Billion Ton Bioeconomy Initiative

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June 13, 2016

Recognitions

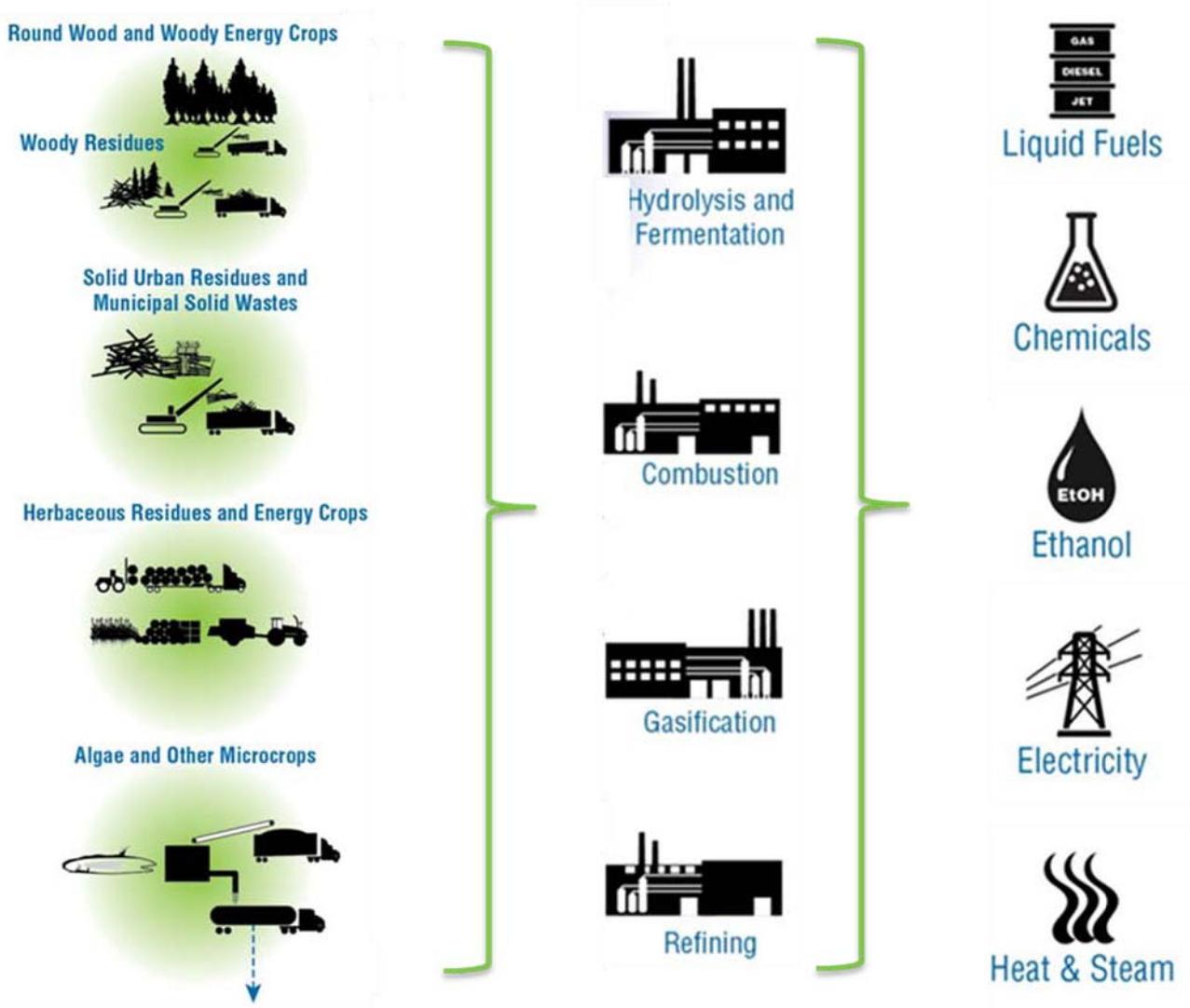
- We would like to thank all of the ~400 participants who attended our five Bioeconomy Listening Sessions over the last two months.
  - The feedback received is instrumental to this report's success for identifying the gaps in federal support for the bioeconomy and innovative ways for agencies to address those gaps.
- We would also like to thank those who facilitated those four meetings for taking time out of their busy schedules to get the feedback needed for this report.
  - In particular: USDA Rural Development, USDA Office of the Chief Economist, and DOE Bioenergy Technologies Office

