



U.S. Department of Energy (DOE) Bioenergy Technologies Office (BETO) Biofuels Information Center

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Goal Statement

- **The Biofuels Information Center (BIC) task provides essential bioenergy data, tools, and information to all stakeholders.**
- **The outcome of the task is to enable stakeholders to make informed decisions.**
- **The relevance of the task is measured by usage of websites and tools and downloads of reports.**

Quad Chart Overview

Timeline

- Project Start Date: FY2008
- Project End Date: Ongoing
- Percent Completion: 20% (FY17, FY18, FY19 work)

Budget

| | Total Costs FY12–FY14 | FY15 Costs | FY16 Costs | Total Planned Funding (FY17–Project End Date) |
|------------|-----------------------|------------|------------|---|
| DOE Funded | \$350k | \$120k | \$140k | \$1,050k* (*total for FY17, FY18, FY19) |

Barriers

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

Partners

- U.S. Department of Agriculture
- Leverage VTO Clean Cities funds for AFDC biofuels pages and other EERE funders of the OpenCarto platform where the Bioenergy Atlas tools reside.

1 – 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 and maps, and the State Bioenergy Assessment Tool.
- The BIC is focused on providing useful bioenergy tools, data, and information. The key tasks are:
 - **TASK 1:** Updating and maintaining the Alternative Fuels Data Center biofuels data and information pages www.afdc.energy.gov.
 - **TASK 2:** Updating, maintaining and adding functionality to the Biofuels Atlas and Biopower Atlas geospatial tools <https://maps.nrel.gov>.
 - **TASK 3:** Leading and participating in stakeholder committees and groups on the subject of biofuels infrastructure compatibility.
 - **TASK 4:** Analyzing USDA Biofuels Infrastructure Partnership data and generating confidential summary reports and a published national summary <https://www.usda.gov/wps/portal/usda/usdahome?contentid=2015/10/0300.xml>.
 - **Future TASK 5:** Updating the annual EERE Bioenergy Market Report www.nrel.gov/docs/fy16osti/63468.pdf.

2 – Approach (Management)

Approach

- **Prioritize** tasks based on data availability and popularity of deliverable—tools, data, and reports.
- **Determine** deliverable timelines on availability of appropriate staff and BETO needs.
- Regularly **review** budget and deliverable status to meet all deadlines.
- **Outreach** of new content or reports and updated tools is essential to the stakeholder community. This is done through email blasts, contacting relevant industry journals, inclusion in BETO email newsletter, and webinars showing results and new functionality in tools.

2 – Approach (Management)

Team Structure

- **AFDC updates**—Kristi Moriarty updates content; Clean Cities team reviews and edits content; programming team uploads changes.
- **Biofuels Atlas/Biopower Atlas**—Anelia Milbrandt and Kristi Moriarty identify new data and update existing data and determine needs for additional functionality. Programming team codes updates and changes.
- **Infrastructure Support**—Kristi Moriarty leads and participates in stakeholder committees and groups and authored the E15 white paper.
- **USDA BIP**—Kristi Moriarty is the lead author on confidential and published reports. NREL and USDA economists assist in data analysis.
- **EERE Bioenergy Market Report**—Kristi Moriarty and Anelia Milbrandt lead updating the content. Other NREL subject matter experts participate as needed.

2 – Approach (Technical)

- **Gather** unbiased, relevant industry data primarily from EIA, EPA, USDA, and EERE projects, and industry.
- **Review** data quality and summarize as needed or process it into geospatial data to display on mapping tools. Ensure consistency of content and language on AFDC pages.
- **Test** online tools for data accuracy and functionality.
- **Deploy** data and information updates to websites.
- **Influence** industry-funded projects by leading and participating in stakeholder committees and groups.
- **Serve** as a technical expert and respond to all industry infrastructure inquiries with useful data and information by email or phone.
- **Leverage** funding-14 NREL mapping tools share costs for coding, updates, and maintenance. AFDC platform is funded by Clean Cities.

2 – Approach (Technical)

Success Metrics

- A key success factor of online websites and tools is tracking usage through Google Analytics.
- Track number of report downloads.

Challenges

- The most significant challenge is the timeliness of data from outside sources and permissions to use purchased or protected data sets.
 - NREL works with the vendor of purchased data sets to reach an agreement on displaying data in ranges that give users enough information.
 - Data timing issues are dealt with by leaving flexibility in the project schedule to allow updates any time of year.

3 – Technical Accomplishments—Task 1

AFDC pages are reviewed, updated, and edited annually.

- Extensive reviews by NREL Clean Cities leads and communications edits
- Completed by March each year
- Ethanol (21 pages)
- Biodiesel (13 pages)
- Emerging (7 pages)
- Maps, data, and publications are updated and added as they are available.

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

Alternative Fuels Data Center

Alternative Fuels Data Center
SEARCH
Search Help

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

EERE > AFDC [Printable Version](#) [Share](#)

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.

The AFDC is a resource of the U.S. Department of Energy's [Clean Cities](#) program.

[YouTube](#) [BLOG](#) [i](#)

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

Station Locator >

Find alternative fueling station locations.

