

Biofuels Information Center



BETO 2015 Peer Review

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Goal Statement

- **The purpose of the Biofuels Information Center (BIC) task is to increase deployment of biofuels production facilities and infrastructure by providing essential biofuels data, tools, and information to all stakeholders**
- **The Bioenergy Atlas tools provide interactive maps and analysis of all relevant biomass data with the purpose of growing the domestic bioenergy market for biofuels and biopower production, infrastructure, and use**
- **The Alternative Fuels Data Center (AFDC) is the most visited EERE website. The BIC funded AFDC biofuels pages provide continuously updated data and information**

Quad Chart Overview

Timeline

- FY2008
- Ongoing
- 100% (FY14 work)

Budget

	Total Costs FY 10 – FY 12	FY 13 Costs	FY 14 Costs	Total Planned Funding (FY 15- Project End Date)
DOE Funded	\$598k	\$0	\$200k	\$320k (FY17)
Project Cost Share (Comp.)*				

Barriers

Barriers addressed

- At-B. Analytical Tools and Capabilities for System-Level Analysis
- At-C. Data Availability across the Supply Chain
- Im-H Availability of Biofuels Distribution Infrastructure

Partners

- Use data from other EERE projects, EIA, EPA, Industry groups, ORNL, USDA
- Leveraging Clean Cities funds for AFDC biofuels pages; and other EERE funders of the Bioenergy Atlas OpenCarto Platform

Project Overview

- **Title II, Sec. 229 of the Energy Independence and Security Act of 2007 (EISA) requires DOE to develop a “Biofuels and Biorefinery Information Center”**
- **Historical work included creating biofuels content on the AFDC, static data & maps, and the State Bioenergy Assessment Tool; later work included the first iteration of the interactive Bioenergy Atlas**
- **The BIC remains focused on providing useful biomass tools, data, and information with a current emphasis on upgraded Bioenergy Atlas tools and AFDC biofuels content**

Technical Approach

- **User Friendly Web-based Information and Tools**
 - OpenCarto Update-NREL developed this platform for multiple geospatial tools of shared code, updates, maintenance, and consistent functionality
 - 12 tools share the platform reducing development, maintenance, and updating costs
 - Located on both EERE and NREL websites to increase access
- **Data Layers**
 - Consistent and reliable data sources: DOE, EPA, USDA, industry groups
 - Leverage other EERE and federal agency funded projects by identifying new useful data sets for the Bioenergy Atlas Tools
- **Analysis & Query**
 - Biofuels & biopower potential calculated on based on user selected radius and pre-loaded assumptions (user can change)
 - Ability to see and download data behind the maps
 - State Summary View & Tables-includes summary traditional and bioenergy data
- **Extensive review and testing** was conducted to ensure data quality, performance, usability
- **Success Factors** track users of AFDC biofuels pages and Bioenergy Atlas tools
- **Challenges** data availability from outside sources and permission; creating an easy to use tool

Management Approach

APPROACH

- Provide unbiased, industry relevant and timely information
- Prioritize work based on popularity of data/tool functionality
- Determine staff needed to complete project on schedule and under budget
- Regularly review project milestones and budget with BETO
- Review budget each month; work with other funders of platforms to manage budget
- Monitor progress by email status updates with management and staff; met as needed when milestone dates were near
- Identify staff and outside users for content review and testing
- Communications: upon completion of milestones—send out an email blast to relevant stakeholders; ask industry groups and journals to communicate new data sets and tools

SUCCESS FACTORS

- Completing milestones on time and within budget

CHALLENGES

- Top challenge is adequate computer programmer staffing; focus was on using contractors for a set amount of time for the project combined with full-time staff to ensure consistent quality and operability of websites and tools overtime

Technical Accomplishments/Progress/Results

AFDC Pages

- Reviewed, updated, edited; changes reviewed by peers; uploaded December 2014.
- Ethanol (21 pages)
- Biodiesel (13 pages)
- Emerging (8 pages)
- Maps, data, and publications are updated and added as they are available

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

EERE Home | Programs & Offices | Consumer Information

Alternative Fuels Data Center

Alternative Fuels Data Center
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FUELS & VEHICLES CONSERVE FUEL LOCATE STATIONS LAWS & INCENTIVES Maps & Data Case Studies Publications Tools About Home

EERE ▶ AFDC

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Fuels & Vehicles ▶

Biodiesel Electricity Ethanol Hydrogen Natural Gas Propane

Meet the new neighbor
Find out how to plan for electric vehicle charging infrastructure in apartment complexes and other multi-unit dwellings.

The Information Source for Alternative Fuels and Advanced Vehicles

The Alternative Fuels Data Center (AFDC) provides information, data, and tools to help fleets and other transportation decision makers find ways to reduce petroleum consumption through the use of alternative and renewable fuels, advanced vehicles, and other fuel-saving measures.

Clean Cities
The AFDC is a resource of the U.S. Department of Energy's Clean Cities program.