Bioeconomy Definition

The bioeconomy is defined as: The global industrial transition of sustainably utilizing renewable aquatic and terrestrial biomass resources in energy, intermediate, and final products for economic, environmental, social, and national security benefits.

--From 2014 Report: Why Biobased? Opportunities in the Emerging Bioeconomy: Why BioPreferred

The Bioeconomy Concept



- Revenue and economic growth
- Broad spectrum of new jobs
- Rural development
- Advanced technologies and manufacturing
- Reduced emissions and Environmental Sustainability
- Export potential of technology and products
- Positive societal changes
- Investments and new infrastructure

A BILLION DRY TONS OF SUSTAINABLE BIOMASS

HAS THE POTENTIAL TO PRODUCE

1.1 MILLION Direct Jobs
and keeps about
$250 BILLION
in the U.S.
(direct contribution and inflation adjusted)

85 BILLION* kWh of electricity to power **6 MILLION** households. Plus **1050 TRILLION BTUs** of thermal energy.

50 BILLION gallons of biofuels displacing almost **25%** of all transportation fuels.

50 BILLION POUNDS of biobased chemicals and bio-products, replacing a significant portion of the chemical market.

400 MILLION TONS of CO_2e reductions every year.

STEPS TO BUILDING THE BIOECONOMY

1. Accelerate research & technology development
2. Develop production, conversion and distribution infrastructure
3. Deploy technology
4. Create markets and delivery systems

Projections based on:

- 2016 Billion Ton Study Report (Forthcoming)
- EIA 2015 AEO
- 2015 USDA Long-Term Forecast
- Various data sources

* Includes 27 billion kWh and 90 TBtu from livestock anaerobic digestion

Federal Activities Report on the Bioeconomy

- On February 18th, the Biomass R&D Board released the Federal Activities Report on the Bioeconomy (FARB).
- This report aims to educate the public on the wide-ranging, federally funded activities that are helping to bolster the bioeconomy.
- The FARB details a vision for a Billion Ton Bioeconomy—tripling the size of today's bioeconomy by 2030.
- Achieving this vision would provide economic, environmental, and social benefits, including a considerable reduction in GHG emissions.

Vision and Goal of the Billion Ton Bioeconomy

The vision for the Billion Ton Bioeconomy is to sustainably reach the full potential of biomass-derived products as a way of expanding our nation's economy. In doing so, the bioeconomy will provide multiple economic, environmental, and social benefits to the Nation.

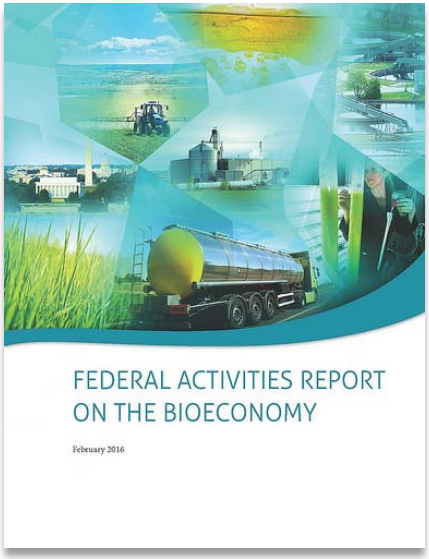
The goal of the Billion Ton Bioeconomy is to develop and provide innovative ways to remove barriers to expanding the sustainable use of Nation's abundant biomass resources for biofuels, bioproducts, and biopower, while maximizing economic, social, and environmental outcomes.

