



ARS Bioenergy Research: Enabling The Next Generation Bio-refineries

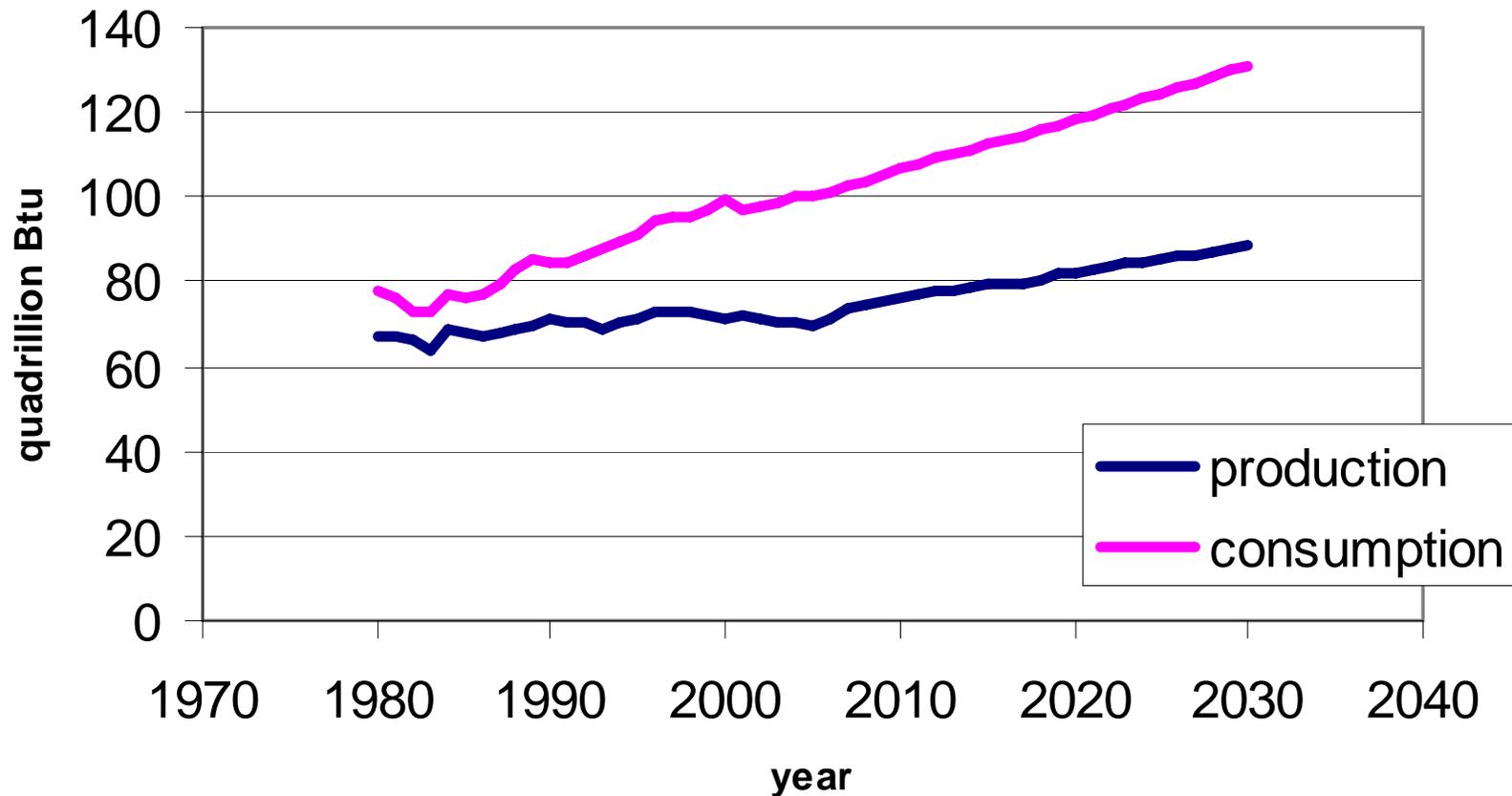


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Energy Security and Energy Consciousness - *Achieving balance to ensure progress*

