The Biofuels Landscape in Louisiana

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Executive Summary

Renewable sources of energy accounted for ~4% of total electricity generation in Louisiana in 2023, and biomass resources (wood and wood waste) accounted for nearly three-fifths of renewable electricity generation (EIA, 2023c). Biomass is a source of renewable energy which can be combusted directly or converted into biofuels, and biomass-based energy is currently witnessing increased interest. Recent announcements of biofuel capital expenditure investments in Louisiana currently amount to approximately $20 billion. This white paper begins with an introduction to biomass and biofuels, biomass composition and its availability, followed by an inventory of currently produced and potential future biofuels in Louisiana.

Key takeaways from this analysis are:

- According to the US Department of Energy's Billion Ton 23 report, **Louisiana has the potential to produce 7 and 17 million bone dry tons (BDT) of biomass each year** in the near-term and mature-market medium term, respectively.
- **Biofuels produced in Louisiana currently account for 4.2% of all primary energy produced in the state**. The state currently produces three main biofuels: renewable diesel, densified biomass fuel, and renewable natural gas; **Louisiana leads the nation in the production of renewable diesel**.
- Proposed future biofuels production includes additional renewable diesel capacity, sustainable aviation fuel (SAF), methanol, and renewable gasoline, among others. If all proposed future projects were deployed, **the share of Louisiana's primary energy derived from biofuels has the potential to increase to 9.2%**.
- While biomass and biofuels may not replace conventional and renewable sources of energy, they find niche applications in the aviation, maritime, and heavy-duty transportation sectors.
- Under the near-term and mature-market medium term scenarios, **SAF production in Louisiana can meet 1 and 3% of the US Department of Energy's SAF Grand Challenge target** (35 billion gallons produced by 2050 in the US), respectively. **This will require 0.6 and 1.4 million acres each year dedicated to biofuel production under the above scenarios, respectively** (assuming switchgrass cultivation at optimistic yields).
- Ultimately, deployment of first and second-generation biofuels may be limited by land use requirements. **To put this in context, meeting Louisiana's annual petroleum refinery inputs using biocrude will require 593 million BDT of biomass, which equates to an area which is approximately 1.5 times the total area of the state**. On the other hand, meeting the volume of jet fuel produced in the state's refineries will require 83 million BDT of biomass, which is 0.2 times the total land area. This reinforces the opportunity for blending biofuels into the harder-to-decarbonize aviation, maritime, and heavy-duty transportation applications.

The article concludes with an assessment of some primary concerns associated with the deployment of biofuels and a preliminary Strength, Weaknesses, Opportunities, and Threats (SWOT) analysis of the deployment of biomass-based energy in Louisiana.

Introduction

As the world looks to balance providing reliable and affordable energy while simultaneously reducing greenhouse gas (GHG) emissions and averting some of the greatest threats posted by anthropogenic climate change, biomass resources have the potential to play an increased role. The recommendations of the Intergovernmental Panel on Climate Change (IPCC), Paris Climate Agreement (PCA) as part of the United Nations Framework Convention on Climate Change (UNFCCC) was notable in allowing the majority of the world's nations to set goals on combating climate change, including: (1) *Prevent the increase in temperature to well below 2 °C above pre-industrial levels*, and (2) *Limit the increase to 1.5 °C by the end of the twenty-first century* (UNFCCC, 2015). The state of Louisiana has one of the most aggressive plans to reduce carbon emissions and attain net-zero emissions by 2050 and is the only state in the Deep South with this agenda. This plan calls for GHG reductions of 26-28% by 2025, 40-50% by 2030 and 100% by 2050 (CITF, 2022).

Arguments for Biomass-based Energy

Biomass was the dominant source of energy in much of the industrialized world until the mid-1800s, including in the United States, and comprised of using wood for heating, cooking, and lighting (EIA, 2024d). Following the discovery of fossil fuels and the advent of the Industrial Revolution, fuels such as coal, oil, and more recently, natural gas, have come to dominate the US energy consumption mix. Over the last 40 years, renewable sources of energy (sources that are not finite and can be regenerated) have begun to enter the picture, including wood and other biomass fuels. *Biomass energy is considered renewable, as solar energy from the sun is used to photosynthesize and accumulate organic material which is transformed to generate energy that is applicable to human needs*. Additionally, photosynthesis is a dominant mechanism for removing carbon from the atmosphere to store it in plant biomass, a process that modern sequestration techniques attempt to emulate. As of 2023, renewable energy resources (including solar, wind, geothermal, hydroelectric, and biomass) accounted for 9% of total US primary energy consumption (EIA, 2024d). Of this share, biomass accounts for 60%, amounting to ~5.4% of total US primary energy consumption (EIA, 2024d). Biofuels production capacity in the US has also been on the increase recently (EIA, 2024e). These trends are reflected on a global scale, with bioenergy accounting for ~55% of total renewable energy produced, and 6% of total energy supply; modern bioenergy is thought to have increased ~4% each year between 2010 and 2023, and is trending upward (Moorhouse & Minier, 2024).