YouTube BLOG

Maps & Data ▶

- U.S. Alternative Fueling Stations by Fuel Type
- Alternative Fuel Vehicles in Use
- U.S. Hybrid Electric Vehicle Sales by Model

Fuel Prices ▶

Compare alternative fuel prices to gasoline.

Tools ▶

- Laws & Incentives
- Petroleum Reduction Planning Tool
- Vehicle Cost Calculator
- Vehicle Search

Find State Information
select a state GO

Find alternative fueling station locations.

Find stations on your iPhone

Poll

What is the primary reason you use an alternative fuel in your vehicle(s):

- Better for the environment/air quality
- U.S. energy security/domestic production
- Fuel cost savings
- Improved vehicle performance
- Required to use an alternative fuel
- Other

View Results VOTE

Technical Accomplishments/Progress/Results

Alternative Fuels Data Center

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Ethanol Basics

Benefits & Considerations

Stations

Vehicles

Laws & Incentives

Ethanol

Ethanol is a renewable fuel made from corn and other plant materials. The use of ethanol is widespread—almost all gasoline in the U.S. contains some ethanol. Ethanol is available as **E85**—a high-level ethanol blend containing 51%-83% ethanol depending on season and geography—for use in flexible fuel vehicles. **E15** is defined by the Environmental Protection Agency as a blend of 10%-15% ethanol with gasoline. It is an approved ethanol blend for model year vehicles 2001 and newer.



Basics ▸

Find information about ethanol blends, specifications, production and distribution, feedstocks, and related links.



Benefits and Considerations ▸

Explore the benefits and considerations of using ethanol as a vehicle fuel.



Stations ▸

Locate ethanol fueling stations in your area and learn about ethanol fueling infrastructure.



Vehicles ▸

Learn about flexible fuel vehicles, including availability, conversions, emissions, maintenance, and safety.



Laws and Incentives ▸

Find ethanol laws and incentives in your area.

Fuel Prices ▸

Find ethanol fuel prices and trends.



Technical Accomplishments/Progress/Results

Bioenergy Atlas Tool-Data Updates

Updated Layers (43 layers)			
<i>Data Layer</i>	<i>Source</i>	<i>Data Layer</i>	<i>Source</i>
Crops (sugar beets, sugarcane)	USDA, National Agricultural Statistics Service 5 year average. 2008 through 2012.	Ethanol plants	Renewable Fuels Association. Updated quarterly.
Crop residues (bagasse, barley straw, corn stover, grain sorghum stubble, rice straw, wheat straw)	USDA, National Agricultural Statistics Service 2012 Census of Agriculture. For more information on data development, please refer to http://www.nrel.gov/docs/fy06osti/39181.pdf .	Bioenergy sites	EPA Repowering America's Land. August 2013.
Harvesting crop residues	USDA, National Agricultural Statistics Service 2012 Census of Agriculture. For more information on data development, please refer to http://www.nrel.gov/docs/fy06osti/39181.pdf .	Biopower plants (agricultural byproducts, digester gas, landfill gas, MSW, wood and byproducts)	EPA EGRID. 2010.
Methane emissions from landfills	EPA LMOP database. April 2013.	Power plants (coal, geothermal, hydro, natural gas, nuclear, other, oil, solar, wind, subset co-fire)	EPA EGRID. 2010.
Methane emissions from animal manure	The methane generation potential was calculated by animal type and manure management system at county level using data from the USDA, National Agricultural Statistics Service, 2007 Census. please refer to http://www.nrel.gov/docs/fy06osti/39181.pdf .	Oil refineries	DOE, Energy Information Agency (EIA); Annual Refinery Report Table 3 Capacity of Operable Petroleum Refineries by State and Individual Refinery as of January 1, 2014.
Processing crop residues	USDA, National Agricultural Statistics Service 2012 Census of Agriculture. For more information on data development, please refer to http://www.nrel.gov/docs/fy06osti/39181.pdf .	Alternative fuel stations (B20, E85)	AFDC Alternative Fuel Station Locator. Updated monthly.
Wood (forest residues, primary mill residues)	USDA, Forest Service's Timber Product Output database, 2012.	Vehicle density (diesel, FFV)	Polk (IHC). 2013.
Wood (secondary mill residues, urban wood)	Data from the U.S. Census Bureau (2012 population data); BioCycle Journal: "State of Garbage in America", January 2008; and County Business Patterns 2012. For information on calculation see http://www.nrel.gov/docs/fy06osti/39181.pdf	Electricity rates (residential, commercial, industrial)	County-level data from NREL, using utility-level Ventyx and state-level EIA source data. 2012.
Biodiesel plants	National Biodiesel Board. June 2014.		