Overview of Agency Activities

Agency	Feedstock Supply	Biomass Conversion	Bioenergy Distribution	Bioenergy End Use
DOE	● ● ● ●	● ● ● ● ●	● ● ●	● ● ● ● ●
USDA	● ● ● ● ●	● ● ● ●	● ● ● ● ●	● ● ● ●
DOT	● ● ● ●	● ● ●	● ● ● ● ●	● ● ● ● ●
EPA	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●	● ● ● ●
DOI	● ●	●		
NSF	● ● ●	● ● ● ●	●	
DoD		● ●	● ● ● ●	● ● ● ●

● Use an integrated systems approach
● Provide the science and the technology
● Public and private collaboration to overcome barriers and accelerate deployment
● Develop a workforce for the future bioeconomy
● Understand and inform policy

Bioeconomy Initiative Reports Plan



The Bioeconomy Initiative: *Challenges and Opportunities for a Billion Ton Vision*
Target Release Date
July 13, 2016

The Bioeconomy Initiative: Action Plan
Target Release date:
Dec., 2016

- Three reports in the series: FARB – released in February, 2016
- Stakeholder engagement
  - Over 400 participants involved in 5 sessions.
    - 4 in-person Listening Sessions were held in conjunction with major bioenergy industry events.
    - 1 public webinar held on May 5th.
- Upcoming report will be the second part of a staggered release of the Initiative based on recommendations and guidance from OSTP.
  - An 'Action Plan' will follow in FY2017.

