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Office of Energy Policy and New Uses

U.S. Biofuels Policy Opportunities and Challenges

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Presented at
THE BENEFITS OF BIO-ETHANOL
Office of Agricultural Affairs/ U.S. Embassy
U.S. Grains Council Korea Office
May 16, 2017



Agenda

- **Background**
 - **Overview US Industry**
- **Policy**
 - **Energy Independence and Security Act**
 - Renewable Fuel Standard
 - **Agriculture Act of 2014**
 - Energy Title, Title IX
 - **Other**
 - Biofuels Infrastructure Partnership
- **Challenges and Opportunities**

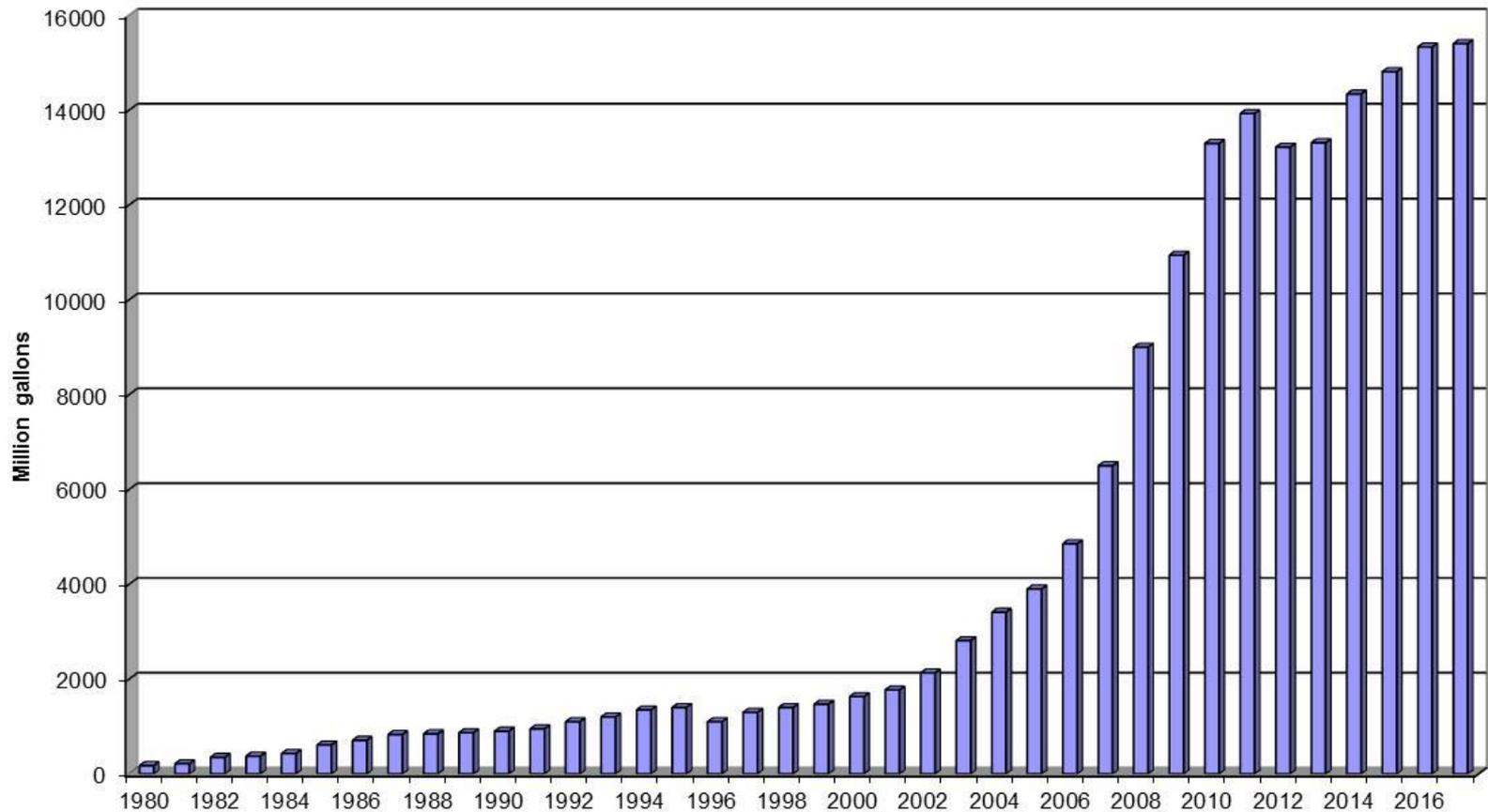


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BACKGROUND

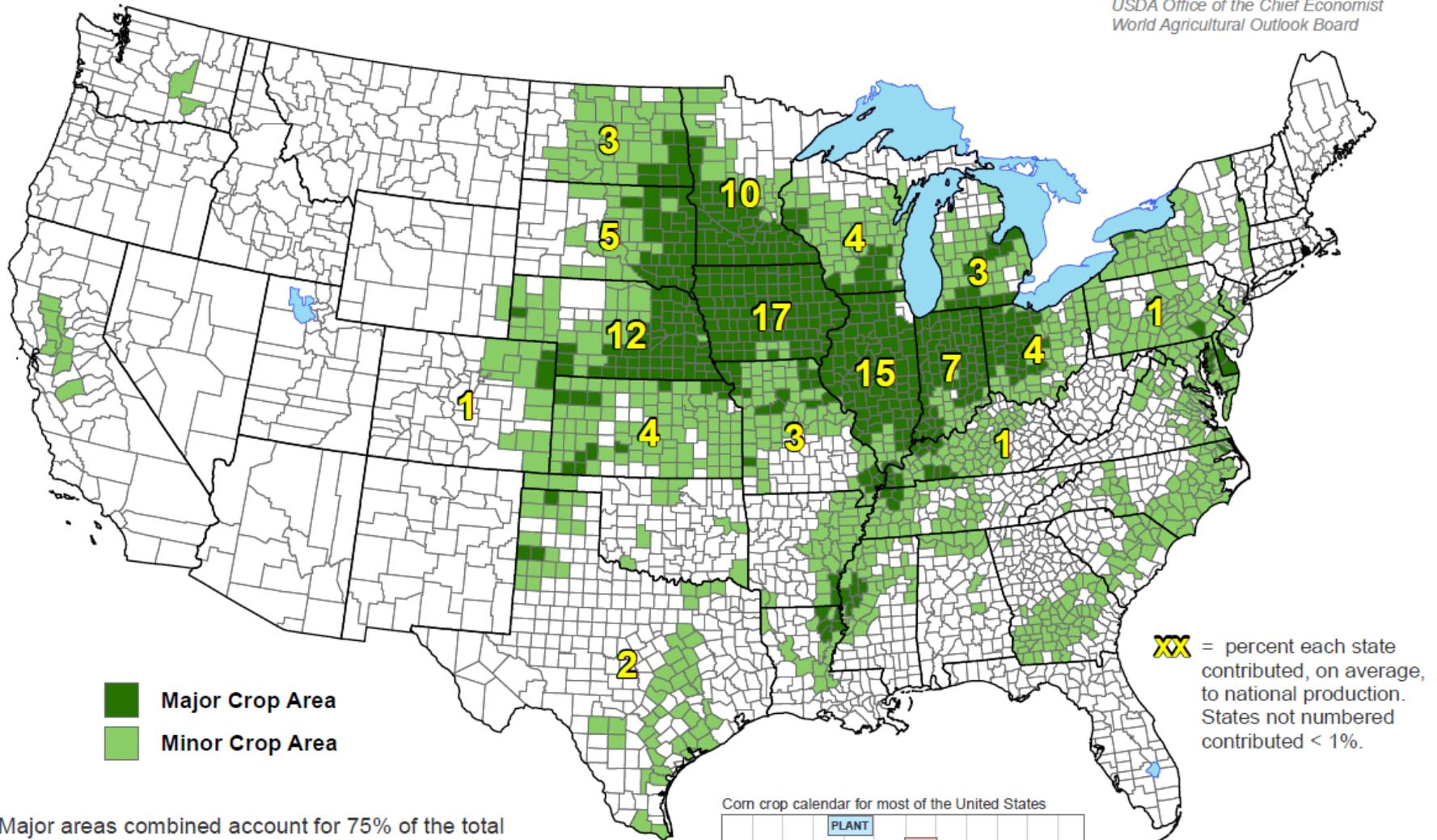


U.S. Ethanol Production, 1980-2017e



United States: Corn

*This product was prepared by the
USDA Office of the Chief Economist
World Agricultural Outlook Board*



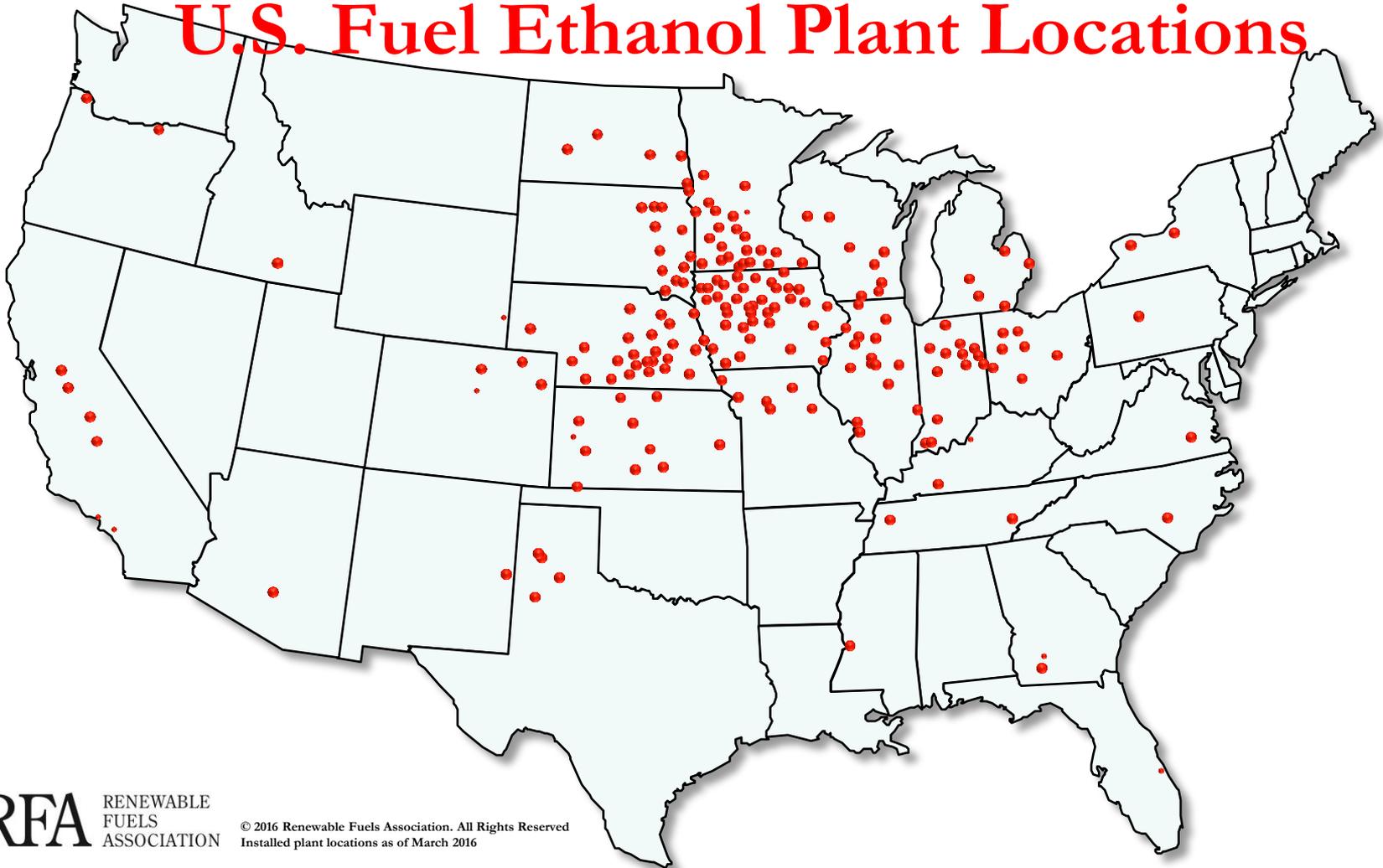
- Major areas combined account for 75% of the total national production.
- Major and minor areas combined account for 99% of the total national production.
- Major and minor areas and state production percentages are derived from NASS survey data from 2010 to 2014.