National and Global Outlook for Biofuels

As indicated above, biomass and biofuels collectively account for 5.4% and 6% of energy consumption in the United States and globally, respectively. In the US, ethanol produced from corn is the predominant biofuel, followed by renewable diesel and biodiesel (more discussion to follow). These are currently blended for use in transportation applications (e.g., ethanol at E10 or E15, biodiesel at B15 or B20), or used as substitute for petroleum-derived fuels (e.g., renewable diesel). The US is also the world's largest producer of fuel ethanol, followed by Brazil and the EU (RFA, 2024). Fuel ethanol is also the predominant biofuel produced globally at 26,260 million gallons (MMgal) in 2022, followed by biodiesel (13,966 MMgal), and other biofuels (EIA, 2023a).

Multinational efforts focused on decarbonizing transportation sectors such as aviation, maritime, heavy-duty transportation, etc., may be attributed to recent interest in biofuels. For reference, transportation accounted for 27% of total US energy consumption in 2022 (EIA, 2023b), and is therefore seen as a crucial space for the implementation of biofuels. Gasoline is currently the dominant fuel used for transportation, accounting for 52% of transportation fuel energy content, whereas jet fuel and biofuels account for 12% and 6%, respectively (EIA, 2023b). Based on transportation sectors, light duty vehicles (includes light trucks, cars, and motorcycles) account for the greatest energy consumption at 53%, whereas aircraft and boats and ships represent 10% and 5%, respectively, of transportation energy consumption (EIA, 2023b).

In terms of emissions, the transportation sector amounted to 33% of total US GHG emissions in 2019—of these, light duty vehicles accounted for 49%, whereas the aviation and maritime sectors accounted for 11% and 2%, respectively (EERE, 2023). While light-duty vehicles represent the largest share of both energy consumption and emissions, it is thought that electrification may offer the greatest long-term opportunity to reach a 'net-zero economy in 2050 (EERE, 2023). However, the range and power requirements for sectors such as long-haul aviation are considered to be beyond the limit of current and projected electrification technology. As these sectors require drop-in (do not need to be blended with fossil fuels), energy-dense fuels, the aviation and maritime sectors are thought to be better suited for conversion to 'sustainable liquid fuels' or biofuels (EERE, 2023).

According to the International Energy Agency (IEA), demand for biofuels globally is anticipated to increase by 30% between 2023 and 2028, driven primarily by renewable diesel and 'biojet' (sustainable aviation fuel or SAF) (IEA, 2024), and it is important to understand the reasons driving this demand. Transportation fuels represent the greatest share of the demand for biomass-based fuels in future projections. Heavy-duty applications such as trucking, and the aviation and maritime sectors are seen as key for the increase in demand for biofuels, especially as these can be used with existing engines and infrastructure (IEA, 2023). These sectors are seen as hard to electrify due to increasing battery weight with additional energy requirements as travel lengths increase—while heavier batteries can increase range, they have deleterious impacts on efficiency. Until battery technology improves, sectors such as aviation, maritime, and long-haul trucking are considered as candidates for decarbonization using low-carbon liquid transportation fuels, such as biofuels.

