

United States – 2018 update

Country Reports

IEA Bioenergy: 09 2018

Bioenergy policies and status of implementation

This report was prepared from the 2018 OECD/IEA World Energy Balances, combined with data provided by the IEA Bioenergy Executive Committee and Task members. All individual country reports were reviewed by the national delegates to the IEA Bioenergy Executive Committee, who have approved the content. General background on the approach and definitions can be found in the central introductory report¹ for all country reports.

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NATIONAL POLICY FRAMEWORK IN THE UNITED STATES

Table 1: US's renewable energy targets.

Sector	Share in gross final consumption per sector
Overall target	none
Heating and cooling	none
Electricity	Varies by state
Transport	Volumes mandated by the Renewable Fuel Standard (RFS) ² , with an overall target of 36 billion gallons of biofuels by 2022. Yearly targets differentiated in conventional biofuel* (topped at 15 billion gallons per year), cellulosic biofuel, biomass-based diesel and other advanced biofuel (yearly increasing targets).

*predominantly starch-based ethanol

Some information on policy and support schemes of bioenergy development can be found here: <https://www.iea.org/countries/membercountries/unitedstates/>

In July 2014, US-DOE (Department of Energy) issued a loan guarantee solicitation³ for up to USD 4 billion in loan guarantees available for innovative renewable energy and energy efficiency projects

¹ Available at <https://www.ieabioenergy.com/iea-publications/country-reports/2018-country-reports/>

² <https://www.epa.gov/renewable-fuel-standard-program>

³ <http://energy.gov/articles/energy-department-makes-additional-4-billion-loan-guarantees-available-innovative-renewable>

located in the U.S. that avoid, reduce, or sequester greenhouse gases. Another USD 500 million was added in 2015.⁴ Another supporting initiative by DOE is the State Energy Program (SEP)⁵ to help advance clean energy economy while contributing to national energy goals. A Clean Energy Investment Initiative was launched by the White House⁶ - this year a goal was set to catalyse USD 2 billion of expanded private sector investment in solutions to climate change, including innovative technologies with breakthrough potential to reduce carbon pollution.

State Renewable Portfolio Standards (RPSs) are flexible-market based policies which ensure that public benefits of renewable energy are recognised. An RPS requires electricity providers to obtain a minimum percentage of their power from renewable energy resources by a certain date. Each state chooses to fulfil its mandate using a combination of renewable energy sources, including wind, solar, biomass, geothermal, or other renewable sources.

The previous in-depth review by IEA, however, highlighted the absence of a clear link at the federal policy level between energy, environmental and security policies, and suggested that benefits could come from closer coordination among Congress, the Administration, and state governments, as well as between executive and legislative branches of the federal government. It also emphasized the need for greater coordination in order to ensure that energy policy challenges facing the country were addressed in a consistent manner.

In 2007, Congress passed the Energy Independence and Security Act (EISA), amending the Renewable Fuel Standard (RFS) as established by EPACT in 2005. The law states that by 2022, the U.S. shall consume 36 billion gallons of biofuels. Of that, 21 billion gallons shall be advanced biofuels.

The Food, Conservation, and Energy Act of 2008 (2008 Farm Bill) established new energy programs, including the Biorefinery Assistance Program, the Biobased Marketing Program and the Biomass Crop Assistance Program (BCAP). The Agricultural Act of 2014 (2014 Farm Bill) reauthorized and provided USD 880 million for energy programs established in the 2008 Farm Bill; expanded the Biorefinery Assistance Program to include biobased products and renewable chemical manufacturing; and expanded the Biopreferred program to include forestry products. The USDA Biomass Crop Assistance Program (BCAP) was created to support the establishment and production of eligible crops for conversion to bioenergy in selected BCAP project areas; and to assist agricultural and forest land owners and operators with collection, harvest, storage, and transportation of eligible material for use in a biomass conversion facility. The 2014 Farm Bill authorized USD 3 million support for biomass research and development grants.

At the end of 2015, the biodiesel blender's tax credit of 1.0 USD per gallon was extended through 2016 (and to retroactively cover 2015).