The crop calendar was developed using NASS crop progress data from 2010-2014. This calendar illustrates, on average, the dates when national progress advanced from 10 to 90 percent.



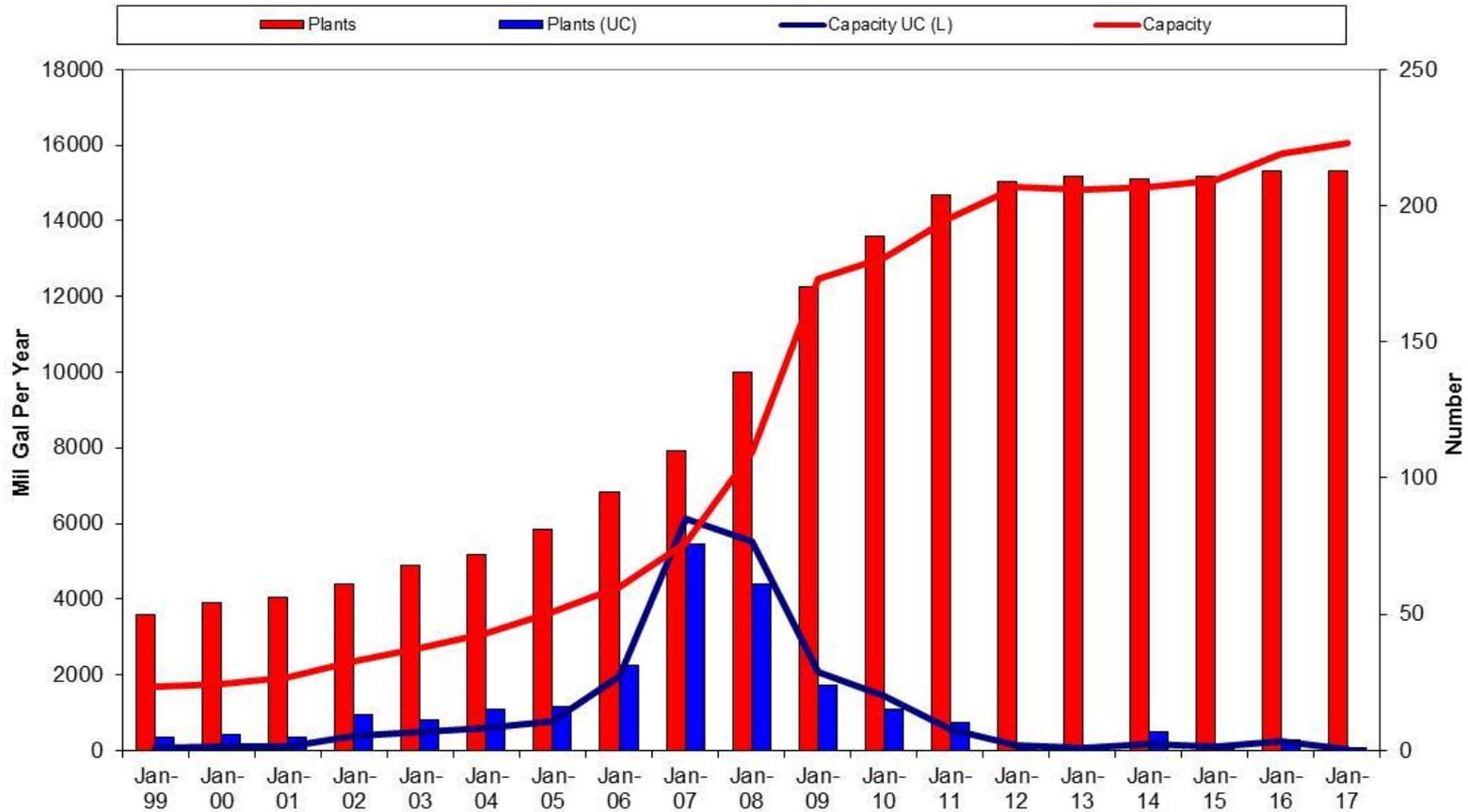
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U.S. Fuel Ethanol Plant Locations