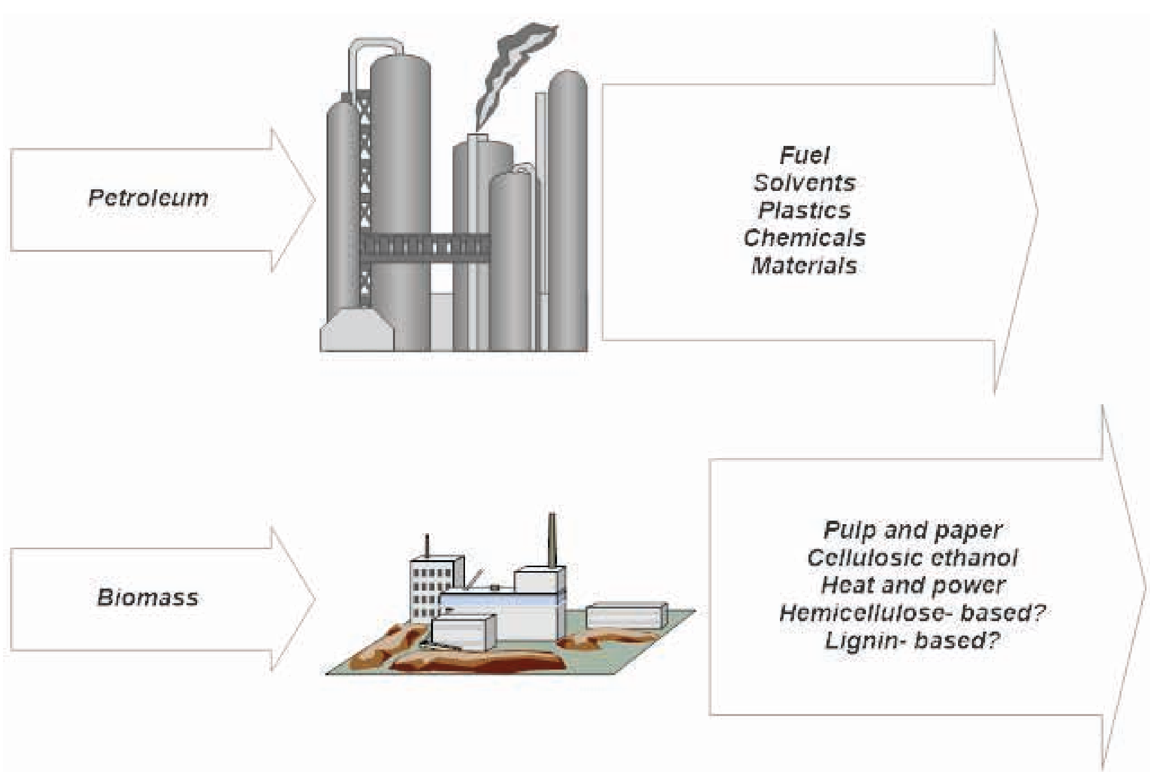
Biomass: Description, Composition, and Availability

Biomass Description

Biomass refers to any carbon-containing material that is or was living at one point and accumulated organic matter. The fuel source for all organic matter on earth is ultimately energy from the sun which drives photosynthesis, thereby propagating life in the form of flora, fauna, and microbial lifeforms. Photosynthesis is the process where plant tissues absorb light, carbon dioxide, and water from the environment to produce carbohydrates, energy, and oxygen, which is released back into the atmosphere. The ongoing process of carbon fixation by photosynthetic organisms (both terrestrial and aquatic plants and organisms) is an important sink, and a source of natural carbon sequestration.

Similar to the production of petroleum products from the refining of crude oil, the utilization of biomass for energy, fuels, materials, and other products, relies on biomass refineries (or biorefineries, for short, see Figure 1). In a nutshell, instead of crude oil, biomass is the input feedstock for a biorefinery, and the outputs are a range of bioproducts (similar to the range of fuels and chemicals that are derived from a petroleum refinery). While several challenges exist in this conceptualization, this is nonetheless a useful way of understanding the role of biomass.

Figure 1: Analogy between a petroleum refinery and a biorefinery



Biomass Composition

Lignocellulosic biomass (generally what most references to 'biomass' imply) is broadly comprised of cellulose, hemicelluloses, lignin, extractives (tannins and other polyphenols), and mineral ash. All constituents play vital roles in the growth and development of the plant: cellulose is a structural polymer accounting for the majority of the lignocellulosic plant material (40-45% by dry weight in the secondary cell walls), hemicelluloses aid in structure and promotes cross-linking of cellulose microfibrils, lignin acts as the hydrophobic matrix to hold the cell wall together and repel water (~15-36% of dry weight of biomass), extractives and plant polyphenols are present in small amounts, and primarily have roles in plant defense against microbial pests. Relative amounts of individual biomass constituents vary by biomass type (woody biomass, grasses, crops and crop residues, etc.), species, biomass tissues (parts of the plant), geographical location (which determines the prevailing weather), and growth and harvest conditions (including soil type, use of fertilizers and/or pesticides, etc.) (Vassilev et al., 2010). For the purposes of this white paper, constituent variations will be ordered in terms of biomass type (hardwoods, softwoods, and grasses). General trends of lignocellulosic biomass composition are compiled in Table 1 (de Jong, 2014; Kelkar et al., 2014; Liao et al., 2004; Rehman et al., 2017; Usman Khan & Kiaer Ahring, 2021; Wang et al., 2011; Zhai et al., 2021).