Technical Accomplishments/Progress/Results


Bioenergy Atlas Tool Data-New Data Layers

New Data Layers (23)	
<i>Data Layer</i>	<i>Source</i>
Methane generation potential from animal manure; Industrial, Institutional, and Commercial Organic Waste; Wastewater Treatment)	U.S. Census Bureau's County Business Patterns 2012 and the Homeland Security Infrastructure Program (HSIP) 2012 which is further processed to estimate the amount of these resources by county.
Methane generation from industrial, institutional, and commercial organic waste	This analysis estimates the methane generation potential from food manufacturing and wholesalers; institutional facilities; correctional facilities. U.S. Census Bureau's County Business Patterns 2012 and the Homeland Security Infrastructure Program (HSIP) 2012 which is further processed to estimate the amount of these resources by county.
Methane generation from wastewater treatment	EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011 and data from the EPA Clean Watersheds Needs Survey (2008).
Energy crop yields (energy cane, miscanthus, poplar, switchgrass, willow)	Biofuel Ecophysiological Traits and Yields Database. Energy Biosciences Center. June 2014.
EPA nonattainment areas (carbon monoxide, lead-2008 and 1978), nitrogen dioxide, 8 hour ozone 2008 and 1997, 1 hour ozone, PM 10, PM 2.5 2006 and 1997, sulfur dioxide 2010 and 1977)	EPA Non-Attainment Areas GIS Data. November 2013.
Greenhouse gas emissions from stationary sources (carbon dioxide, methane, nitrous oxide)	GHG Reporting Program Data Sets. 2012.

Technical Accomplishments/Progress/Results

Select and Query Data

Run Analysis

 The Biofuels Atlas

Data Layers Legend Query

Feedstocks

Crops

Crop Residues

Bagasse

Barley Straw

Corn Stover

Grain Sorghum Stubble

Rice Straw

Wheat Straw

Wood

Biomethane

Billion-ton Study

Energy Crop Yields

Bioenergy Plants

Biodiesel Plants

Ethanol Plants

Biopower Plants

BioEnergy Sites

Power Plants (non-biopower) and Refineries

Alternative Fuel Stations

Biodiesel Stations

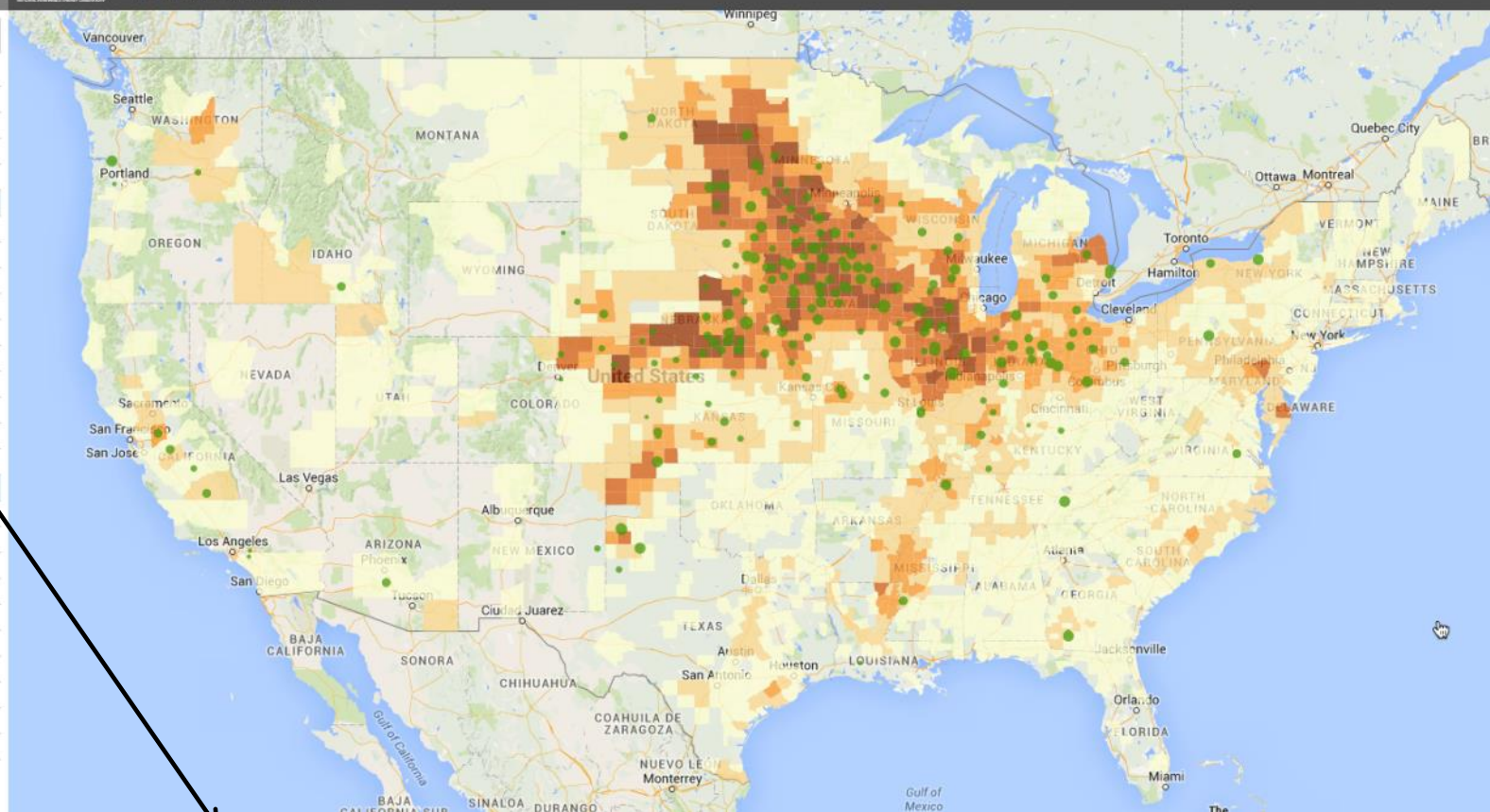
E85 Stations

Vehicle Density

Diesel

Flex-Fuel

Infrastructure and Boundaries



Ethanol Plants

Download map layer data in the following geospatial data formats:

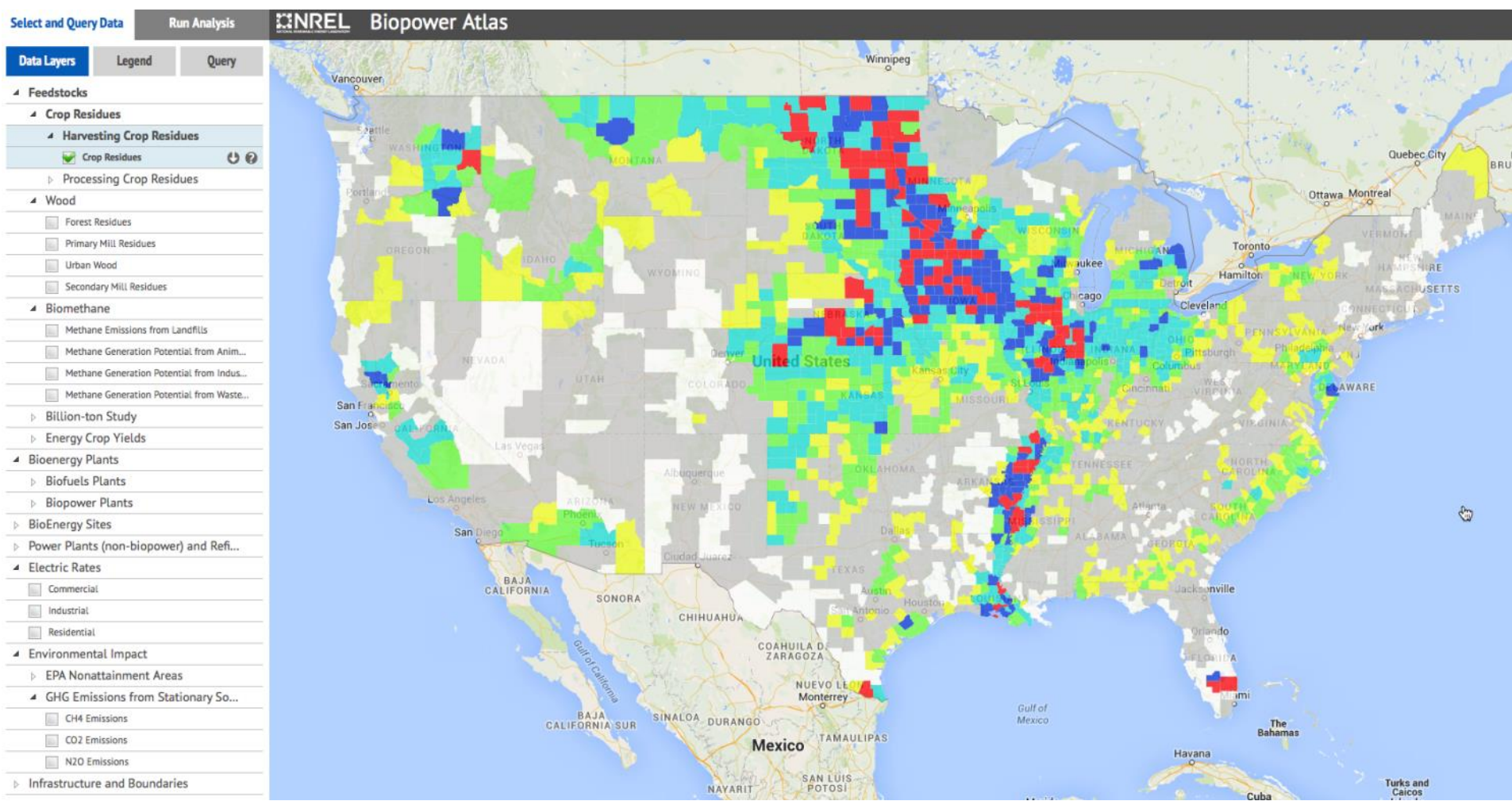
Ethanol Plants 2014

Existing ethanol plant locations are shown. Ethanol plant data is updated quarterly and provided by the Renewable Fuels Association (RFA). RFA updates plant data more often, visit: [RFA Biorefinery Locations](http://www.rfa.org/locations)

Data layers can be downloaded;
Data layers has source, date, and
link to original data.