Source: <http://www.biodieselmagazine.com/articles/654945/obama-signs-spending-bill-tax-extend-legislation>

⁴ <http://energy.gov/lpo/articles/doe-finalizes-1-billion-new-loan-guarantee-authority-and-announces-new-application>

⁵ <http://energy.gov/eere/wipo/state-energy-program>

⁶ <https://www.whitehouse.gov/the-press-office/2015/02/10/fact-sheet-obama-administration-announces-initiative-scale-investment-cl>

TOTAL PRIMARY ENERGY SUPPLY (TPES) AND THE CONTRIBUTION OF BIOENERGY

The total primary energy supply of the US in 2016 amounted to 90.7 exajoule (EJ), and is dominated by fossil fuels (82%). This includes 33.0 EJ oil products, 27.3 EJ natural gas and 14.3 EJ coal products. Nuclear energy in nuclear power stations represents 10% of total primary energy supply or 9.2 EJ. Renewable energy sources have a share of 7.2% or 6.5 EJ – 4.5% bioenergy and 2.7% other renewable energy sources.

Compared to 5 years earlier (2011) the share of coal products has gone down from 21.9% to 15.8%. On the other hand, the share of natural gas has increased from 26.0% to 30.1%. Oil products and nuclear energy were relatively stable. In the same period the share of renewable energy had a modest increase from 6.2 to 7.2%.

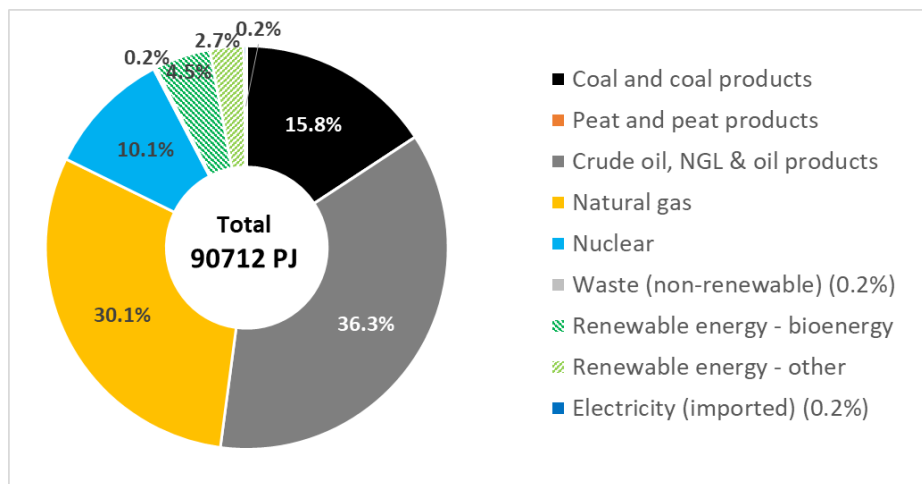


Figure 1: Total primary energy supply⁷ in the US in 2016 (Source: World Energy Balances © OECD/IEA 2018)

Most of the total primary energy supply of renewable energy sources is covered by bioenergy (4,079 PJ), followed by hydropower (971 PJ), wind energy (826 PJ), geothermal energy (384 PJ) and solar energy (282 PJ).

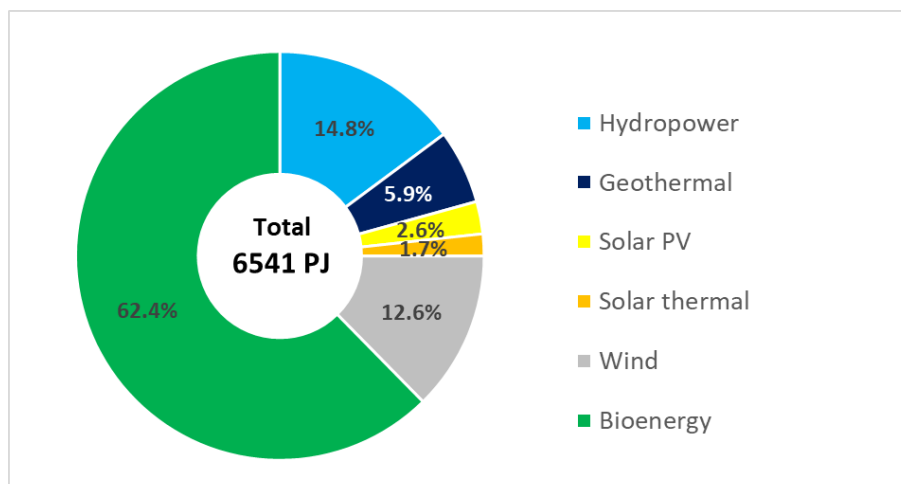


Figure 2: Total primary energy supply of Renewable Energy Sources in the US in 2016 (Source: World Energy Balances © OECD/IEA 2018)

⁷ TPES underestimates the actual role of pure electricity sources like PV, wind or hydro energy, and overestimates the role of resources producing electricity with a high share of unused waste heat (like nuclear, coal).