Find State Information
select a state

Find stations on your iPhone [i](#)

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](#)

www.afdc.energy.gov

3 – Technical Accomplishments—Task 1

AFDC biofuels pages have consistent formats.

The screenshot displays the AFDC website interface. At the top, the U.S. Department of Energy logo is on the left, and navigation links for EERE Home, Programs & Offices, and Consumer Information are on the right. The main header features the 'Alternative Fuels Data Center' title and a search bar. A green navigation bar contains links for Fuels & Vehicles, Conserve Fuel, Locate Stations, Laws & Incentives, Maps & Data, Case Studies (highlighted), Publications, Tools, About, and Home. Below this, a breadcrumb trail reads 'EERE > AFDC > Fuels & Vehicles > Ethanol'. On the right side of the page, there are links for 'Printable Version' and 'Share'. The main content area is titled 'Ethanol' and includes a descriptive paragraph: 'Ethanol is a renewable fuel made from corn and other plant materials. The use of ethanol is widespread, and approximately 97% of gasoline in the U.S. contains some ethanol. The most common blend of ethanol is E10 (10% ethanol, 90% gasoline). Ethanol is also available as E85 (or flex fuel)—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 10.5%-15% ethanol with gasoline. It is an approved ethanol blend for use in model year 2001 and newer light-duty conventional vehicles.' To the left of the main text is a sidebar with a list of categories: Ethanol Basics, Benefits & Considerations, Stations, Vehicles, and Laws & Incentives. Below the main text are five expandable sections, each with an icon and a brief description: 'Basics' (info icon), 'Benefits and Considerations' (scales icon), 'Stations' (gas pump icon), 'Vehicles' (car icon), and 'Laws and Incentives' (dollar sign icon). On the right side of the page, there is a 'Fuel Prices' section with the text 'Find ethanol fuel prices and trends.' and an illustration of a gas pump with a 'Download the Alternative Fuel Price Report' button.

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

EERE Home | Programs & Offices | Consumer Information

Alternative Fuels Data Center

Search the AFDC

FUELS & VEHICLES | CONSERVE FUEL | LOCATE STATIONS | LAWS & INCENTIVES | Maps & Data | **Case Studies** | Publications | Tools | About | Home

EERE > AFDC > Fuels & Vehicles > Ethanol

Printable Version | Share

Ethanol Basics

Ethanol

Ethanol is a renewable fuel made from corn and other plant materials. The use of ethanol is widespread, and approximately 97% of gasoline in the U.S. contains some ethanol. The most common blend of ethanol is E10 (10% ethanol, 90% gasoline). Ethanol is also available as E85 (or flex fuel)—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 10.5%-15% ethanol with gasoline. It is an approved ethanol blend for use in model year 2001 and newer light-duty conventional vehicles.

- 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.

