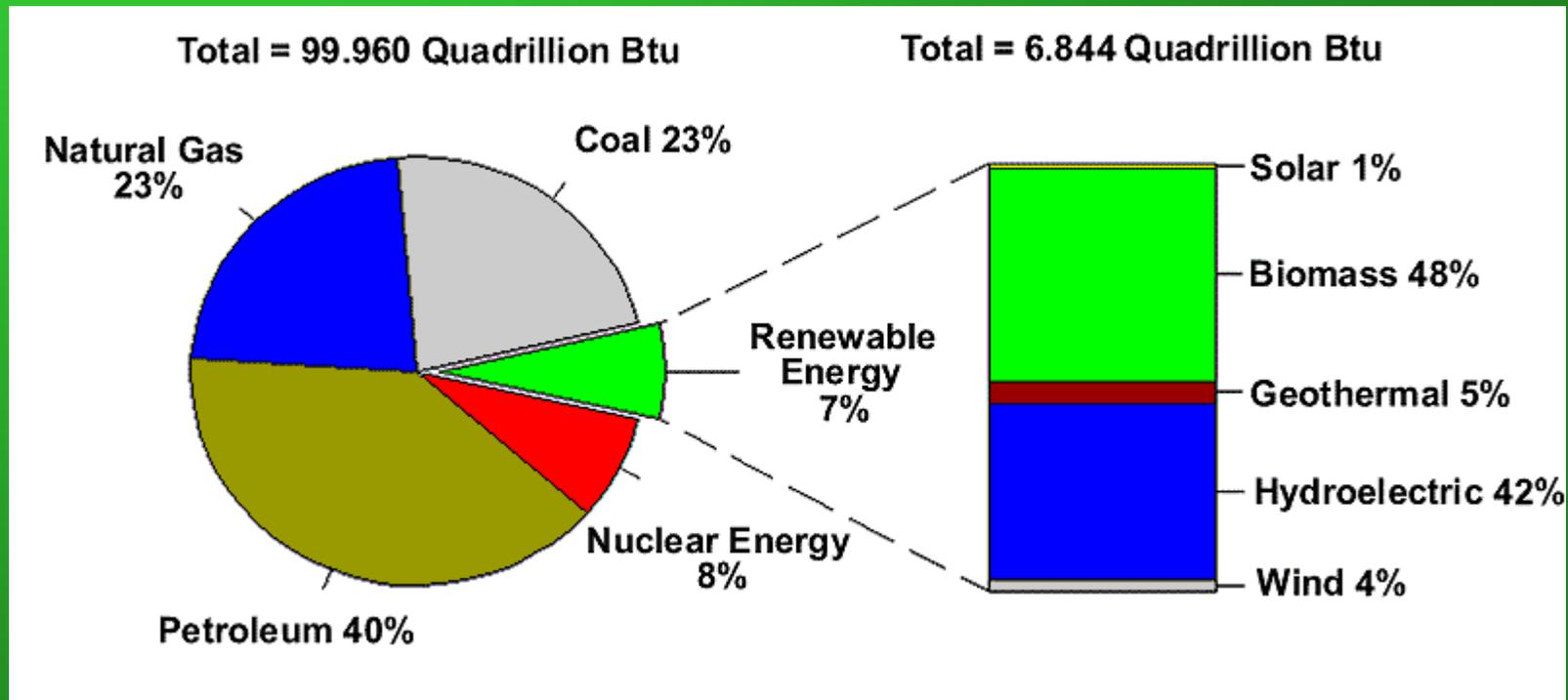
**US Liquid Fuel Supply and Imports**  
**Quadrillion BTU**



**Growing need for domestic and renewable energy**

Source: Energy Information Agency, DOE, Advanced Energy Outlook 2007 AEO 2007  
<http://www.eia.doe.gov/oiaf/aeo/index.html>

# Energy Security and Energy Consciousness - *Achieving balance to ensure progress*



**Biofuel consumption up 28%**

Source: Energy Information Agency, DOE, Renewable Energy Consumption and Electricity Preliminary 2006 Statistics

[http://www.eia.doe.gov/cneaf/solar.renewables/page/prelim\\_trends/rea\\_prereport.html](http://www.eia.doe.gov/cneaf/solar.renewables/page/prelim_trends/rea_prereport.html)

# Energy Production through Agriculture -

*Capture carbon dioxide and convert solar energy to fuels and products*

## BIOMASS

grain crops/oil crops/cellulosics

**FUELS**

**VALUABLE  
COPRODUCTS &  
BIOPRODUCTS**

**CHEMICAL  
FEEDSTOCK**

**Tremendous opportunities for agriculture**

# Bioenergy R&D Challenges/Opportunities

- Can we produce enough feedstocks?

- Enhance productivity
- Not disrupt markets
- Avoid land-use competition

- Can we produce feedstocks sustainably?

- Maintain ecological integrity
- Enhance environmental values

- Can we make biofuels competitive?