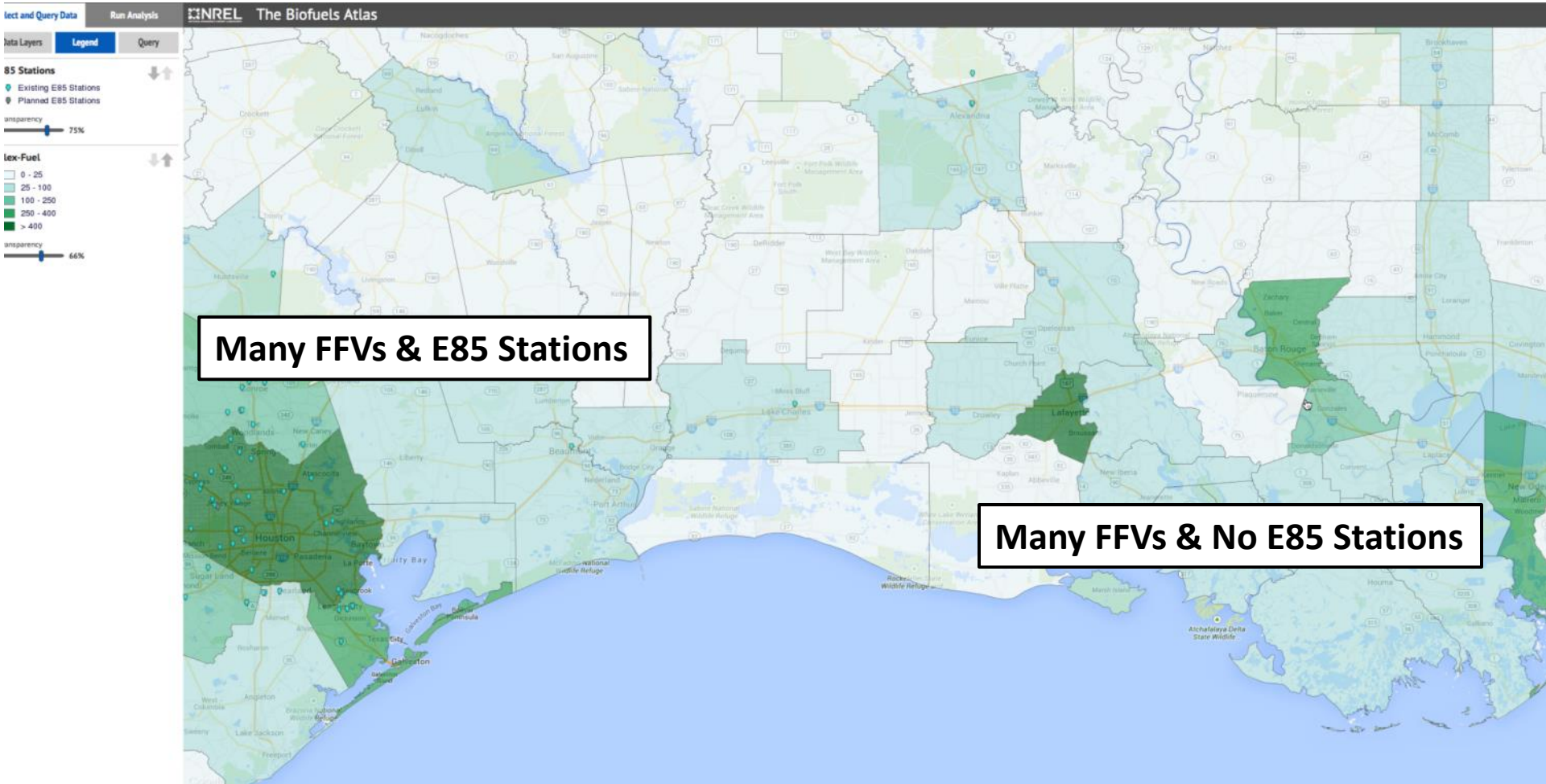
<http://maps.nrel.gov>

Technical Accomplishments/Progress/Results

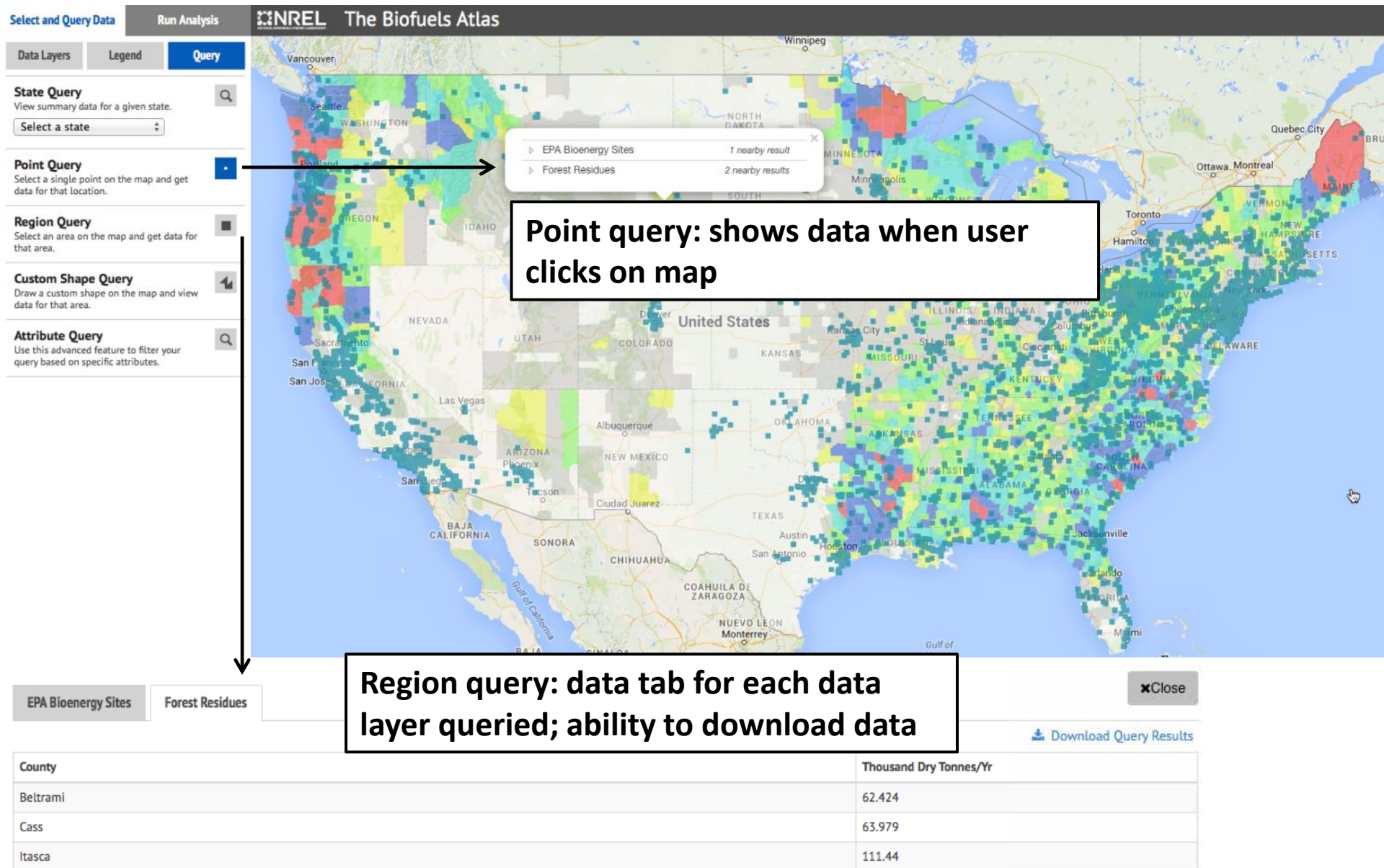