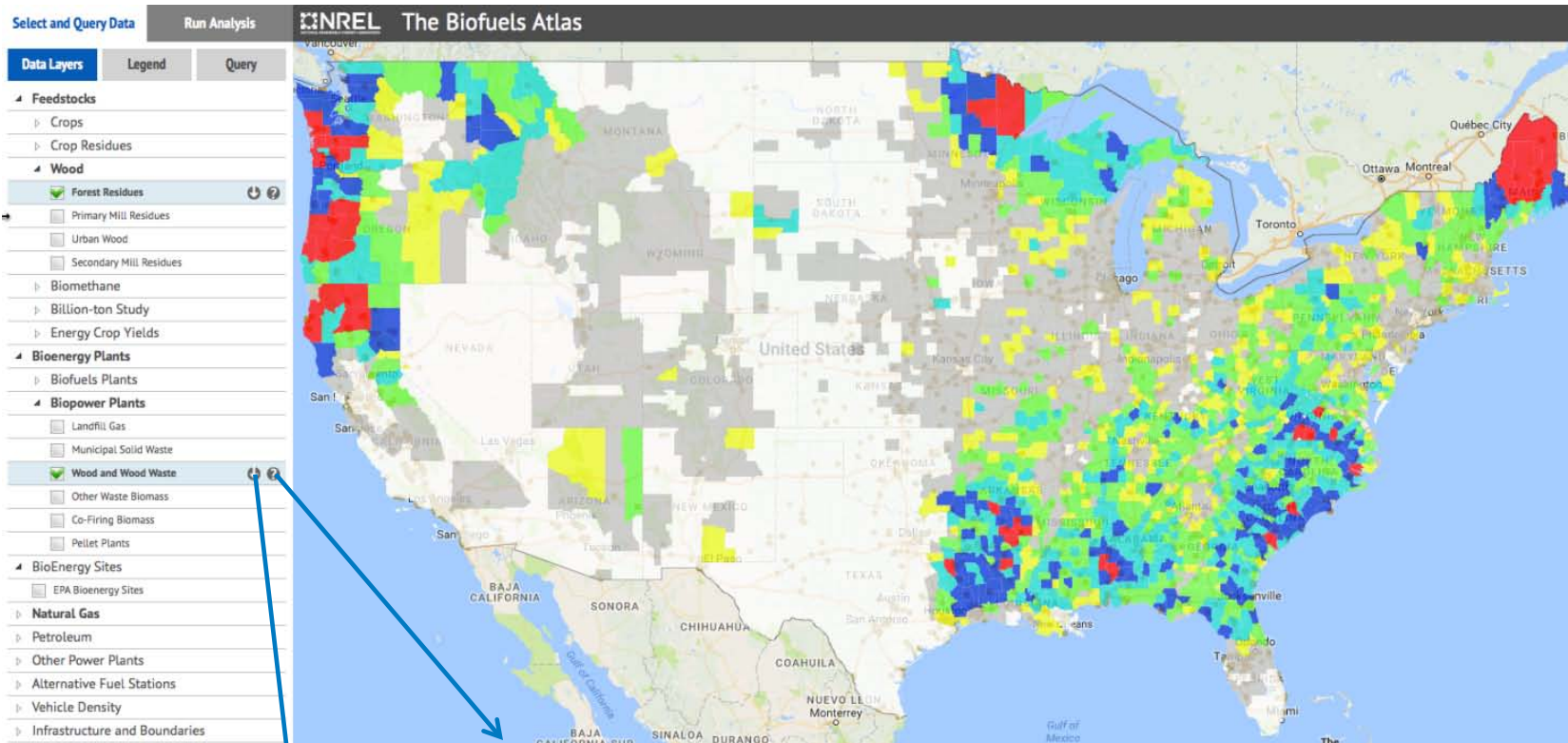
Fuel Prices

Find ethanol fuel prices and trends.

Download the Alternative Fuel Price Report

3 – Technical Accomplishments—Task 2

Bioenergy Atlas data is updated annually if new data is available and functionality is added each year.



Wood and Wood Waste

Download map layer data in the following geospatial data formats:

CSV Shapefile KML GeoJSON

Description: Operable electric generating plants in the United States by energy source. This includes all plants that are operating, on standby, or short- or long-term out of service with a combined nameplate capacity of 1 MW or more (Aug. 2015).

Source: Energy Information Administration

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

<https://maps.nrel.gov>

3 – Technical Accomplishments—Task 2

Data visualization highlights deployment opportunities



The map displays Louisiana parishes with varying shades of orange and red, indicating the density of FFVs and E85 stations. The darkest red areas, representing the highest density of both, are concentrated in the Houston area (parishes like Harris, Montgomery, and others) and the New Orleans area (parishes like Orleans, St. Bernard, and others). Lighter orange areas represent lower densities. Numerous teal pin markers are scattered across the map, with a high concentration in the Houston area and a few in the New Orleans area. Major highways like I-10, I-55, and I-210 are also visible.

Many FFVs & E85 stations

Many FFVs & few E85 stations

3 – Technical Accomplishments—Task 2

Multiple user-friendly methods to see data behind the map.

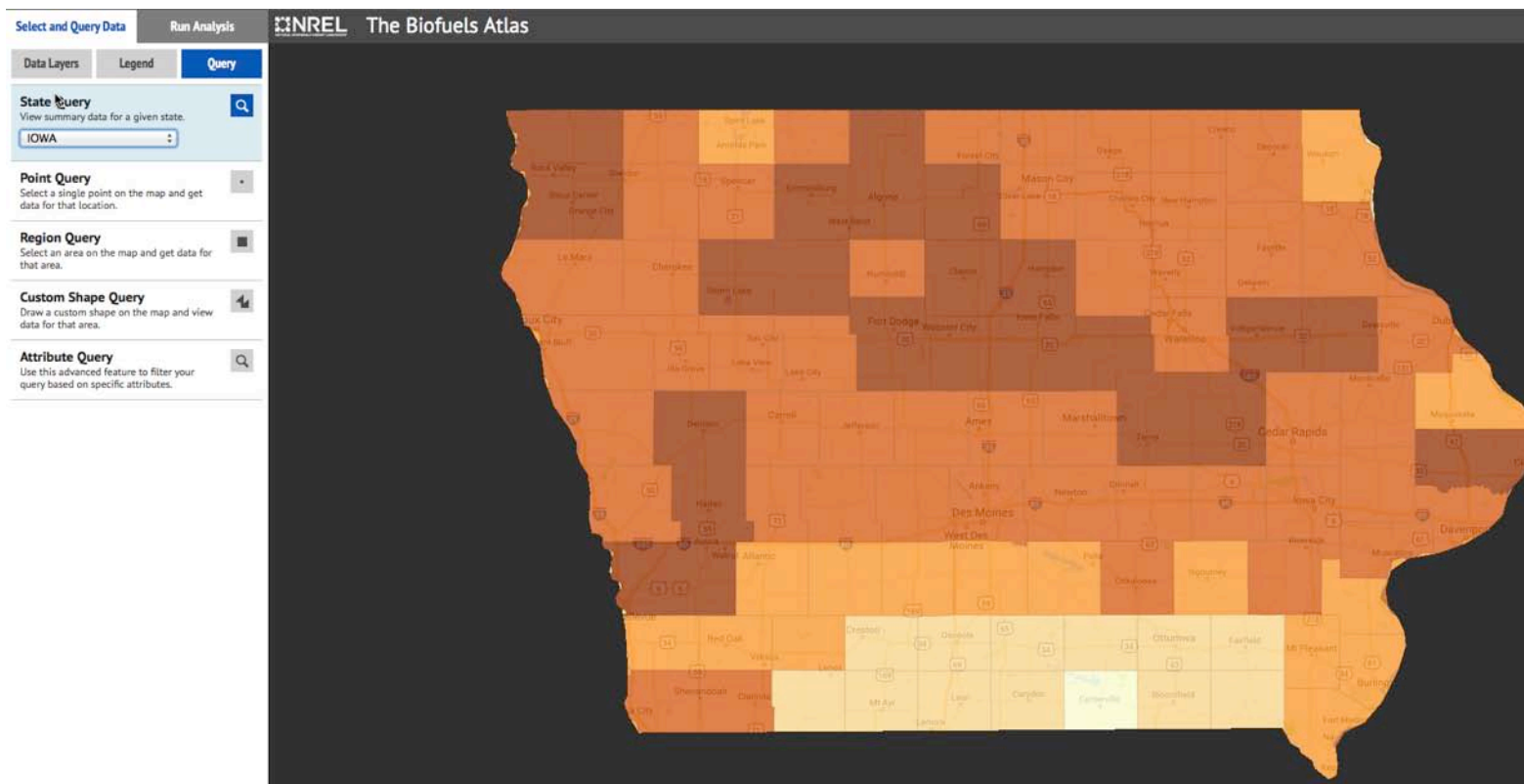
Point query: Shows data when user clicks on map

