



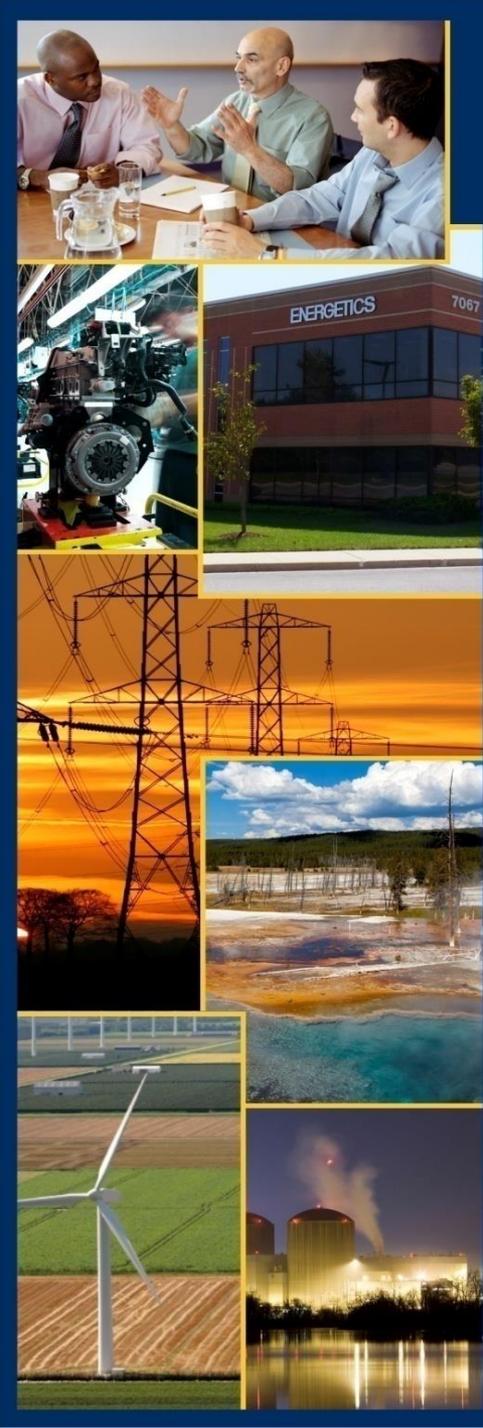
Chapter 2: Biomass Consumed in the Current Bioeconomy

Bioenergy 2016: 1-A: Assessing America's Biomass Potential (2016 Billion-Ton Report)

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- 2.2 Primary Energy Consumption
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2.1 Introduction

365 Million Bioenergy
Equivalent Dry Tons

Consumed in the Current Bioeconomy

2016 Billion Ton Report



2004 estimate

184 Million Dry Tons



2011 estimate

214 Million Dry Tons

- “Bioenergy equivalent dry tons” due to the use of conversion factors
- The 2016 update includes additional crops and secondary feedstocks contributing to industrial energy generation
 - Increases from 2004 and 2011 are largely due to growth in the biofuels industry
- 2014 values of biomass energy consumption are used as much as possible
 - Wood-derived energy, MSW, and landfill gas are 2013 values from EIA’s 2015 Electric Power Annual
- “Currently used resources” in reporting the billion-ton potential is reported alongside potential future supply to highlight the growth in biomass potential supply