Technical Accomplishments/Progress/Results

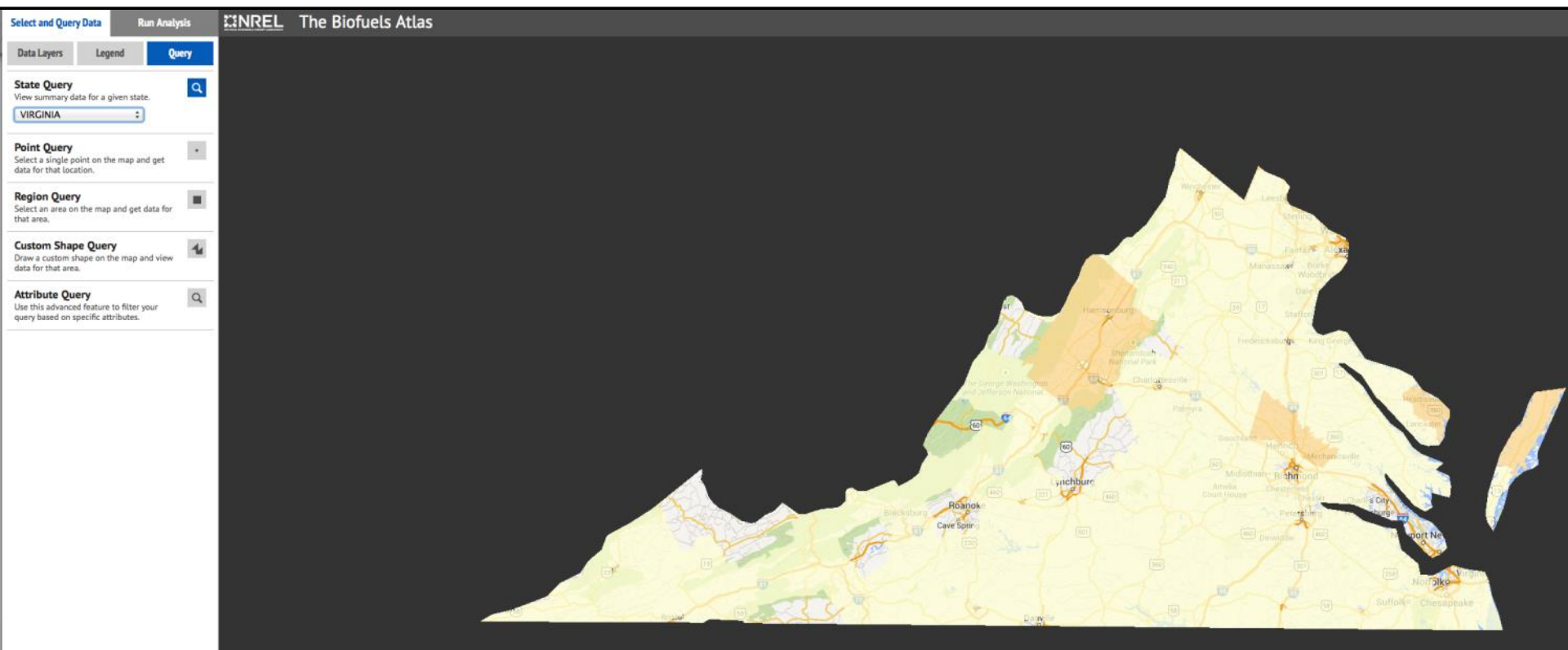
Data Visualization Highlights Deployment Opportunities