Ethanol Industry: Overview



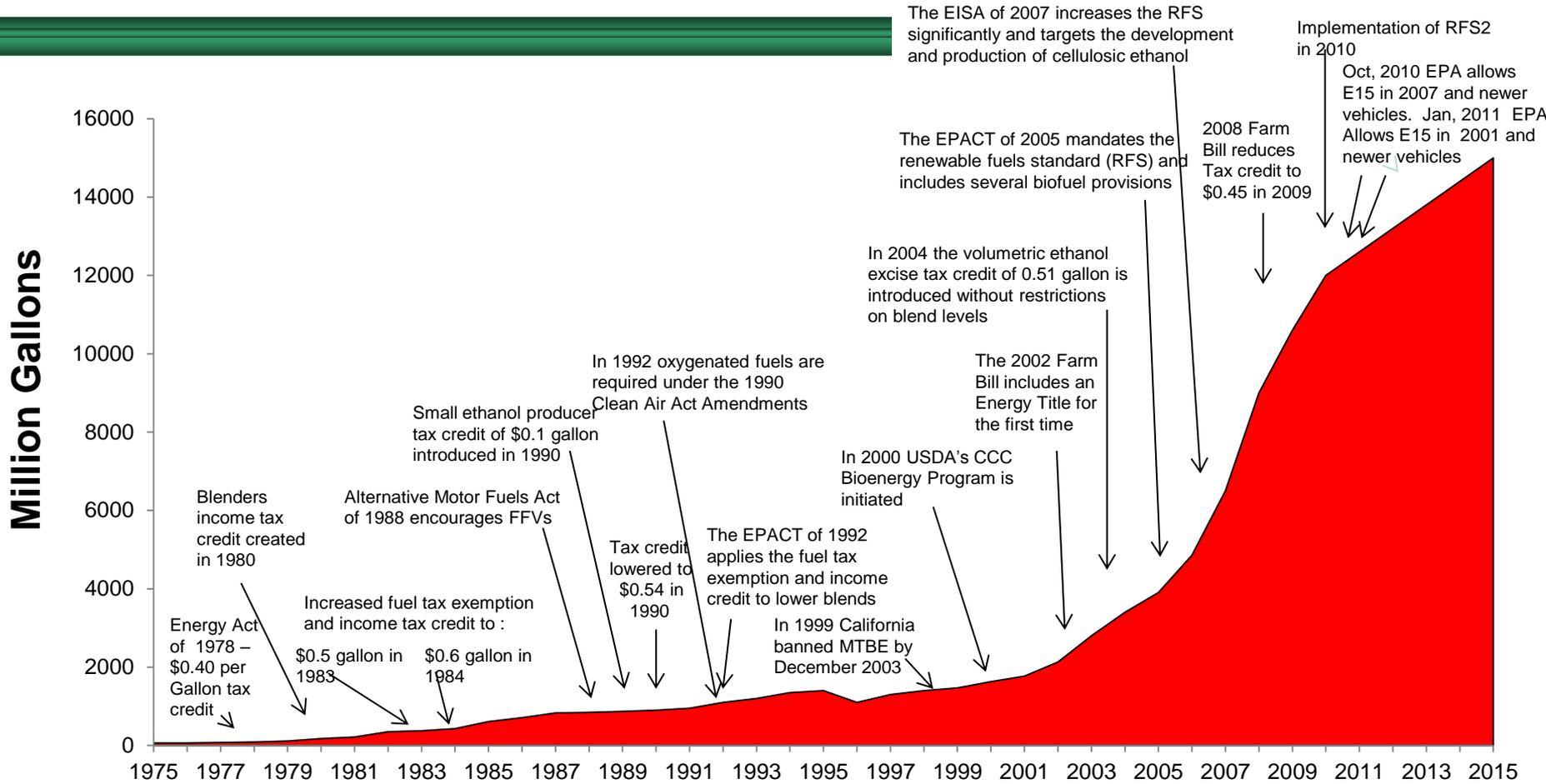


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POLICY



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Government Policies Increase Ethanol Production Over time



Summary of Policies Supporting Development of Ethanol Industry

- Commodity Policy
- Production Tax Credit
- Fuel Tax Exemption
- Oxygenate Requirements (Clean Air Act) – fuel blending
- Income Exemptions
- Ban of MTBE
- Production Payments (Bioenergy Program)
- Farm Bill – Energy Title (2002, 2008, 2014)
- Import Fees
- Volumetric Excise Blending Credits
- Mandates – requiring use in fuels
- Approval of Higher Fuel Blends
- Infrastructure Programs



Energy Independence and Security Act of 2007

- Signed December 18, 2007 is Broad Based
 - Increase Alternative Fuel Use
 - Mandatory Renewable Fuel Standard (RFS)
 - 36 bg by 2022
 - Caps Corn based ethanol at 15 bgpy
 - Advance Biofuels – cellulosic ethanol account for other 21 bgpy
- The Environmental Protection Agency issues annual rules for the quantities of renewable fuels
- Life Cycle Analysis must include
 - Direct and indirect land use change due to biofuel feedstock production
 - Baseline fuel comparison to gasoline and diesel fuel in 2005