Completed Bioeconomy Listening Sessions

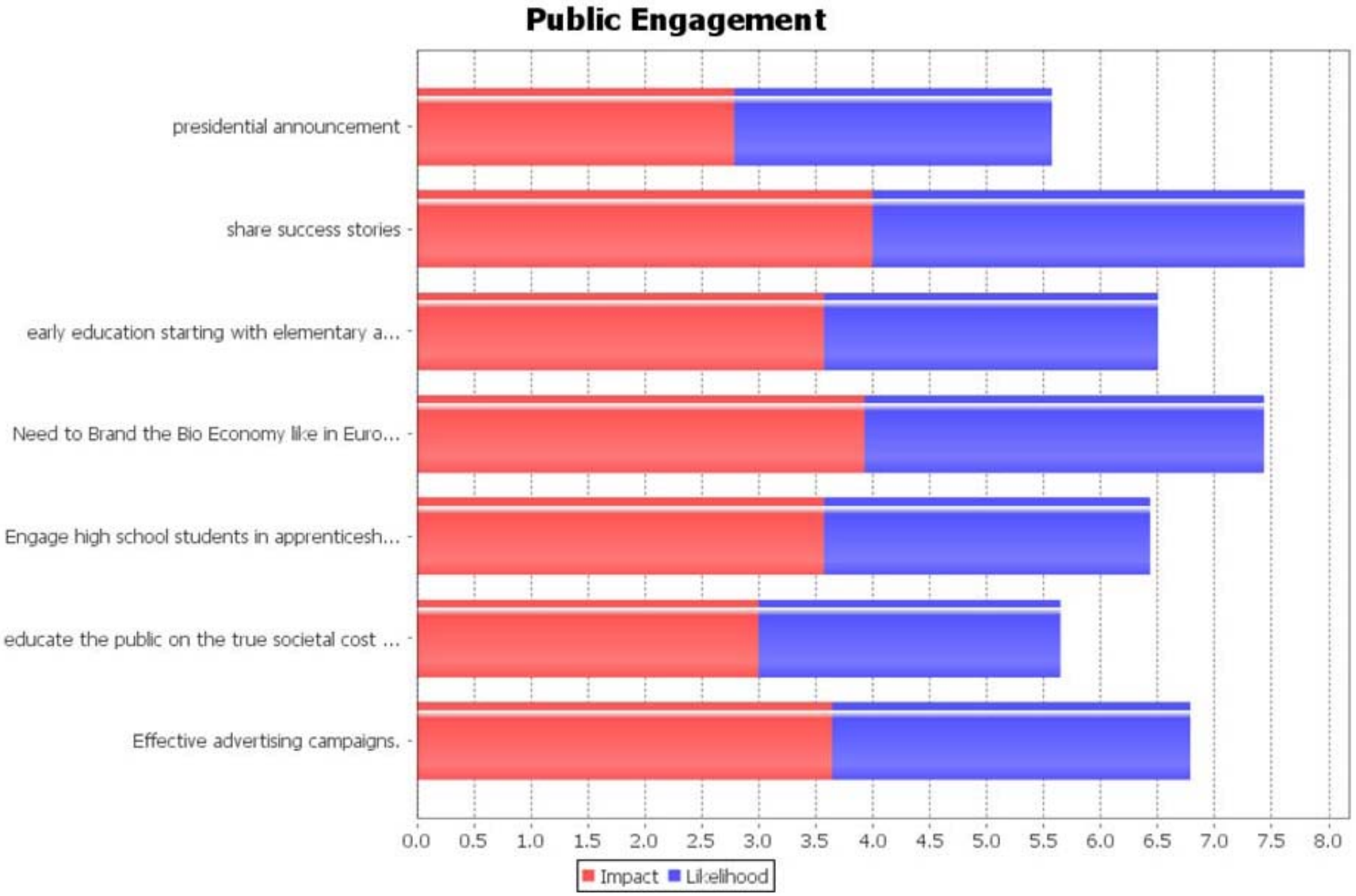
1. On 2/19 at the Advanced Bioeconomy Leadership Conference in DC from 3:00 to 5:00 PM.
   - Focus on CEOs and entrepreneurs.
2. On 4/10 at the International Biomass Conference & Expo in Charlotte from 2:30-4:30 PM.
   - Focus on feedstocks and logistics.
3. On 4/17 at the BIO World Congress on Industrial Biotechnology in San Diego from 2:30-4:30 PM.
   - Focus on the industrial bioenergy sector.
4. On 4/27 at the 38th Symposium on Biotechnology for Fuels and Chemicals in Baltimore from 3:00 to 5:00 PM.
   - Focus on research and development.
5. On 5/5 via ThinkTank webinar hosted in DC from 2:00 to 4:00 PM.
   - Focus on broader audience.

Sample of Stakeholder Feedback

- Federal sector can address several needs across the supply chain:
  - Access to capital
  - Speed to market
  - Loan guarantees
- Promote incentives available for low carbon biomass that accomplishes additional goals:
  - Restoring degraded land
  - Double/triple cropping
  - Better management of waste
- Suggestions on defining the bioeconomy
  - Establish a normalizing currency in order to value biomass-derived feedstocks as tradable commodities; i.e. $/megajoule conversion formula for each feedstock based on sugar content.
  - Provide granular description of economic impact of bioeconomy; where are the jobs located and what type of jobs are/will be available?
  - Ensure that chemicals, materials, and products are all emphasized.
  - Include a broad range of activities that are part of the bioeconomy; i.e. end use products such as automobiles.
- Suggestions on advancing the bioeconomy
  - Aggressively pursue inclusion of rural communities; eliminate regulatory bottlenecks that may impact rural opportunities.
  - Enlist support of investment community, oil and gas industry, and automobile manufacturers