Region query: Data tab for each data layer queried; ability to download data

| County | Thousand Dry Tonnes/Yr |
|----------|------------------------|
| Beltrami | 62.424 |
| Cass | 63.979 |
| Itasca | 111.44 |

3 – Technical Accomplishments—Task 2

Stakeholders can easily find summary data for their state.



Conventional energy summary

Bioenergy & other renewable energy summary

Biopower potential from each feedstock

Conventional Energy

| | |
|--|------------|
| Electric Power Generation from Conventional Sources (including nuclear, MWh) | 40,943,720 |
| Nameplate Capacity for Conventional Power Plants (MW) | 12,000.6 |
| Conventional Power Plants (#) | 165 |
| Average Retail Price of Electricity (cents/kWh) | 8.07 |
| Total Retail Sales of Electricity (MWh) | 46,705,216 |

Renewable Energy

| | |
|---|------------|
| Biopower Generation (MWh) | 158,630 |
| Nameplate Capacity for Biopower Plants (MW) | 15.6 |
| Biopower Plants (#) | 5 |
| Electric Power Generation from Other Renewable Sources (solar, wind, geothermal, MWh) | 15,568,406 |
| Nameplate Capacity for Other Renewable Power Plants (solar, | 5,154.1 |

Biopower Potential

| Feedstock | Tonnes/yr | Potential Biopower Capacity (MW) | Potential Biopower Generation (MWh) |
|-----------------------|---------------|----------------------------------|-------------------------------------|
| Crop Residues | 20,966,882.00 | 1,260.98 | 8,836,943.00 |
| Forest Residues | 189,608.72 | 14.91 | 104,504.00 |
| Primary Mill Residues | 136,899.00 | 10.77 | 75,453.00 |

3 – Technical Accomplishments—Task 2

Easy to use analysis function to see production potential.

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 | Edit |
|----------------------------------|------------------|------------|------|
| Bagasse | 0.00 | 0 | Edit |
| Barley Straw | 2,516.64 | 95,795 | Edit |
| Forest Residues | 129,833.45 | 4,085,262 | 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 | 611,792.00 | 26,674,175 | Edit |
| Rice Straw | 0.00 | 0 | Edit |
| Sugar Beets | 462,910.04 | 6,991,999 | Edit |
| Sugarcane | 0.00 | 0 | Edit |
| Wheat Straw | 58,725.89 | 2,321,805 | Edit |
| Totals | 1,518,136.34 | 49,183,312 | |

Winnipeg
Portland
San Francisco
San Jose
Los Angeles
San Diego
Las Vegas
Albuquerque
Columbus
Chicago
Cleveland
Detroit
Hamilton
Toronto
Ottawa
United States
Los Angeles
San Antonio
Houston
Dallas
Phoenix
Denver
Chicago
Columbus
Detroit
Cleveland
Toronto
Ottawa
Jacksonville
Miami

Close

Available resource
 tonnes/year

Expected biofuel yield
 gallons/tonne

Percent of resource obtainable:
 %

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

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

3 – Technical Accomplishments—Task 2

New functionality to see incentives in a state.