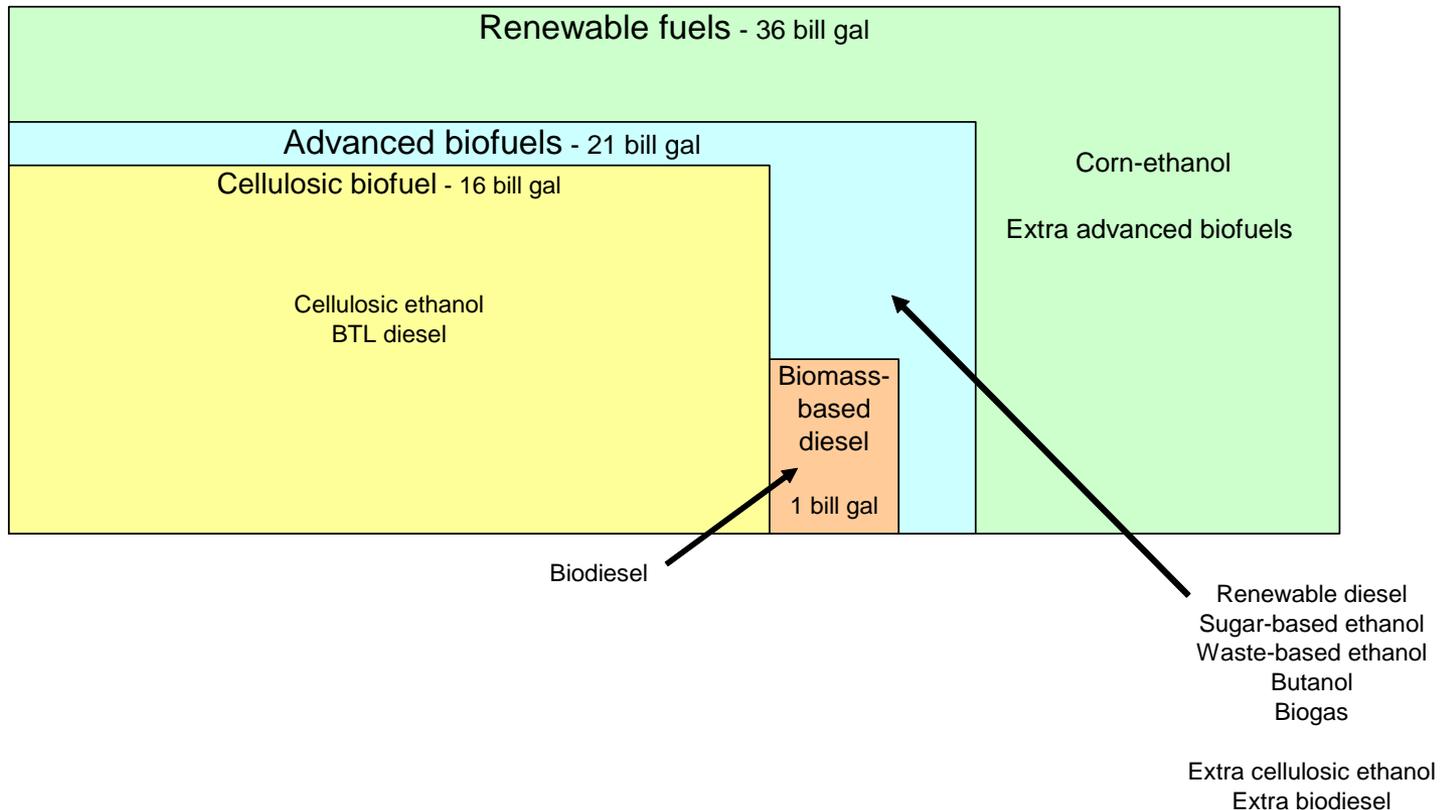
Energy Independence and Security Act of 2007

- Fuel categories must meet greenhouse gas life cycle performance threshold
 - 20% life cycle reduction threshold – Conventional Biofuels (ethanol derived from corn starch from new facilities)
 - 50% life cycle reduction threshold – Advanced Biofuels
 - 50% life cycle reduction threshold – Biomass-based Biofuels
 - 60% life cycle reduction threshold – Cellulosic Biofuels
- Changes to the definition of renewable fuels to include minimum lifecycle GHG reduction thresholds and grandfathering of volume from certain facilities
- Restrictions on the types of feedstocks that can be used to make renewable fuel, and the types of land that can be used to grow and harvest feedstocks