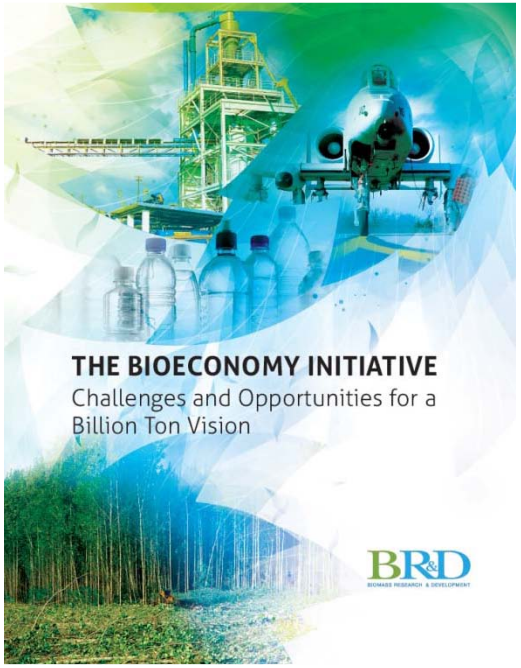
Current technology barriers aside, what would it take to make the Billion Ton Bioeconomy feasible?

How can we best engage the interested public in the process of developing a Billion Ton Bioeconomy?



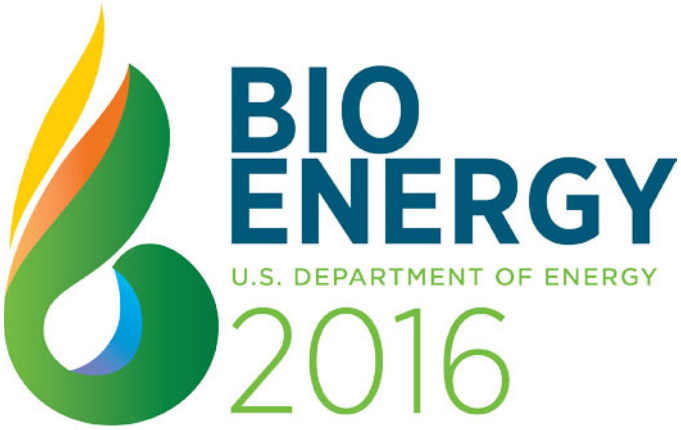
Report Outline

- Introduction
  - Purpose of the report
  - Background of the Bioeconomy Effort
- The Bioeconomy Initiative
  - Path to building the Initiative
  - Overview of the Bioeconomy Vision as stated in the FARB
  - Highlights and Learnings from the FARB
  - Expected benefits for 2030 as defined by Analysis IWG
- Challenge Areas (as identified by Stakeholders)
- Ongoing Interagency Areas of Importance and Growth for the Initiative
- Next Steps/Path Forward
  - How to move from the Strategy Report to an Action/Implementation Plan
  - Additional Stakeholder Involvement
  - Call for partners from industry/research community to 'Join the Initiative'
- Conclusion



Next Steps

- New report released: July 13 at Bioenergy 2016
  - Resulting from stakeholder input – document highlights critical barrier areas that will need to be addressed to realize the metrics.
  - Looking for external stakeholder commitments to complement Federal commitments toward building the Bioeconomy.
- Regional Partnership Workshops to be planned August-October 2016
- Develop Federal Implementation Strategy to be released in FY 2017



ATIP Foundation Workshops – Regional Forums

- These workshops, organized by the ATIP Foundation, will focus on regional issues and their specific bioeconomy-related industries by partnering with the states rather than conferences geared to a specific industry. These workshops will take place in the late July through October timeframe.

- The feedback gathered from these formal workshops will be used to solidify and support the Action Plan that is planned for release in December of 2016.

Thank you!

Billion Ton Studies History and Accomplishments

Billion-Ton Study (BTS), 2005

- Technical assessment of agricultural and forestry systems to supply low-valued biomass for new markets
- Identified adequate supply to displace 30% of petroleum consumption; i.e. physical availability

Billion-Ton Update (BT2), 2011

- Quantified potential economic availability of feedstocks for 20-year projection
- Publicly released county-level supply curves for 23 candidate biomass feedstocks through Bioenergy Knowledge Discovery Framework.