- Incentives analysis returns results from other EERE funded tools.
- Biofuels Atlas pulls from the AFDC Laws & Incentives Database.
www.afdc.energy.gov/laws
- Biopower Atlas pulls from EERE-funded North Carolina State's Database of State Incentives for Renewables & Efficiency (DSIRE)
www.dsireusa.org

Select and Query Data Run Analysis

Bioenergy Resource Analysis

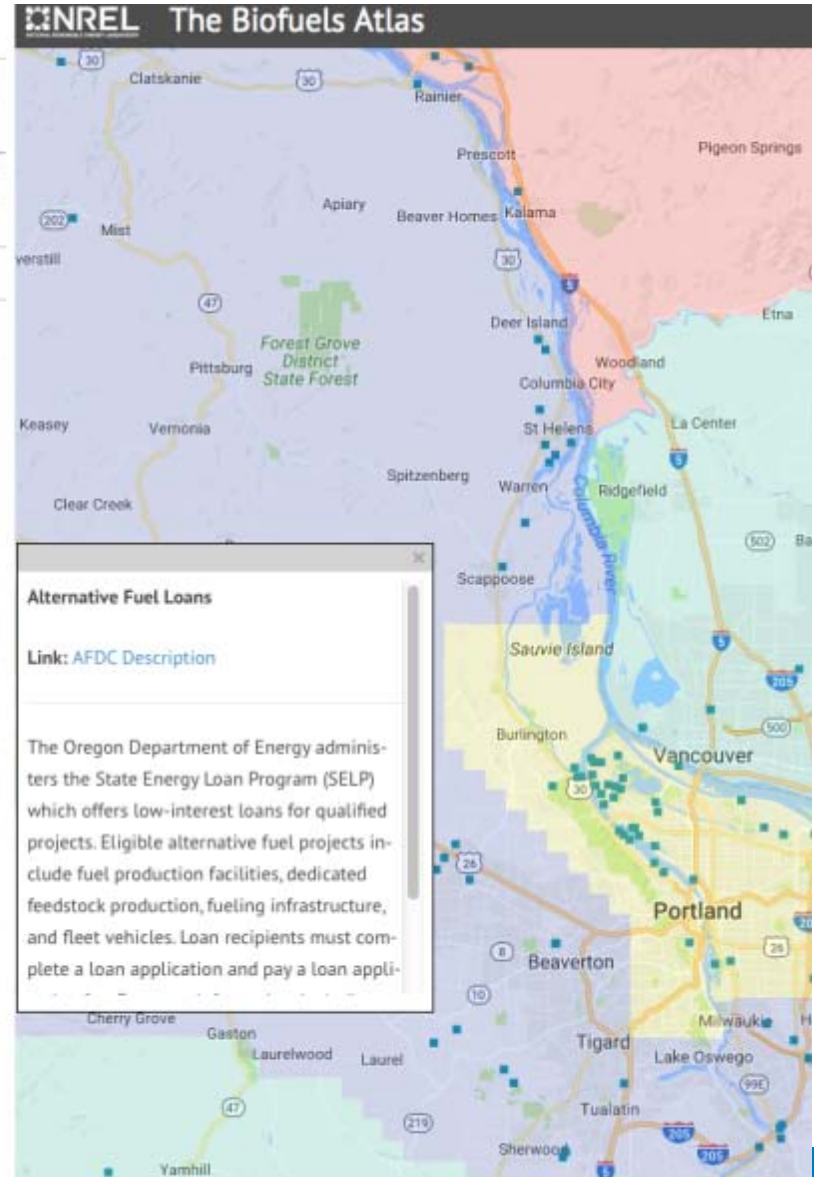
Run an analysis on the amount of yield that can be produced in a specific area.

Incentives

Run an analysis on the incentives available in a specific area.

Incentives

| Program | Type | Source | Link |
|---|----------------------|--------|-------------------------|
| Biofuels Production Property Tax Exemption | State Incentives | OR | Details |
| Alternative Fuel Vehicle (AFV) Loan Program | State Incentives | OR | Details |
| Alternative Fuel Vehicle (AFV) and Infrastructure Tax Credit for Businesses | State Incentives | OR | Details |
| Alternative Fuel Loans | State Incentives | OR | Details |
| Biodiesel Tax Exemption | State Incentives | OR | Details |
| Alternative Fueling Infrastructure Tax Credit for Residents | State Incentives | OR | Details |
| Alternative Fuel Vehicle (AFV) Parking Space Regulation | Laws and Regulations | OR | Details |
| Clean Transportation Fuel Standards | Laws and Regulations | OR | Details |
| Alternative Fuel Vehicle (AFV) Acquisition, Fuel Use, and Emissions Reductions Requirements | Laws and Regulations | OR | Details |
| Renewable Fuels Mandate | Laws and Regulations | OR | Details |



3 – Technical Accomplishments—Task 3

Wrote E15 Retail Station Opportunities and Challenges White Paper.

- Purpose: DOE spent \$46 million on E15 research. Stations that sold and did not sell E15 were interviewed, as were EPA staff on vapor pressure rules, Clean Air Act fines, and fuel quality surveys.
- E15 is sold as 88 octane fuel at a lower price than E10 and generally provided a higher profit margin for stations compared with E10.
- Stations that sold E15 were typically single-owner stations that offered E15 as a way to differentiate from their competitors—they also tended to sell E10.
- Stations that did not sell E15 expressed concerns about misfueling liability under the Clean Air Act due to the bifurcated market in which only 2001 and newer light duty vehicles are approved.
- Report limited to EERE and BETO staff.

3 – Technical Accomplishments—Task 4

Wrote USDA Summary Report.