2.1 Introduction

365 Million Dry Tons estimated based on 4 major product categories:

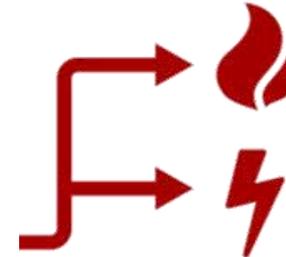
128
MM Dry Tons



Transportation Fuels

- Ethanol
- Gasoline
- Naphtha
- Diesel
- CNG/LNG
- Jet Fuel

223
MM Dry Tons



Heat and Power

- Electric
- Residential
- Industrial
- Commercial
- Farm Use

6
MM Dry Tons



Biobased Chemicals

8
MM Dry Tons

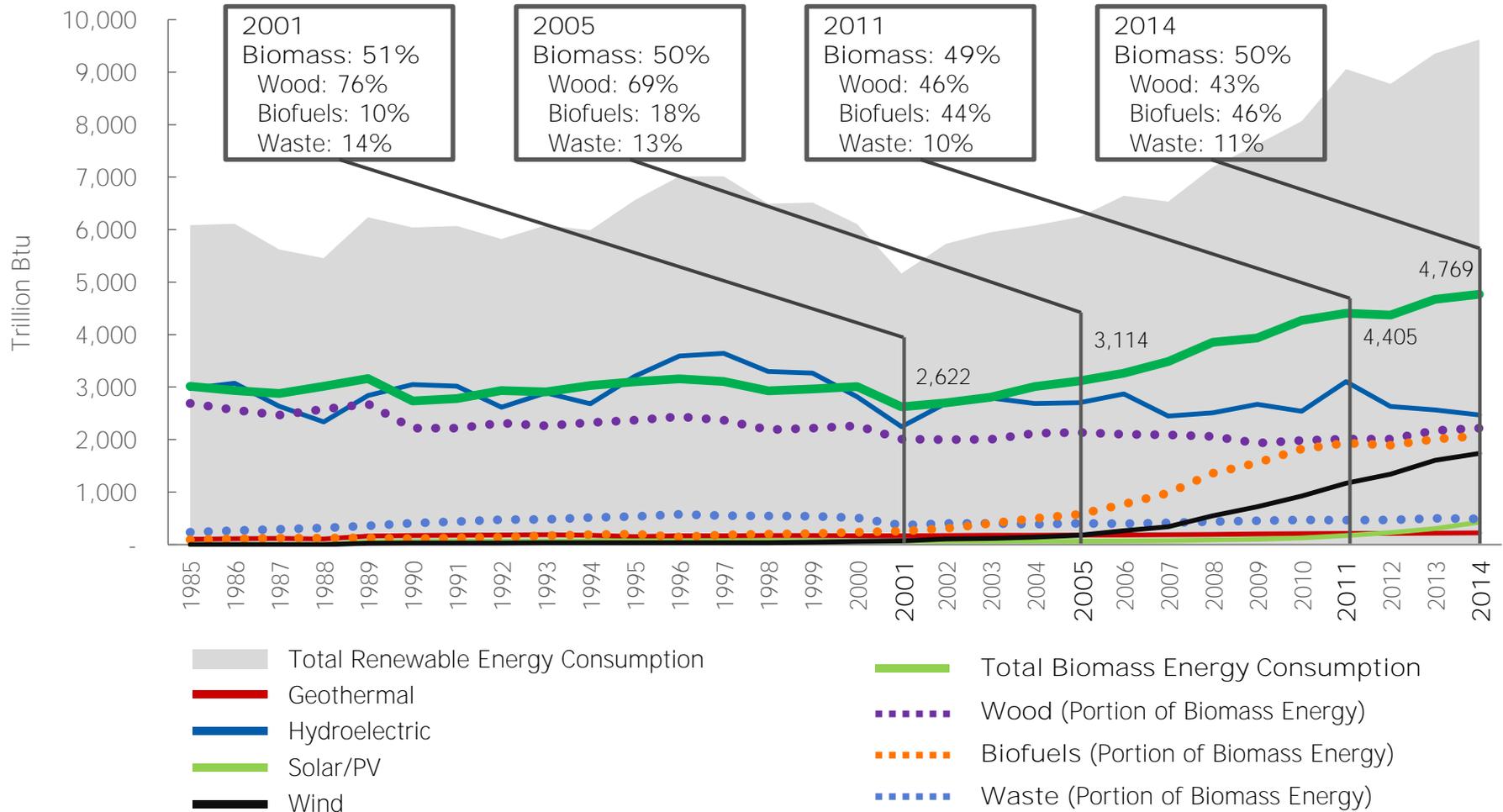


Wood Pellets

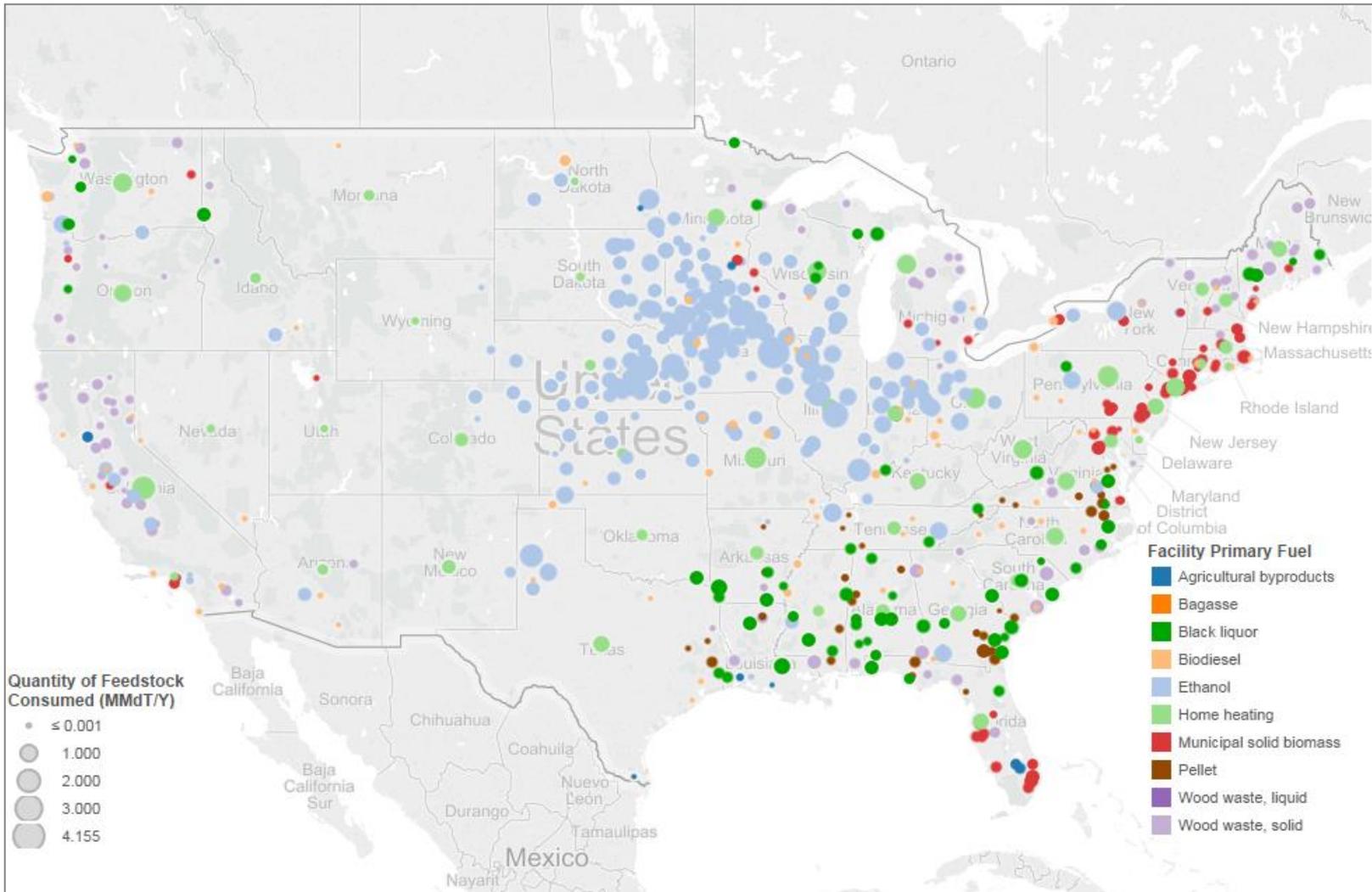


2.2 Primary Energy Consumption

Primary Renewable Energy Consumption by Source and Total Consumption (1985–2014)