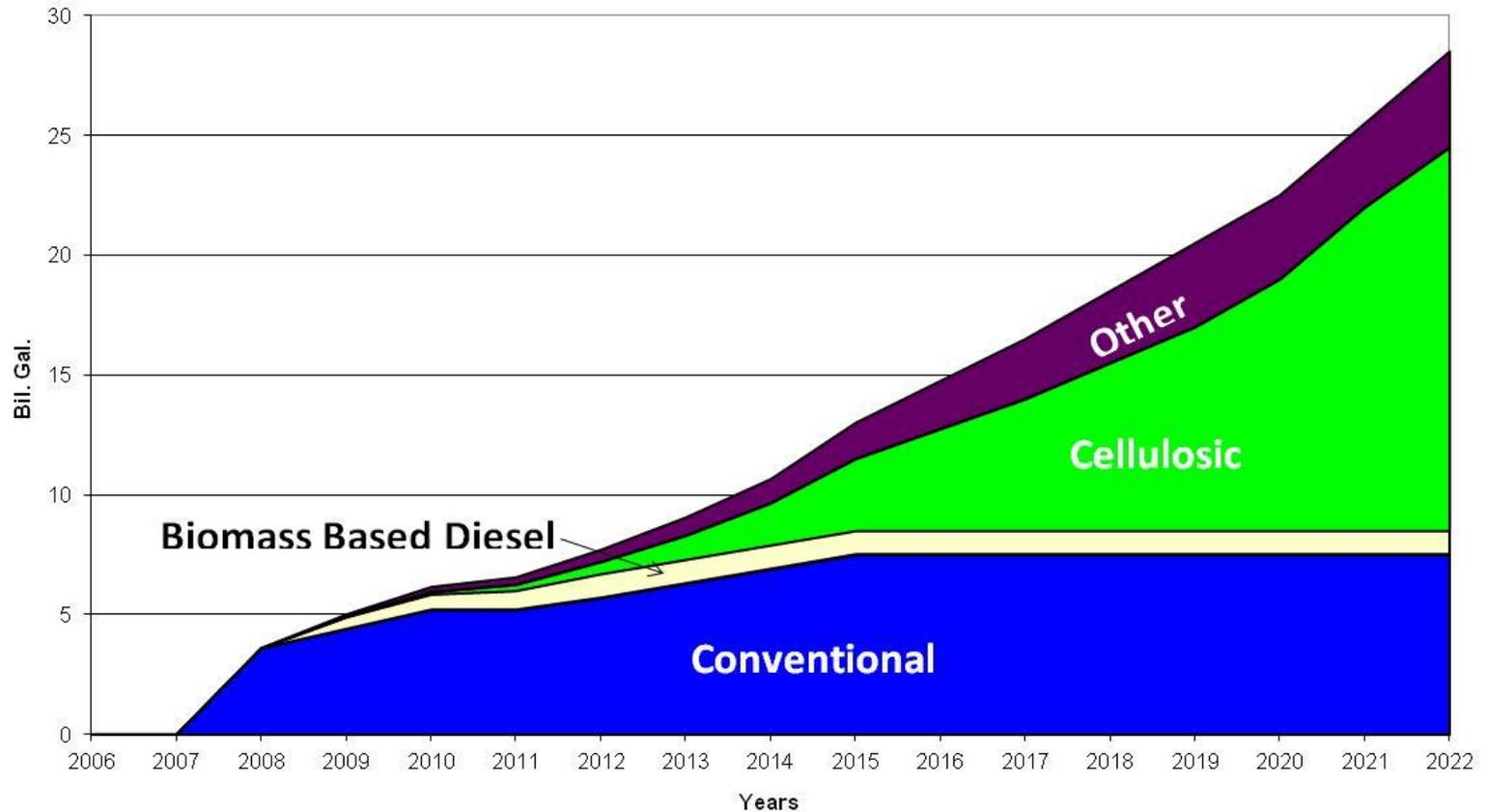
More Categories of Fuels

Shown with 2022 volumes





EISA – Renewable Fuel Standard





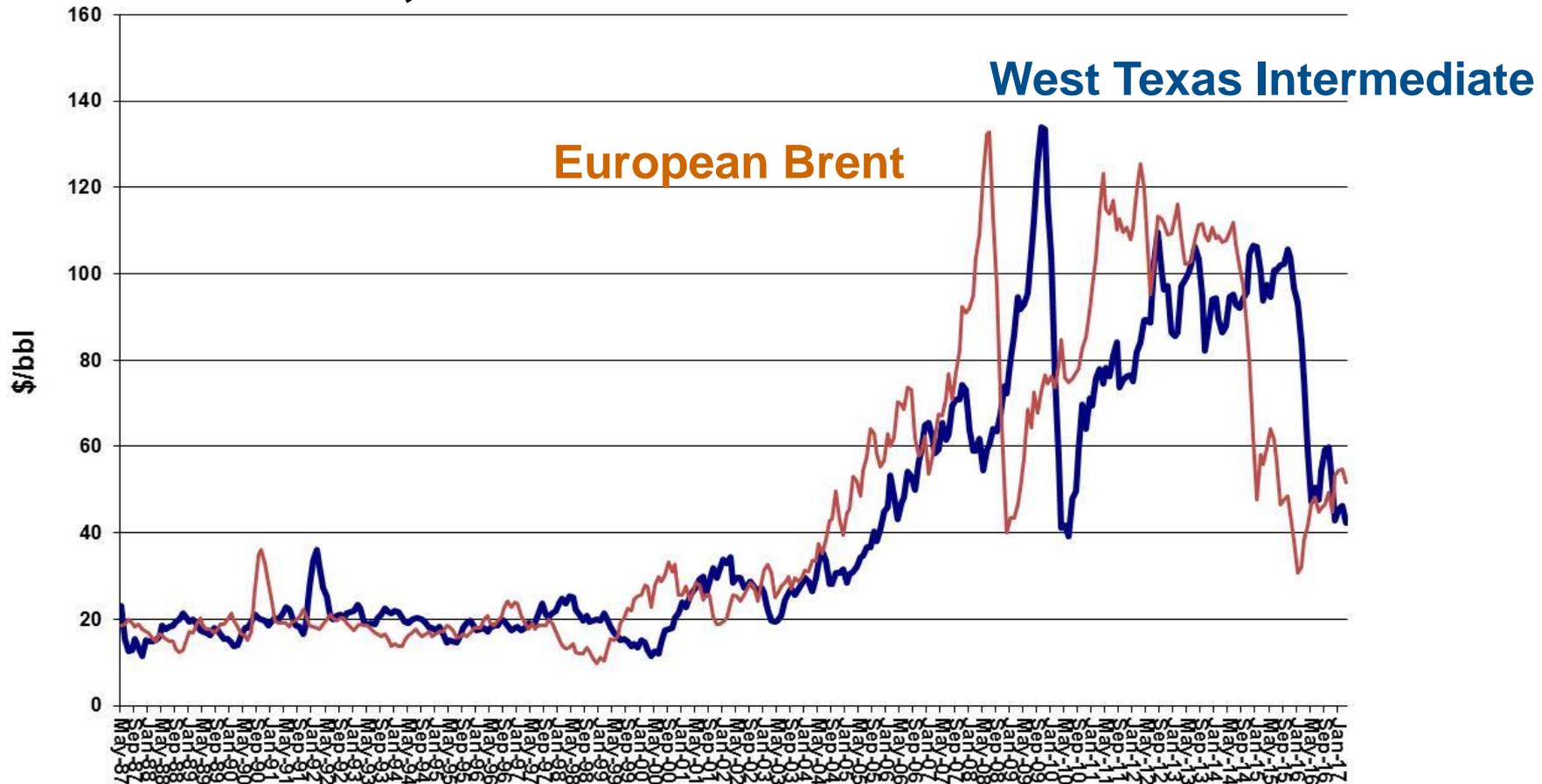
Final and Enacted Fuel (RFS) Volumes

			2014	2015	2016	2017
Cellulosic Biofuel	Final	Mil. Gal.	33.0	123.0	230.0	311.0
	Enacted	Mil. Gal.	1750.0	3000.0	4250.0	5500.0
Biomass Based Diesel	Final	Bil. Gal.	1.6	1.7	1.9	2.0
	Enacted	Bil. Gal.	1.0	1.0	1.0	1.0
Advanced Biofuels	Final	Bil. Gal.	2.7	2.9	3.6	4.3
	Enacted	Bil. Gal.	3.8	5.5	7.3	9.0
Renewable Fuel	Final	Bil. Gal.	16.3	16.9	18.1	19.3
	Enacted	Bil. Gal.	18.2	20.5	22.3	24.0
Conventional	Final	Bil. Gal.	13.6	14.1	14.5	15.0
	Enacted	Bil. Gal.	14.4	15.0	15.0	15.0

Source: U.S. Environmental Protection Agency



OIL, SPOT PRICE FOB





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USDA Policy & Programs

- **Agricultural Adjustment Act of 2014**
 - Technical and Financial Assistance
 - Title IX Energy Title
 - Expires September 2018
- **Biofuels Infrastructure Partnership**
- **BioPreferred Program**
 - Federal Procurement Program



Agricultural Act of 2014 - Title IX – Energy

- **Biobased Markets Program (9002)**
- **Biorefinery, Renewable Chemical, and Biobased Product Manufacturing Program(9003)**
- **Repowering Assistance Program (9004)**
- **Bioenergy Program for Advanced Biofuels (9005)**
- **Biodiesel Fuel Education program (9006)**
- **Rural Energy for America Program (REAP - 9007)**
- **Biomass Research and Development (9008)**
- **Feedstock Flexibility Program (9009)**
- **Biomass Crop Assistance Program (9010)**
- **Community Wood Energy Program (9012)**



Biorefinery, Renewable Chemical, and Biobased Product Manufacturing Program(9003)

9003 Biorefineries:

- Must produce an advanced biofuel
- May produce biobased products and renewable chemicals

Biobased Product Manufacturing:

- Convert Renewable Chemicals and other biobased outputs of Biorefineries (biobased products of biorefineries) into
- End-user products on a Commercial Scale
- Technologically New



Key points:

- Loans of up to \$250 Million (no minimum)
- Loan amount cannot exceed 80% of eligible project cost (generally 50 – 60%)
- New technology is eligible
- Not limited to rural locations
- Competitive application process



Biofuel Infrastructure Partnership

- **USDA investing \$100 million (CCC funds) in Clean Energy Infrastructure**