- USDA and state/industry partners have invested \$210 million in grants for E10+ refueling equipment to ~1,475 to expand the availability of blends above E10.
- DOE and USDA entered into a memorandum of agreement to share data from stations, including infrastructure data, sales price, and volume data.
- NREL is tasked with analyzing this data to understand if this was a successful deployment.
- NREL provided a summary report in January 2017, another is expected in spring 2017.
- This is a five-year project.



USDA Biofuels Infrastructure Partnership Summary Report

Kristi Moriarty
National Renewable Energy Laboratory

January 6, 2017

This document contains confidential and proprietary information. DO NOT CITE or DISTRIBUTE.

4 – Relevance

- BIC helps BETO meet its goals and objectives of expanding the domestic bioenergy market by providing current relevant bioenergy data and tools to a wide group of stakeholders.
- Stakeholders are using the AFDC and Bioenergy Atlas tools at over 740,000 page views (an instance of an Internet user visiting a Web page) per year, with a budget of \$140,000.
- The AFDC had 1.96 million page views in FY16 and the biofuels pages accounted for 37% of that total.

| Google Analytics | FY14 | FY15 | FY16 |
|---------------------------------------|------------------|----------------|----------------|
| | <i>Pageviews</i> | | |
| Biofuels Atlas | 7,804 | 58,911 | 82,594 |
| Biopower Atlas | not available | 12,227 | 20,004 |
| AFDC Ethanol Pages | 310,210 | 394,509 | 405,355 |
| AFDC Biodiesel Pages | 193,251 | 210,070 | 186,082 |
| AFDC Emerging Fuel Pages ^a | 57,320 | 68,780 | 50,134 |
| Total | 568,585 | 744,497 | 744,169 |

a-renewable natural gas was moved from emerging fuels section to natural gas in FY16.

4 – Relevance

PI is an expert in refueling infrastructure and supports stakeholders in the following capacity:

- Co-chair of the infrastructure committee of the agriculture/auto/ethanol working group, which is performing follow-on research to DOE's previous high octane fuel project.
- Member of Coordinating Research Council's ULSD corrosion committee.
- UL panel member for several test standards.
- Regularly provides data and information to EPA, USDA, and other government agencies.
- Presents to multiple industry groups on the topic of biofuels and infrastructure compatibility.
- Fields weekly industry inquiries for information and data on biofuels infrastructure as well as industry questions on emerging biofuels impact on the fuel supply chain.
- These activities result in information and data for other EERE projects and programs, for example Co-Optimization of Fuels and Vehicles Project, USDRIVE project, and Clean Cities program.

- **Engaging stakeholders through individual assistance and meetings and through leading and participating in committees helps create an understanding and a link between DOE, the national laboratories, and industry to help bridge the final hurdle of getting new fuels into existing infrastructure.**

4 – Relevance

Many types of stakeholders use the AFDC and Bioenergy Atlas tools and provide feedback on what is missing. They also ask for assistance in refueling infrastructure. They include:

- **Bioenergy companies** and their industry groups, including Advanced Biofuels Association, Electric Power Research Institute, Growth Energy, National Biodiesel Board, and Renewable Fuels Association.
- **Other government agencies**, including DOD, DOI, DOT, EPA, State, and USDA.
- **State offices**, including economic development, energy, environment, and transportation.
- **Retail station owners**, fleet station owners, fuel marketers, refueling equipment manufacturers and their industry groups, including National Association of Convenience Store Owners, National Association of Truck Stop Owners, Petroleum Equipment Institute, Petroleum Marketers Association of America, and Steel Tank Institute.
- **Oil and refining companies** and the American Petroleum Institute.
- **Vehicle and engine manufacturers** and their industry groups, including the Auto Alliance, Society for Automobile Engineers, and United States Council for Automotive Research.
- **Others** include ASTM, Carbon War Room, Environmental and Energy Study Institute, Fuels Institute, institutions, investment firms, and universities.

5 – Future Work—Task 1, 2, 3

Continued annual support of AFDC and Biofuels Atlas tools.

- Annual update of AFDC biofuels pages March 2017.
- Bioenergy Atlas work (ongoing throughout the year):
 - Review and update Bioenergy Atlas data layers (85 Biofuels Atlas, 90 Biopower Atlas), including updating new Billion Ton Study data layers.
 - Add wet waste feedstocks generated from a joint NREL PNNL project. Add water data layers. Review other new data layers for relevance.
- Continue to lead and participate in infrastructure committees and engage stakeholders individually.
- Go/no-go for future funding is based on a consistent use of AFDC biofuels pages and Bioenergy Atlas tools; tracking by Google Analytics.

5 – Future Work—Task 4

- Summarize February 2017 data set.
- Prepare an update of the the summary report with new February 2017 data.
- NREL and USDA economists, along with technical experts, will analyze data to identify success metrics and trends to determine if more E10+ fuel was sold, as well as what metrics impact fuel sales.
- Anticipate national publication of results in FY18, FY19, FY20, and FY21.



5 – Future Work—Task 5



- The *Bioenergy Market Report* compliments annual reports for other EERE programs.
- 2013 and 2015 reports published. <http://www.nrel.gov/docs/fy17osti/66943.pdf>
- Topics covered include production, trade, policies, infrastructure, end-use, outlook, and trends for ethanol (conventional and cellulosic), biodiesel, biobutanol, renewable hydrocarbons, biopower, and bioproducts.
- Write 2016 *Bioenergy Market Report* deliverable due July 2017.