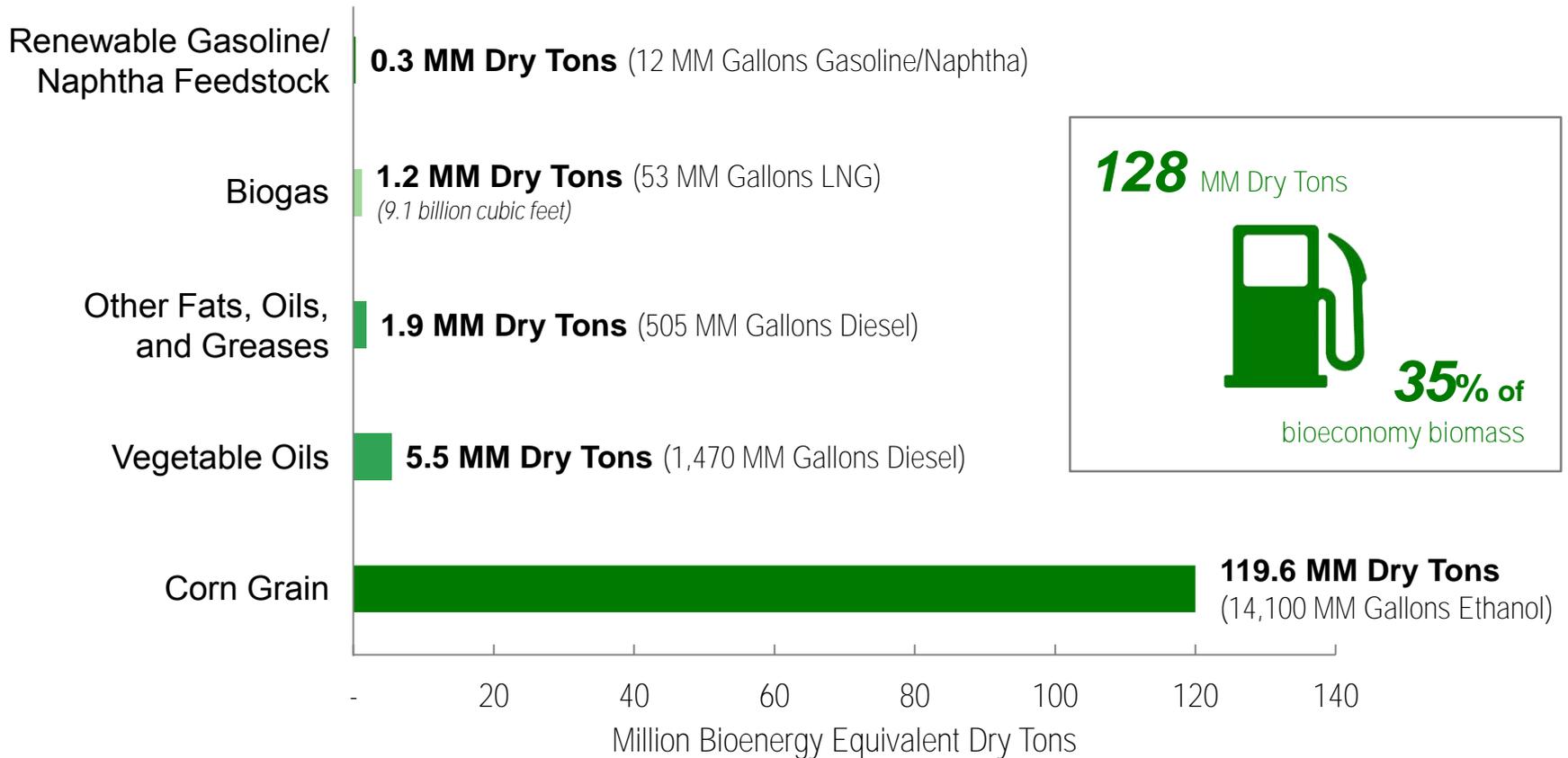
2.2 Spatial Distribution of Biomass Consumption