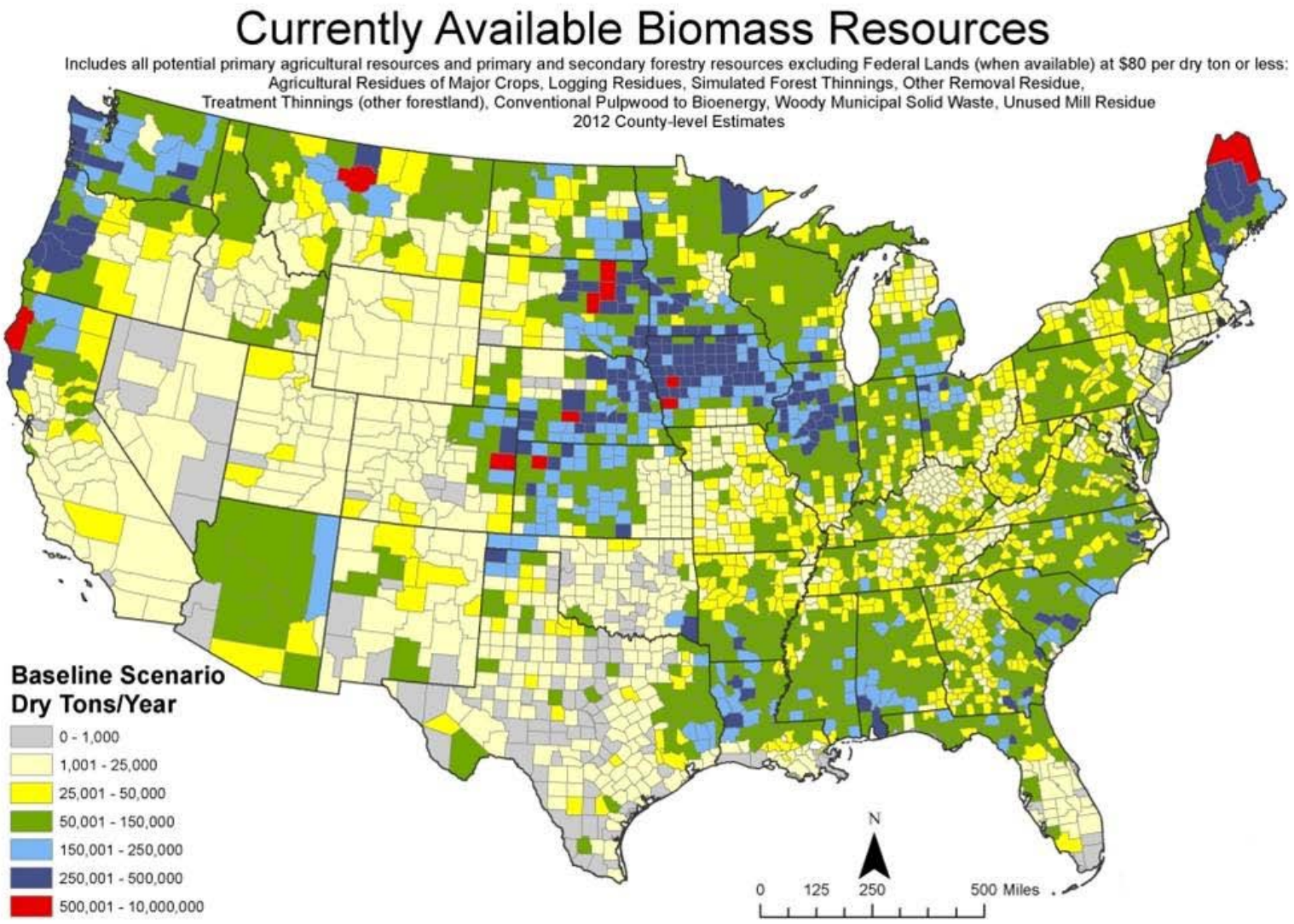
2016 Billion-Ton Report (BT16), 2016

- Expansion of resource assessment to include additional feedstocks and delivered supply
- Two-volume approach