US Production versus Consumption

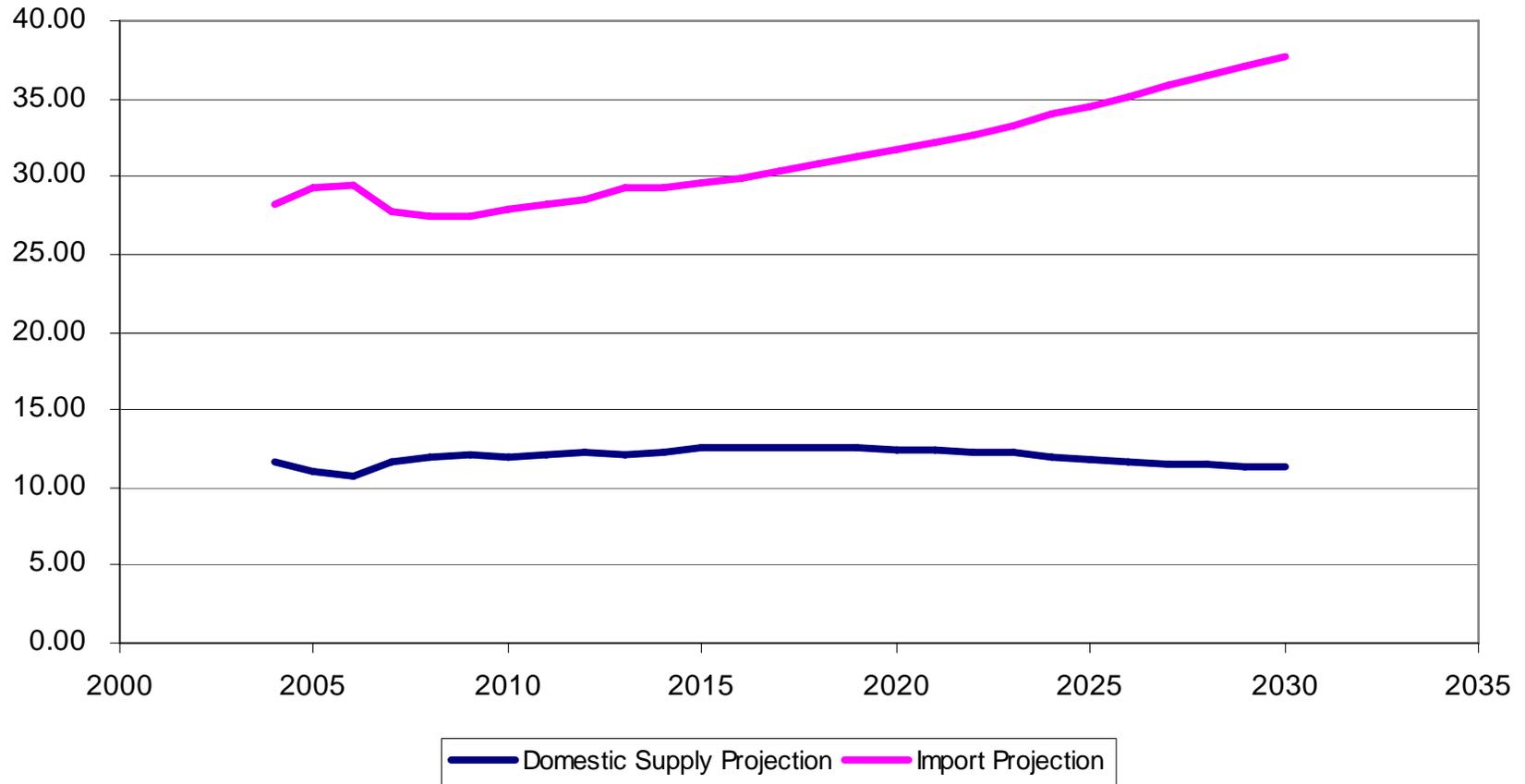


Growing need for domestic and renewable energy

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

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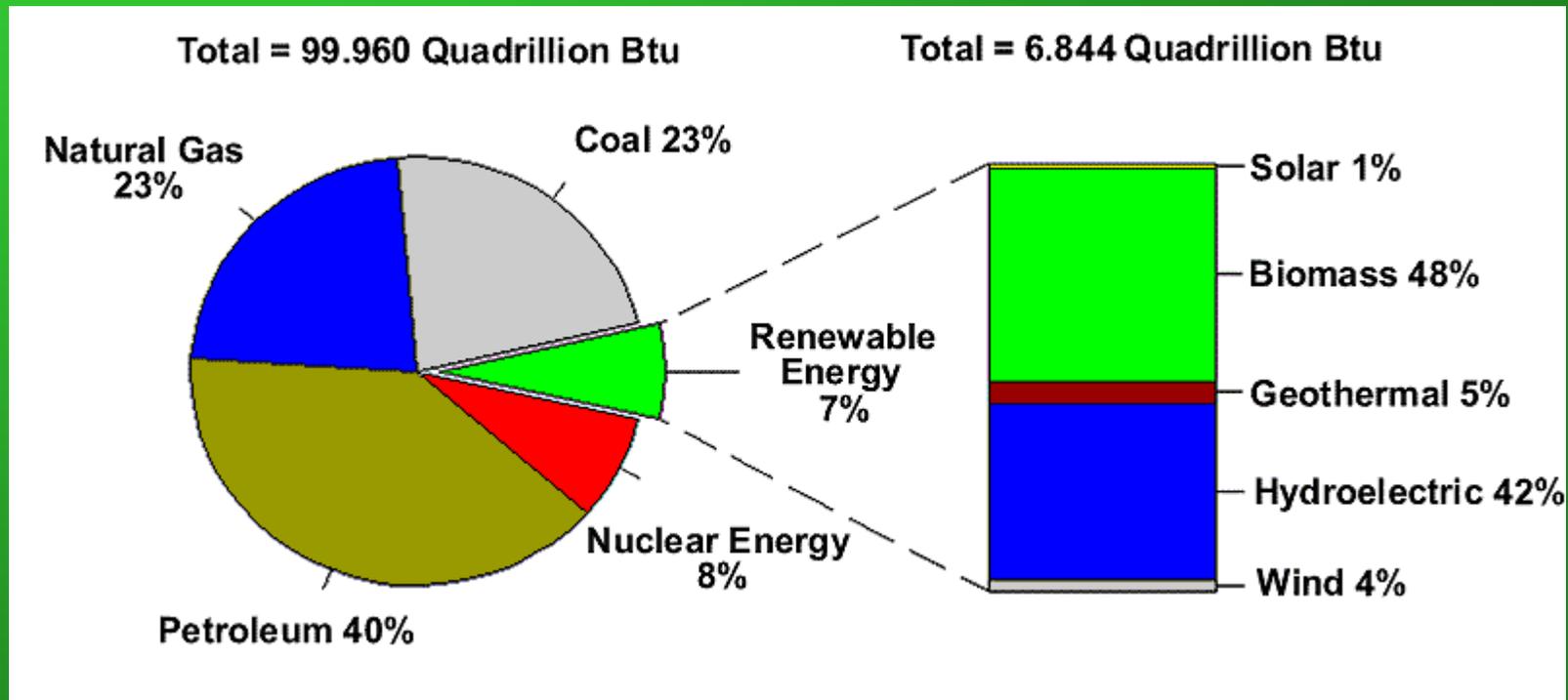
US Liquid Fuel Supply and Imports
Quadrillion BTU



Growing need for domestic and renewable energy

Source: Energy Information Agency, DOE, Advanced Energy Outlook 2007 AEO 2007
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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

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?