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 BIC task reaches numerous stakeholders to grow the bioenergy market.**
 - A FY2016 budget of \$140,000 resulted in over 740,000 page views.
- **Future work will result in annual reports that provide current bioenergy data and information.**

Additional – Publications & Select Presentations

- **Publications:**

- Confidential: USDA Biofuels Infrastructure Partnership Summary Report
- Confidential: E15 Retail Station Opportunities and Challenges White Paper
- Future publications (not confidential): 2016 Bioenergy Market Report, USDA BIP Analysis report.

- **Presentations/Outreach**

- Bioenergy Atlas Tools Webinar December 16, 2015-100+ attendees. Recorded-
<https://attendee.gotowebinar.com/register/4594212950316566530>
- Steel Tank Institute Annual Meeting January 30, 2017
- Agriculture/Auto/Ethanol Annual Meeting October 4, 2016
- Demonstration of Bioenergy Atlas tools to USDA Agricultural Research and U.S. Forest Service Staff August 23, 2016

Additional-Response to 2015 Peer Review Comments

- **2015 Overall Impression comments:**
 - **Comments** “It is surprising that the BioEnergy Atlas, which delivers a rich set of data and analysis capabilities, is among the least popular elements of the BIC.” and “I think the work could be advertised more, but then again, I think that it needs some examples of how the information can be used, and/or have DOE employees use it and publish on the site the ways in which they used it and how it was valuable.”
 - **Response-**Two years of outreach efforts including a webinar and email blast increased Biofuels Atlas use by 958% and a one year increase Biopower Atlas by 63%. BETO staff saves time by directing inquiries for information and datasets to the website and tools supported by the BIC task.

Additional-Biofuels Atlas Data Layers

| CATEGORY | DATA LAYERS | SOURCE |
|-----------------------------------|--|------------------------------|
| FEEDSTOCKS | | |
| Crops | sugar beets, sugarcane | USDA |
| Crop Residues | bagasse, barley straw, corn stover, grain sorghum stubble, rice straw, wheat straw | USDA-calculated |
| Wood | forest residues, primary residues | USFS |
| Wood | urban wood, secondary mill residues | Census Bureau, industry data |
| Biomethane | landfills, animal manure, Industrial, Institutional, and Commercial Organic Waste, wastewater treatment | Census Bureau, EPA, HSIP |
| Billion-ton (future availability) | county (annual energy crops, barley straw, compositite operations no federal lands, composite operations with federal lands, conventional woods, coppice and non-coppice woody crops, corn stover, forestland thinnings no federal lands, forestland thinnings with federal lands, mill residue unused primary, oat straw, other residue, perennial grasses, sorghum stubble, urban C&D wood, urban MSW wood, wheat straw). state (cotton gin trash, cotton residue, manure, orchid & vineyard pruning's, rice hulls, rice straw, sugarcane trash, wheat dust) | Billion Ton Study |
| Energy Crop Yields | energy cane, miscanthus, poplar, switchgrass, willow | Energy Biosciences Institute |

| CATEGORY | DATA LAYERS | SOURCE |
|---|--|-----------------------|
| BIOENERGY PLANTS | | |
| Biofuels Plants | biodiesel plants, ethanol plants, integrated biorefineries | EIA, RFA, BETO |
| Biopower Plants | landfill gas, MSW, wood and wood waste, other waste biomass, co-firing, pellet plants | EIA, Biomass Magazine |
| Other Power Plants | coal, natural gas, oil | |
| CONVENTIONAL ENERGY & OTHER RENEWABLE ENERGY | | |
| Natural Gas | liquefied natural gas import/export terminals, pipelines, market hubs, processing plants, underground storage facilities, power plants | EIA |
| Petroleum | refineries, pipelines, fuel terminals, rail terminals, power plants | EIA |
| Other Power Plants | coal, geothermal, hydro, nuclear, other, solar, wind | EIA |
| OTHER | | |
| Alternative Fuel Stations | Biodiesel, E85 | AFDC |
| Infrastructure | counties, state borders, American Indian reservations, railroads, congressional districts, federal lands | Standard GIS layers |
| Sites | bioenergy potential sites | EPA |
| Vehicle Density | Diesel, Flex-Fuel | HIS |