The 2016 Billion Ton Report

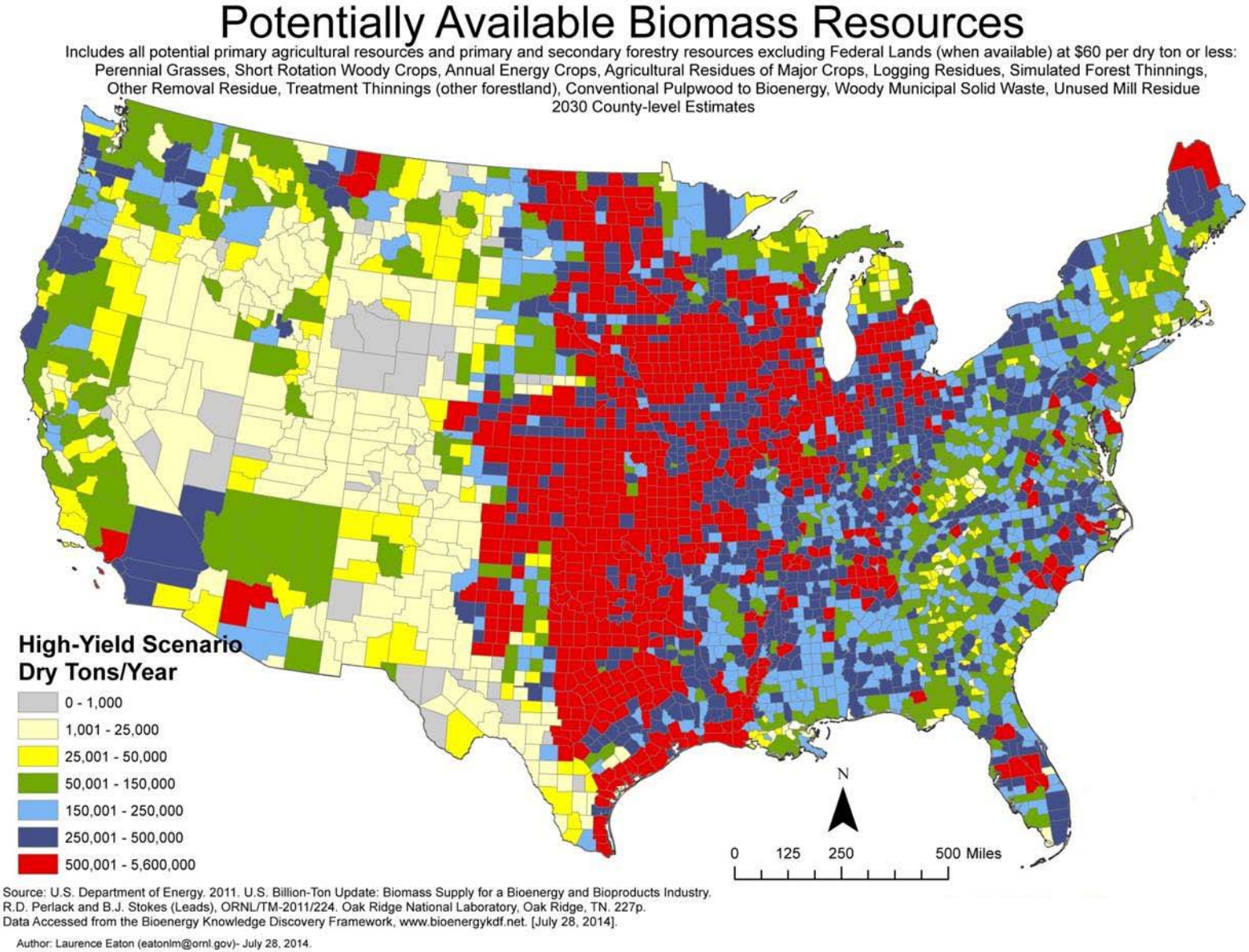
Supply Curve Results

2012 Baseline scenario at $80 per dry ton



Supply Curve Results

2030 Baseline scenario at $60 per dry ton



Opportunities across the Supply Chain