Solid biomass represents about half of bioenergy supply (2,090 PJ), of which 374 PJ is used in the residential sector. There is also a major role for biogasoline (1,348 PJ), followed by biodiesel (319 PJ). Biogas (155 PJ) and renewable MSW (155 PJ) reach somewhat lower shares.

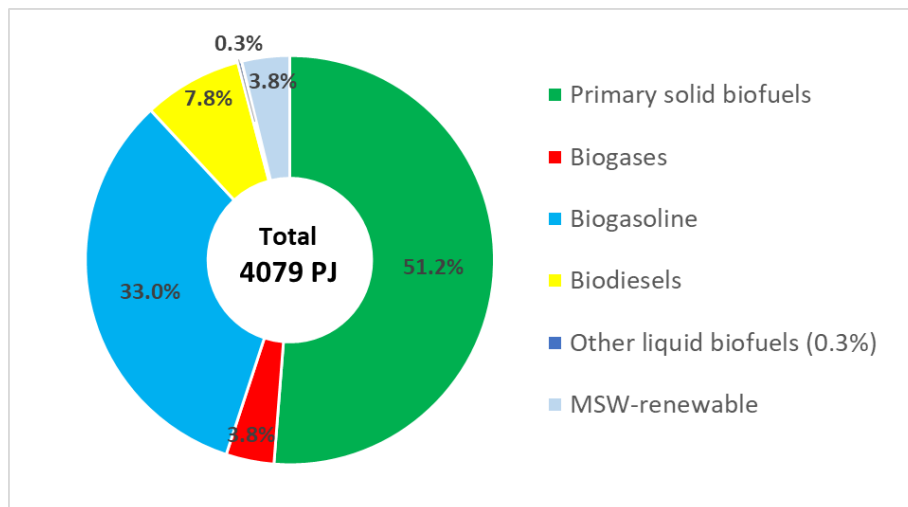


Figure 3: Total primary energy supply from bioenergy in the US in 2016 (Source: World Energy Balances © OECD/IEA 2018)

The share of bioenergy in TPES in the US has grown from 3.0% to 4.5% between 2005 and 2013. Since 2013 this share is relatively stable around 4.5%. The use of solid biomass is fairly stable since 1990 (between 2100 and 2400 PJ), even with a slight decrease in the last years. Liquid biofuels saw a more than 10-fold increase from 124 PJ in 2000 to 1,362 PJ in 2012; in the past years there is an increasing trend with average growth rates of about 4-5% per year up to 1,679 PJ in 2016. The role of biogas increased between 1995 and 2009 from 43 PJ to 213 PJ, than dropped suddenly to 116 PJ in 2010, increased again up to 183 PJ between 2010 and 2014, and decreased again to around 150 PJ in 2016. Renewable MSW is stable around 150 PJ per year.