Technical Accomplishments/Progress/Results



Technical Accomplishments/Progress/Results



Download state table and data sources

Fossil Fuel		Bioenergy Production & Infrastructure		Feedstocks		
Gasoline (million gallons/year)	3,863	Biodiesel Stations	11	Feedstock	Tonnes/yr	Ethanol yield/yr
Diesel (million gallons/year)	1,017	E85 Stations	17	Bagasse	0.00	0.00
Electricity (thousand MWh/year)	107,795	Ethanol Plants	1	Barley Straw	20,478.00	1,695,559.00
Natural Gas (million cubic feet)	392,257	Total Ethanol Capacity (million gallons/year)	65.0	Corn Cobs	46,689.00	3,921,952.00
Conventional Power Plants (#)	72	Biodiesel Plants	4	Forest Residues	2,567.00	161,473.00

Summary of conventional energy, & Other RE statistics

Summary of state bioenergy statistics

Summary totals for each feedstock and biofuels potential

Technical Accomplishments/Progress/Results

Select and Query Data **Run Analysis**

Bioenergy Resource Analysis ■

Run an analysis on the amount of yield that can be produced in a specific area.

Results

These data show the amount of yield from each feedstock in the area you selected.

Feedstock	Dry Amt (tonnes)	Gallons	
Bagasse	0.00	0	Edit
Barley Straw	2,316.64	95,793	Edit
Forest Residues	129,833.45	4,083,262	Edit
Urban Wood and Sec. Mill Residues	49,275.01	2,025,203	Edit
Primary Mill Residues	182,262.31	7,490,981	Edit
Corn Stover	611,793.00	26,674,175	Edit
Rice Straw	0.00	0	Edit
Sugar Beets	482,930.04	6,591,995	Edit
Sugarcane	0.00	0	Edit
Wheat Straw	59,725.89	2,221,803	Edit
Totals	1,518,136.34	49,183,212	

Corn Stover	611,792.99	26,460,047	Close
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Available resource

tonnes/year

Expected biofuel yield

gallons/tonne

Percent of resource obtainable:

%

NREL The Biofuels Atlas

User drags a circle to select radius; feedstock data for all counties in radius is used in calculations.

User can edit pre-loaded assumptions are based on feedstock characteristics (sources are Theoretical Ethanol Yield Calculator & Biomass Feedstock Composition and Property Database)

Technical Accomplishments/Progress/Results

Select and Query Data Run Analysis

NREL Biopower Atlas

BioPower Analysis

Run an analysis on the amount of yield that can be produced in a specific area.

Results
These data show the amount of yield from each feedstock in the area you selected.

Feedstock	MWh Potential	MW Potential	
Crop Residues	18.00	0.00	Edit
Forest Residues	208,327.00	29.73	Edit
Primary Mill Residues	646,506.00	92.25	Edit
Urban Wood & Secondary Mill Residues	241,290.00	34.43	Edit
Methane from Manure	115.00	0.16	Edit
Methane from Wastewater	29.00	0.04	Edit
Totals	1,096,285.00	157	

← User drags a circle to select radius; feedstock data for all counties in radius is used in calculations.

Primary Mill Residues 646,506.00 92.25 Close

Gross Potential Energy: 21,981,213.18 (MMBtu)

Net Potential Energy: 10,990,606.59 (tonnes/year)

Available resource: (tonnes/year)

Energy Content: (Btu/dry lb.)

Obtainable: (%)

Heat Rate: (%)

Capacity Factor: (%)

← User can edit pre-loaded assumptions based on feedstock characteristics and common power inputs.