2.3 Transportation Fuels

Biomass Consumed for Fuel Production in the Current Bioeconomy



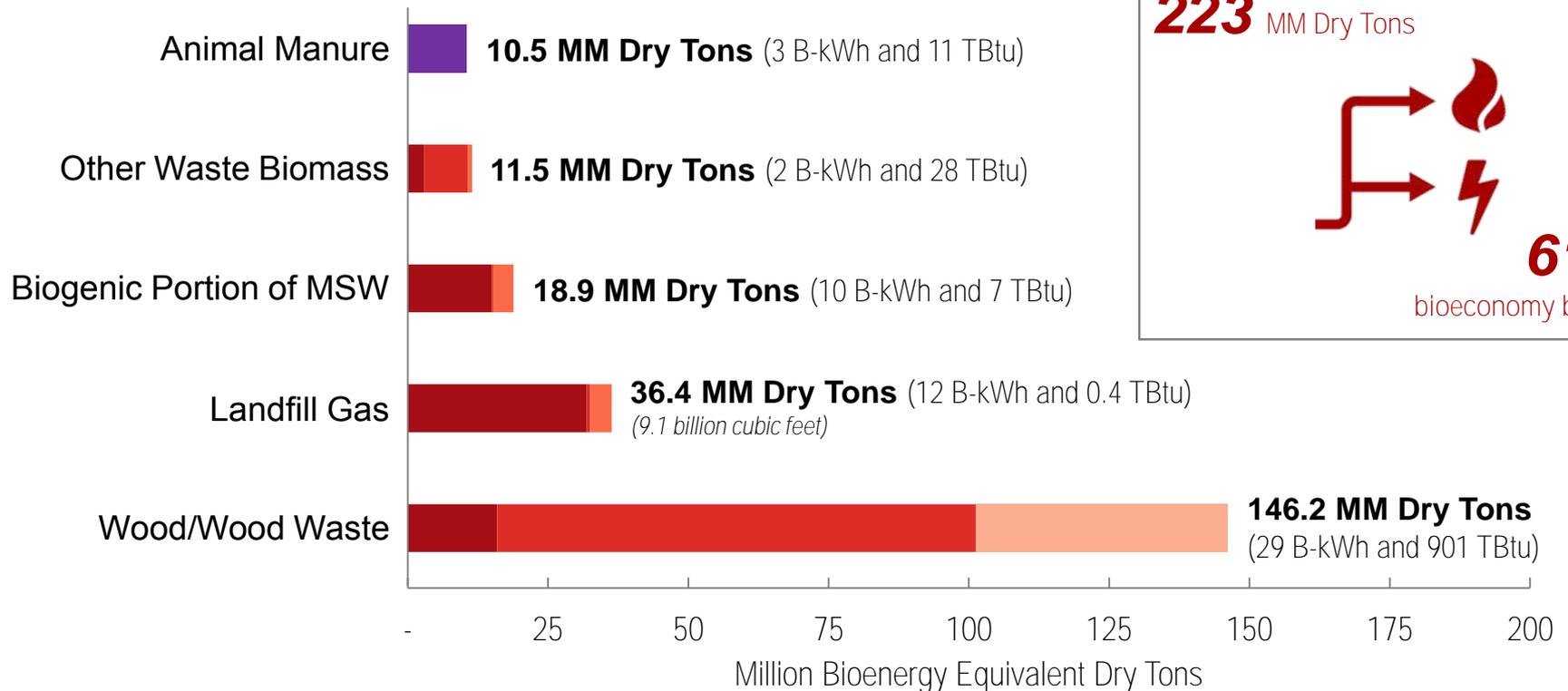
Key Sources:

1. RFS2 Reported Production Volumes 2014
2. USDA Feed Grains Database 2015
3. EIA Monthly Biodiesel Production Report



2.4 Heat and Power

Biomass Resources Consumed for Heat and Power in the 2013 Bioeconomy



Key Sources:

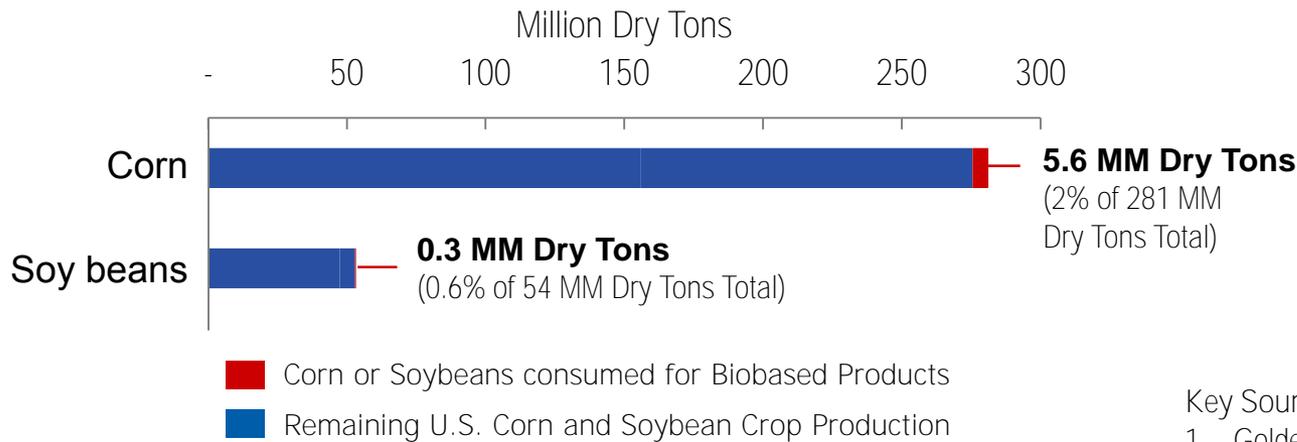
1. 2015 EIA Electric Power Annual Tables 5.5-5.8
2. 2015 EIA Annual Energy Outlook Table A17
3. AgSTAR Anaerobic Digester Projects Database

■ Electricity ■ Industrial ■ Commercial ■ Residential ■ Farm use



2.5 & 2.6 Other Energy Related Products

Biobased Chemicals



6 MM Dry Tons



1.6% of
bioeconomy biomass

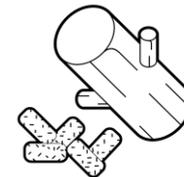
Key Sources:

1. Golden, J. et. Al. 2015. USDA BioPreferred Report
2. 2015 USDA Oilseed Yearbook

Wood Pellets

- 7.6 Million Dry Tons of wood pellets (2014).
- Majority of pellets exported to the UK and Europe due to regulatory and political factors.

8 MM Dry Tons



2.2% of
bioeconomy biomass

Key Sources:

1. United Nations Forest and Agricultural Organization
2. Abt et al. 2004. U.S. Forest Service
3. Goetzl 2015. US International Trade Commission

2.7 Emerging Sources

Biosolids and Wastewater



- **1,241 U.S. Operate AD Systems**
 - 48% of all wastewater flow
 - 10% of that biogas used beneficially
- **282 operational CHP systems**
 - 69 water recovery facilities exporting electric power to the grid (Argonne 2015)
- **Significant potential to increase biogas utilization and AD capacity**
 - Wastewater treatment systems have not yet been fully quantified and included in the Billion Ton Report

Biomass Crop Production



- **Herbaceous and woody crops grown solely for energy end uses, including:**

Herbaceous	Woody
- Switchgrass	- Hybrid Poplar
- Miscanthus	- Southern Pine
- Energy Cane	- Eucalyptus
- Sorghum	- Willow
- Perennial Grasses	
- **11,300 dry tons on 2,900 acres in 2012**
 - Data reporting incomplete
 - 211 acres in August 2014 to 2,554 acres in November 2014

Key Sources:

1. Shen et al. 2015. Argonne National Laboratory
2. WEF 2014. Phase 1 US WWTP Database

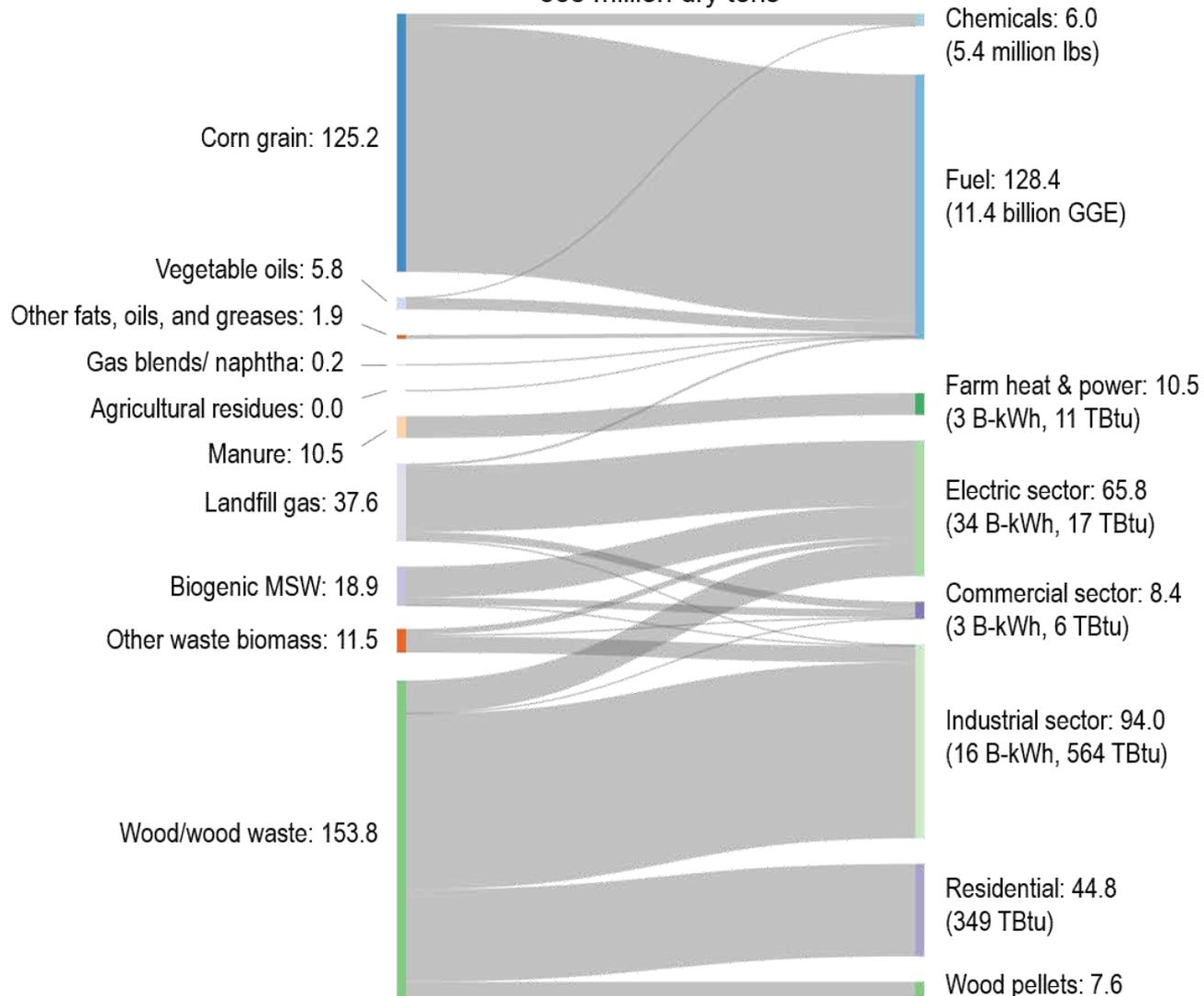
Key Sources:

1. Regional statistics from the 2012 USDA census
2. WEF 2014. Phase 1 US WWTP Database



2.8 Summary

Current (2014) Biomass Allocation:
365 million dry tons





Acknowledgements

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Questions?

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