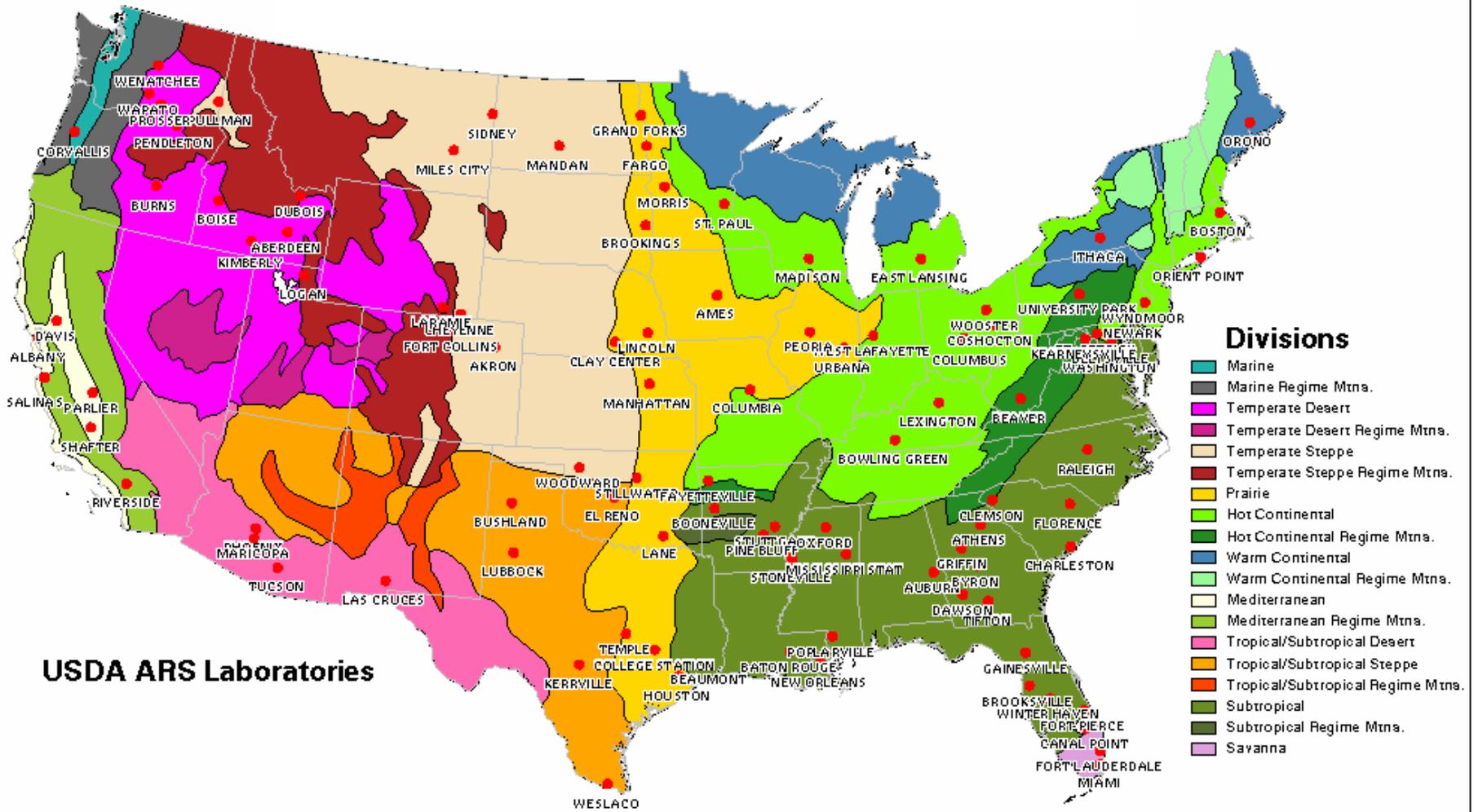
- Optimize agronomic and silvicultural systems
- Innovative conversion and delivery technology deployment
- Bioproducts and coproducts

- 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



Rice Sample Scores for Factors

L = Light Milled D = Deep Milled