- **Administered through competitive grants and matched by States and private contributions**
- **Test innovative ways to distribute higher blends of renewable fuel**
- **Double the number of fuel pumps capable of supplying higher blends of renewable fuel to consumers, such as E15 and E85**
- **Give consumers more choices for fuel and bring higher fuel blends to areas that have little or no infrastructure in place to deliver higher blend fuels**



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USDA BioPreferred Program: Federal Purchasing Program

- Federal agencies and federal contractors required to buy biobased products in categories designated by USDA
- 97 diverse categories including cleaning products, bioplastics, lubricants, and adhesives
- Currently about 15,000 products in BioPreferred catalog that qualify for mandatory federal purchasing
- In FY 2017, Federal agencies have committed to 84,433 contracts to include biobased product purchasing requirements totaling \$453,150,168.





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OPPORTUNITIES & CHALLENGES



-
- Challenges
 - Low Oil Prices
 - Cost to build biorefineries and investor (financing) risk
 - Infrastructure
 - Fuel delivery
 - Vehicle fleet
 - Feedstock Availability
 - Policy Uncertainty
 - Consumer resistance
 - Opportunities
 - Energy Security
 - Economic Growth
 - Rural Development
 - Job creation
 - GHG Reductions
 - Large global market for fuels

Comparison with Other Carbon Intensity Studies

Study	Sub-Analysis	Emissions Impact (gCO ₂ e/MJ of corn ethanol)	Boundaries
EPA RIA	N/A	75	All 11 source categories
Wang et al. 2012	Without DGS Credit	76	Excludes domestic and international rice methane, domestic and international livestock, international farm inputs and fertilizer N ₂ O
	With DGS Credit	62	
Dunn et al. 2013	Maximum U.S. LUC	68	Excludes domestic and international rice methane, domestic and international livestock, international farm inputs and fertilizer N ₂ O
	Minimum U.S. LUC	62	
Wang et al. 2015	Displacement	61	Excludes domestic and international rice methane, domestic and international livestock, international farm inputs and fertilizer N ₂ O
	Marginal	62	
	Hybrid Allocation	59	
	Process-Level Energy Allocation	46	
ICF 2016	ICF: 2014 Conditions	53	All 11 source categories
	ICF: 2022 BAU Scenario	48	
	ICF: 2022 High Efficiency – High Conservation Scenario	22	