Additional-Biopower Atlas Data Layers

| CATEGORY | DATA LAYERS | SOURCE |
|-----------------------------------|--|------------------------------|
| FEEDSTOCKS | | |
| Crop Residues | harvesting crop residues, processing crop residues (bagasse) | USDA-calculated |
| Wood | forest residues, primary residues | USFS |
| Wood | urban wood, secondary mill residues | Census Bureau, industry data |
| Biomethane | landfills, animal manure, Industrial, Institutional, and Commercial Organic Waste, wastewater treatment | Census Bureau, EPA, HSIP |
| Billion-ton (future availability) | county (annual energy crops, barley straw, composite operations no federal lands, composite operations with federal lands, conventional woods, coppice and non-coppice woody crops, corn stover, forestland thinnings no federal lands, forestland thinnings with federal lands, mill residue unused primary, oat straw, other residue, perennial grasses, sorghum stubble, urban C&D wood, urban MSW wood, wheat straw). state (cotton gin trash, cotton residue, manure, orchid & vineyard pruning's, rice hulls, rice straw, sugarcane trash, wheat dust) | Billion Ton Study |
| Energy Crop Yields | energy cane, miscanthus, poplar, switchgrass, willow | Energy Biosciences Institute |

| CATEGORY | DATA LAYERS | SOURCE |
|---|---|-----------------------|
| BIOENERGY PLANTS | | |
| Biofuels Plants | biodiesel plants, ethanol plants, integrated biorefineries | EIA, RFA, BETO |
| Biopower Plants | landfill gas, MSW, wood and wood waste, other waste biomass, co-firing, pellet plants | EIA, Biomass Magazine |
| Other Power Plants | coal, natural gas, oil | |
| CONVENTIONAL ENERGY & OTHER RENEWABLE ENERGY | | |
| Natural Gas | liquefied natural gas import/export terminals, pipelines, market hubs, processing plants, underground storage facilities, power plants | EIA |
| Petroleum | refineries, pipelines, fuel terminals, rail terminals, power plants | EIA |
| Other Power Plants | coal, geothermal, hydro, nuclear, other, solar, wind | EIA |
| OTHER | | |
| Environmental Impacts | EPA nonattainment areas (carbon monoxide, lead (two standards), nitrogen dioxide, 8 hour ozone (two standards), 1 hours ozone (two standards), PM10, PM 2.5 (two standards), sulfur dioxide (two standards). GHG emissions from stationary sources CHR, CO2, N2O. | EPA |
| Infrastructure | counties, state borders, American Indian reservations, railroads, congressional districts, federal lands | Standard GIS layers |
| Sites | bioenergy potential sites | EPA |

Additional-Biofuels Atlas and Biopower Atlas State Data

| DATA | DATA SOURCE |
|---|--|
| Electricity Use | EIA, Electric Power Monthly, Retail Sales of Electricity to Ultimate Consumer by End-Use Section-All Sectors |
| Power Plants (fossil and biopower) | EPA, Egrid Database |
| Natural Gas | EIA, Natural Gas Consumption by End Use, Volumes Delivered to All Consumers |
| Oil Refineries and Capacity | EIA, Refinery Capacity |
| Alternative Fuel Stations | AFDC, Alternative Fuels Station Database. |
| Ethanol Plants | Renewable Fuels Association |
| Biodiesel Plants | National Biodiesel Board |
| Biopower Plants | EPA, Egrid Database |
| Forest Residues and Primary Mill Residues | USDA, Forest Service Timber Output database |
| Diesel Use | EIA, State Energy Data EIA Motor Gasoline Consumption in Transportation |
| Gasoline Use | EIA, State Energy Data EIA Distillate Fuel Oil Consumption in Transportation |
| Crop Residues | USDA, National Agricultural Statics Service 2012 Census of Agriculture |
| Urban Wood and Sec. Mill Residues | U.S. Census Bureau |
| Sugarcane and Sugar beets | USDA, National Agricultural Statistics Service and 2012 Census of Agriculture |
| Potential Petroleum Transportation Use Replaced by Biofuels | Biomass Characteristic Database and Theoretical Ethanol Yield Calculator |

| | |
|---|---|
| Average Retail Price of Electricity (cents/kWh) | EIA, Detailed State Data |
| Biopower Generation (MWh), Biopower Generation (MWh) | EIA, Detailed State Data |
| Natural Gas | EIA, Detailed State Data |
| Conventional Power Plants (#) | EIA, Detailed State Data |
| Crop Residues | USDA, National Agricultural Statistics Service, Census of Agriculture |
| Electric Power Generation from Conventional Sources (including nuclear, MWh), | EIA, Detailed State Data |
| Electric Power Generation from Other Renewable Sources (solar, wind, geothermal, MWh) | EIA, Detailed State Data |
| Forest Residues | USDA, Forest Service's Timber Product Output database |
| Methane from Food Waste | U.S. Census Bureau's County Business Patterns and the Homeland Security Infrastructure Program (HSIP) |
| Methane from Landfills | EPA LMOP database |
| Methane from Manure | USDA, National Agriculture Statistics Service, Census of Agriculture |
| Methane from Wastewater | EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks |
| Nameplate Capacity for Biopower Plants, Conventional Power Plants, and Other Renewable Power Plants | EIA, Detailed State Data |
| Natural gas City Gate Price | EIA, Natural Gas Prices |
| Natural Gas Consumption | EIA, Natural Gas Consumption by End Use |
| Natural Gas Dry Production | Natural Gas Gross Withdrawals and Production |
| Other Renewable Power Plants | EIA, Detailed State Data |
| Primary Mill Residues | USDA, Forest Service's Timber Product Output database |
| REC Prices | Renewable Energy Certificate (REC) Prices |
| Total Retail Sales of Electricity | EIA, Detailed State Data |
| Urban Wood | U.S. Census Bureau ; BioCycle Journal: "State of Garbage in America"; and County Business Patterns |