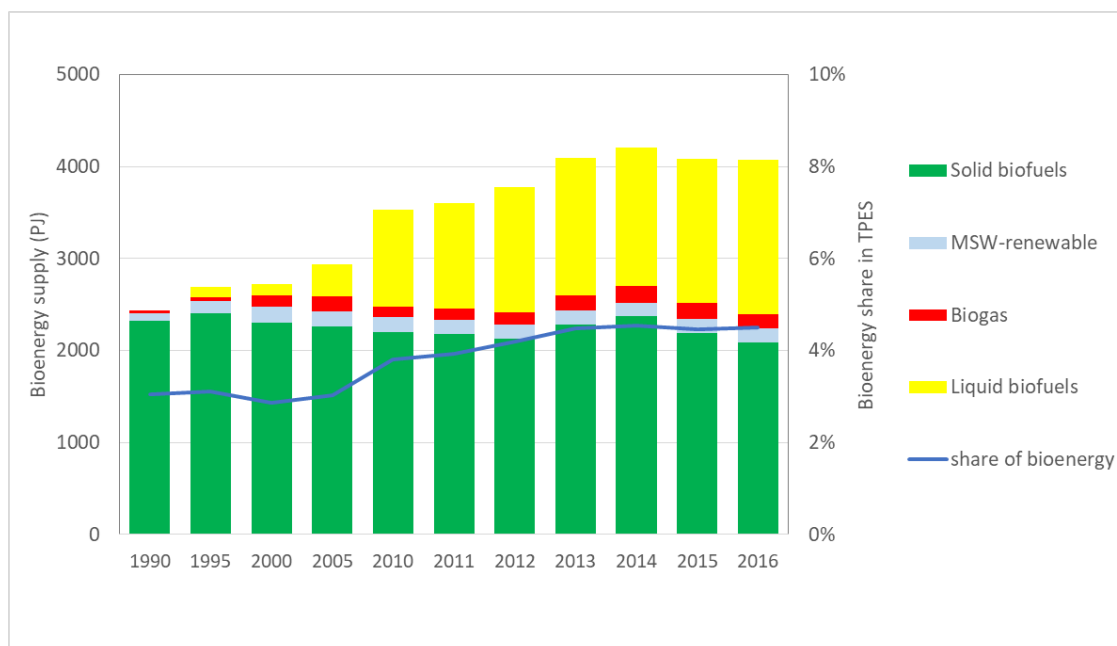


Figure 4: Development of total primary energy supply from bioenergy in the US 1990 – 2016 (Source: World Energy Balances © OECD/IEA 2018)

Table 2 expresses the 2016 TPES figures per capita, considering the US population of 323.4 million people.

Compared to the other 22 member countries of IEA Bioenergy (expressed per capita), the United States ranks highest for liquid biofuels (per capita even higher than Brazil), and halfway for solid biofuels, biogas and renewable MSW. Mind that total TPES per capita is the second highest of all IEA Bioenergy members (after Canada).

Table 2: Total primary energy supply per capita in 2016

	GJ/capita
Total energy	280.5
Bioenergy	12.6
Solid biofuels	6.5
Renewable MSW	0.5
Biogas	0.5
Liquid biofuels	5.2

Source: World Energy Balances © OECD/IEA 2018

Role of bioenergy in different sectors

The US has a modest share of renewable electricity of around 15% in 2016; 80% of those are divided between hydropower and wind energy, 10% is electricity from biomass.

The share of biofuels for transport was around 5.6% in 2016.

Overall, the direct share of biomass for heating in the different sectors is around 10%. Heat output generated and sold by CHP plants and heat plants represents only 1.5% of fuel/heat provided, of which around 8% is produced from biomass. In the residential sector biomass represents about 7% of fuel/heat consumption.

Table 3: Role of bioenergy and renewable energy in electricity production, transport energy consumption and fuel/heat consumption in 2016

Sector	Share of bioenergy	Share of renewable energy	Overall production/ consumption
Electricity production	1.6%	14.8% (6.3% hydro) (5.3% wind)	4,300 TWh (15,479 PJ)
Transport energy (final consumption)	5.6%	5.6%	25,851 PJ
Overall fuel and heat consumption⁸	Direct biomass: 9.6% Biobased heat: 0.1%	10.3%	18,016 PJ

Source: World Energy Balances © OECD/IEA 2018

⁸ This includes final consumption of fuels and heat in industry, the residential sector, commercial and public services and agriculture/forestry. Transport fuels are excluded. Energy used for transformation and for own use of energy producing industries is also excluded.

RESEARCH FOCUS RELATED TO BIOENERGY

The Federal Activities Report on the Bioeconomy provides an overview of the wide-ranging, federally funded activities that are currently helping to bolster the bioeconomy through the production and use of biofuels, bioproducts, and biopower, including research.

http://www.biomassboard.gov/pdfs/farb_2_18_16.pdf

RECENT MAJOR BIOENERGY DEVELOPMENTS

In July 2011, the Secretaries of Agriculture, Energy, and Navy signed a Memorandum of Understanding to commit \$510 million (\$170 million from each agency) to produce hydrocarbon jet and diesel biofuels available for purchase by the Navy under a program called the Defense Production Act (DPA). Two DPA projects have successfully completed their engineering and design work, reached financial close, and have broken ground or getting ready to (Fulcrum (Nevada) 05/16/2018; Red Rock Biofuels (Oregon) 07/18/2018). Both will now construct and operate new biorefineries that potentially could produce greater than 12 million gallons each of drop-in biofuels per year. The production pathways being used by these companies include municipal solid waste gasification to renewable jet and diesel and waste woody biomass gasification to renewable jet and diesel.

LINKS TO SOURCES OF INFORMATION

The following websites provide useful information and data on US bioenergy policy, production and consumption:

US Energy Information Administration: Total Energy: <https://www.eia.gov/totalenergy/>

US Energy Information Administration: Renewable & Alternative Fuels: <http://www.eia.gov/renewable/>

2014 IEA review of the US energy policies: <http://www.iea.org/Textbase/npsum/US2014SUM.pdf>

IEA – United States Energy System Overview: <https://www.iea.org/media/countries/UnitedStates.pdf>



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