Economic Impact of the U.S. Biobased Industry

The Total Number of Jobs Contributed to the U.S. Economy by the U.S. Biobased Products Industry in 2014

4.2 Million

The Total Value added Contribution to the U.S. Economy from the U.S. Biobased Products Industry in 2014

\$393 Billion

The Jobs Multiplier

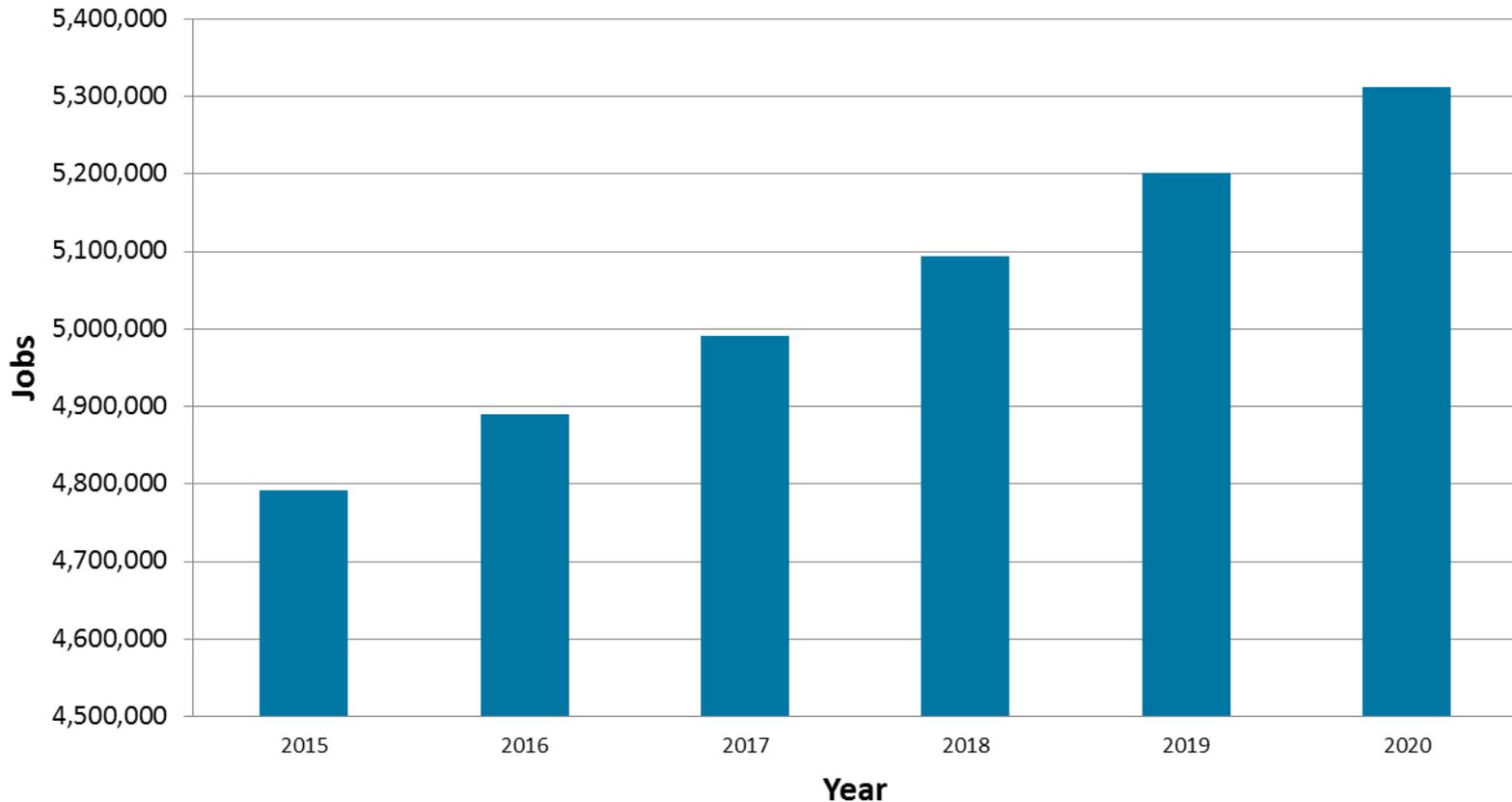
2.76

For every 1 Biobased Products jobs, 1.76 more jobs are supported in the United States.



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U.S. Estimated Growth in Employment for the Biobased Products Sector (2015-2020)



*An Economic Impact Analysis of the U.S. Biobased Products Industry: 2016 Update
(*excluding enzymes)*

A BILLION DRY TONS OF SUSTAINABLE BIOMASS

HAS THE POTENTIAL TO PRODUCE

1.1 MILLION
Direct Jobs
and keeps about
\$260 BILLION
in the U.S.
(direct contribution
and inflation adjusted)

75 BILLION*
kWh of electricity
to power
7 MILLION
households. Plus
990 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.

450
MILLION
TONS
of CO₂e
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:

Rogers, J. N., Stokes, B., Dunn, J., Cai, H., Wu, M., Haq, Z. and Baumes, H. (2016). An assessment of the potential products and economic and environmental impacts resulting from a billion ton bioeconomy. *Biofuels, Bioprod. Bioref.* doi:10.1002/bbb.1728

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



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THANK YOU