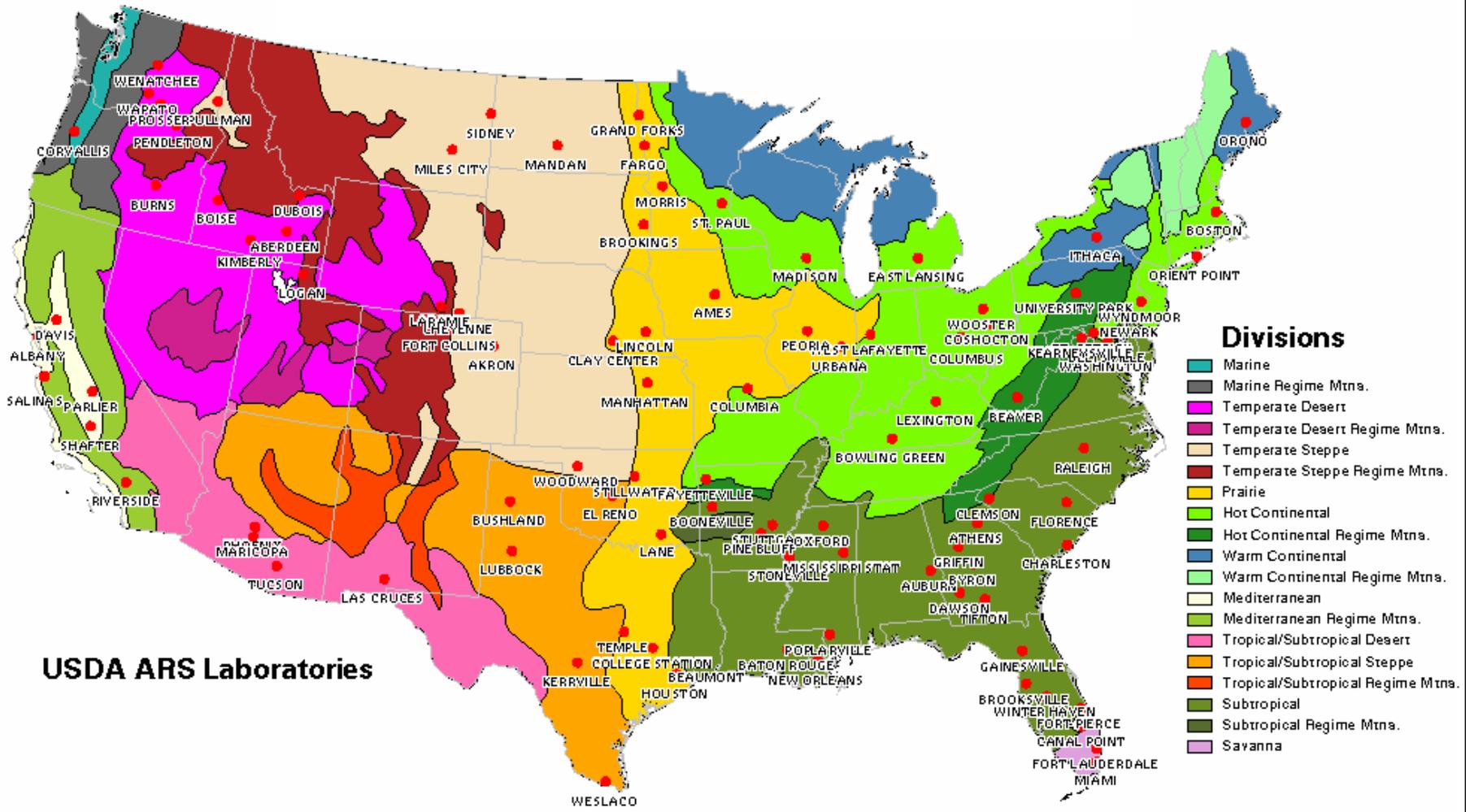
- Optimize agronomic and silvicultural systems
- Innovative conversion and delivery technology deployment
- Bioproducts and coproducts

- Can we enable a “Rural Renaissance?”

- Transition to a bioeconomy – education, training, and outreach
- Provide economic opportunities
- Provide assistance



- Scientific research arm of USDA
- Farm-to-table research scope
- Information and technology transfer
- National Programs
- 1,100+ projects
- 2,500+ scientists
- 9,000 employees
- 100+ lab locations
- \$1.1 billion annual budget (FY07)
- International collaboration
- Partnerships with universities and industry
- Stakeholder driven priority process



U.S. Department of Agriculture  
 Agricultural Research Service  
 Beltsville, MD April 2006

Data Source: Robert G. Bailey - USDA Forest Service  
 Albers Projection  
 Prepared by W. Dulaney - Hydrology and Remote Sensing Laboratory (HRS�)

# ARS' Bioenergy National Program

- **Energy crop research**
  - Developing new plant varieties for biofuels feedstocks
- **Ethanol**
  - Processing
  - Developing new microbes and enzymes for conversion
  - Developing valuable co-products from ethanol production
- **Biodiesel**
  - Processing
  - Quality and performance
- **Other**
  - Methane from manure
  - Thermo-chemical and biological conversion of biomass to hydrogen
  - On-farm and remote renewable energy systems

# Stakeholder Driven Research Agenda

*In what areas of research and development can ARS have a dramatic impact?*

*In what areas of research and development does ARS uniquely contribute to and where should ARS take on leadership roles?*

*ARS resources are not unlimited, but they are substantial and can create significant impact.*

# Stakeholder Driven Research Agenda

*ARS is looking for suggestions on how to solicit input and advice from customers & stakeholders on our Strategy and Action Plan during the period between now and the next Stakeholder Workshop in 2012.*

*ARS welcomes suggestions for additional priorities which would require resources that we do not currently possess.*

# Expected Outcomes

*Recommended priority areas for ARS-wide research that could impact bioenergy production (or use) by agriculture*

*Recommendations regarding the Action Plan for the Bioenergy National Program over the next five years*

*Identify synergies and linkages between the ARS National Program in Bioenergy and other National Programs within ARS*

*Recommendations on how ARS should partner with other Federal agencies, universities and/or industry so as to maximize the impact of its bioenergy research and technology transfer.*

# *Agricultural Science: key to food and energy security and natural resources stewardship*