Relevance

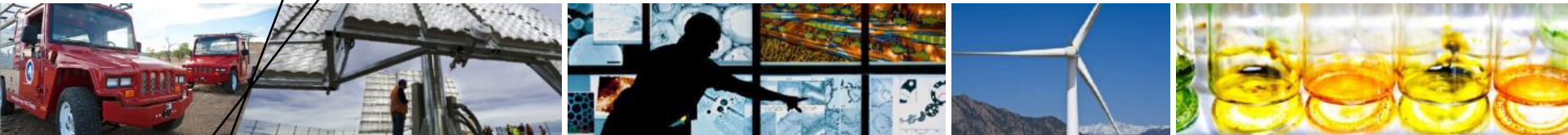
- **BIC helps BETO meet its goals and objectives of expanding the domestic bioenergy market by providing current relevant biopower and biofuels data and tools to a wide group of stakeholders**
- **FY2014 Statistics (tracked by Google Analytics):**
 - Biofuels Atlas: 7,804 pageviews (expect to double in FY15)
 - AFDC Ethanol Pages: 310,210 pageviews (21 pages of content)
 - Biodiesel Pages: 193,951 pageviews (13 pages of content)
 - Emerging Fuels: 57,320 (8 pages of content)
 - AFDC: 1.8 million page views and most used EERE site (24% of all page views)
- **The AFDC and Bioenergy Atlas tools are used by industry to increase deployment of production and use**
 - Stakeholders include bioenergy companies; other government departments/agencies (DOD, DOI, DOT, EPA, USDA); industry groups (Advanced Biofuels Association, American Petroleum Institute, ASTM, Growth Energy, National Association of Convenience Store Owners, National Association of Truck Stop Owners, National Biodiesel Board, Petroleum Equipment Institute, Renewable Fuels Association, Steel Tank Institute, Western Governors Association); state offices (economic development, energy, environment); institutions; investment firms; universities.

Future Work

- **FY2015 work includes:**
 - Review and update all AFDC biofuels web pages and content (completed December 2014)
 - E15 white paper (draft March 2015)
 - Prepare a short white paper exploring why more stations do not sell E15 despite substantial research and investment by DOE. This paper will review the impacts of regulations and liabilities and identify the motivations of stations owners who sell and do not sell E15
 - Upgrades to Bioenergy Atlas (September 2015)
 - Add Information on bioenergy-related incentives and policies (from Database of State Incentives for Renewables & Efficiency and AFDC's Federal and State Laws & Incentives)
 - Add time series or multivariant data filtering to expand analysis capabilities
- **Go/No-go for future funding is based on a consistent use of AFDC biofuels pages and Bioenergy Atlas tools; tracking by Google Analytics**

Summary

- **The BIC task funds AFDC biofuels pages and Bioenergy Atlas Tools**
 - The AFDC biofuels pages are a critical resource for current and relevant information and data
 - The Bioenergy Atlas tools provide users with interactive maps
 - Allows viewing of all major categories of biomass data
 - Allows user to see and download data behind the maps
 - Allows user to select a geographic area to view potential biofuels production or biopower generation
 - One of very few tasks that cover biopower
 - **The BIC task reaches numerous stakeholders to grow the bioenergy market**
 - A relatively small budget led to combined website views of nearly 570,000 in FY2014



Additional Slides

Links

BioFuels Atlas Access

- <http://www.afdc.energy.gov>
- <http://maps.nrel.gov/bioenergyatlas>
- <http://maps.nrel.gov>

Upcoming Outreach

- Webinar on Bioenergy Atlas tools for stakeholders
- Communication of updated Bioenergy Atlas tools to industry groups
- Contacting industry journals with updated Bioenergy Atlas tools

Additional Slides-Feedstock Calculations

Crop Residues

- Crop production (tons) x residue ratio x % dry matter x 0.35 (% removed)

Methane

- *Manure Equation 1:* Volatile Solids per animal type=animal population x animal weight x volatile solids for animal type
- *Manure Equation 2:* Methane production = Equation 1 x max methane producing capacity (ft³/lbs volatile solids) x methane conversion factor x % of animal types manure management system
- *Wastewater:* Methane=county population x BOD per capita per year x % BOD anaerobically digested per year x methane generation potential

Secondary Mill Residues

- *For Pallet/Lumber:* Residues=# of companies in country x 300 (avg wood waste per year) x 0.9072 (conversion to metric tons)
- *Woodworking Co's:* Residues=# of companies in country x avg wood waste (based on # of employees) x 0.9072 (conversion to metric tons)

Urban Wood Waste

- *Utility/Tree Co's:* Single tree crew harvest 1,000 tons per year
- *Construction/Demolition:* Residues=0.09 (tons/yr/person) x population

Additional Slides-Analysis Calculations

Feedstock	Expected Yield-use this (gallons per tonne)
Sugar beets	27.3
Sugar cane	21.5
Barley Straw	82.7
Corn Cobs	84.0
Corn Stover	87.2
Rice Straw	84.8
Bagasse	86.0
Wheat Straw	74.4
Primary Mill Residues	82.2
Secondary Mill Residues and Urban Wood	82.2
Forest Residues	62.9

- Yields are 70% of EERE Theoretical Ethanol Calculator yields
- Potential Biofuels Yield (million gallons) = available resource (tons of feedstock in counties in selected radius) x expected yield x % obtainable (defaults to 50%--assumes project can obtain half the available resource)
- User can change all inputs to see how yield and % obtainable impact potential biofuels production