Table 1: Summary of lignocellulosic biomass constituents

Biomass *Type*	**Cellulose *(wt%)***	**Hemicelluloses *(wt%)***	**Lignin *(wt%)***	**Ash *(wt%)***
Softwoods	40 – 48	19 – 25	26 – 31	0.1 – 5.2
Hardwoods	30 – 43	19 – 32	20 – 25	0.3 – 4.6
Grasses	35 – 50	27 – 32	13 – 23	2.7 – 22.1
Livestock Manure	21 – 37	12 – 26	13 – 36	10

Biomass Types and Availability

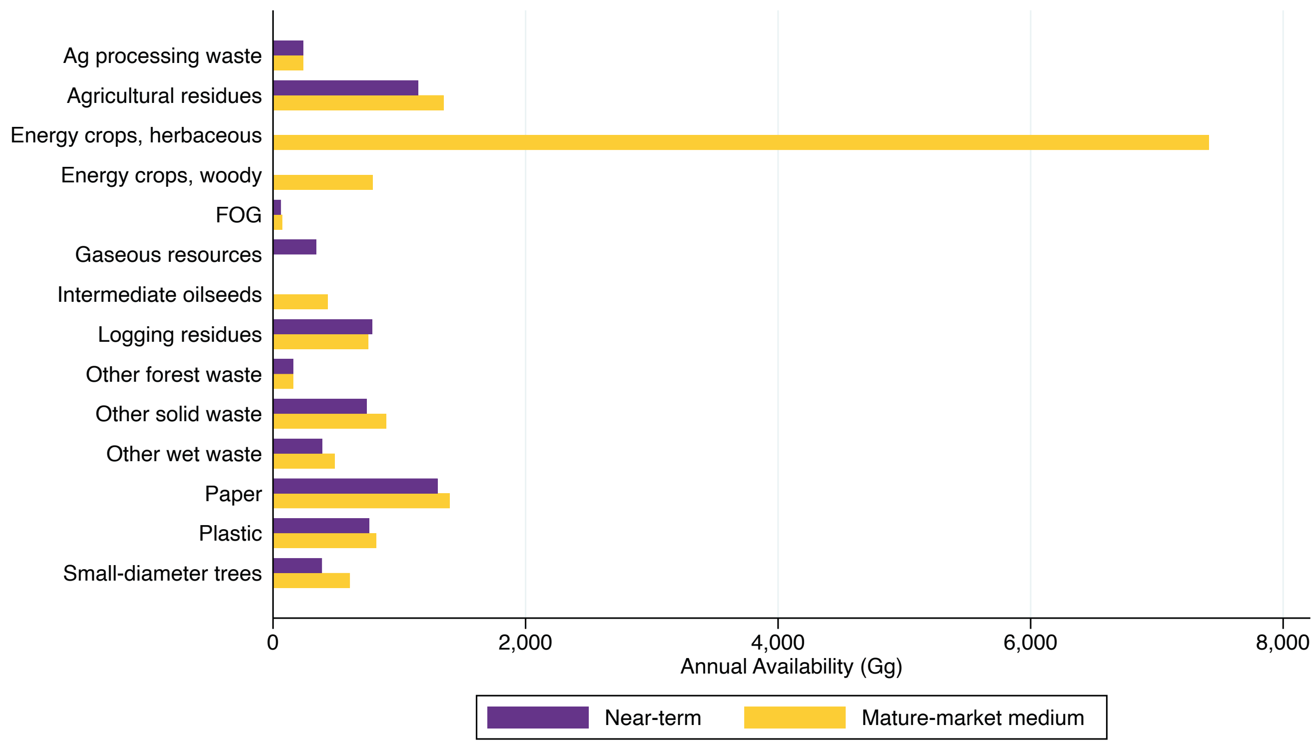
Biomass can also be classified into broader categories based on their production and origin. Some categories based on the origin of biomass include those derived as byproducts from agriculture and forestry operations (referred to sometimes as residues), purpose-grown crops (for biofuel production), and other 'wastes' from municipal sources, etc. While several sources have attempted to categorize the type and estimate the amount of biomass that is annually available for both the United States (Milbrandt, 2005; NREL, 2014) and Louisiana (de Hoop et al., 2006; Kizhakkepurakkal, 2012), this white paper refers to the latest Billion-Ton study update (BT23) as the standardized dataset for information on regiospecific biomass resources. Originally introduced in 2005 by the Oak Ridge National Laboratory as the Billion-Ton Study (BTS) (Perlack et al., 2005), the BT23 represents the latest update in a long line of research on this topic (Langholtz, 2024b); Turhollow et al., 2014). The main subclasses of biomass resources identified in BT23 are:

1. Small-diameter trees — defined as trees less than 11" diameter at breast height (DBH)
2. Other forest waste
3. Logging residues — defined as 'the unused portions of growing-stock and non-growing-stock trees cut or killed by logging and left in the woods'
4. Agricultural processing waste — defined as waste residues from processing of agricultural products in factories, mills, etc. (distinct from harvesting in the field)
5. Intermediate oilseeds — includes plants such as camelina and pennycress
6. Woody energy crops — include woody biomass sources including softwoods, hardwoods, and short-rotation woody crops (SRWC), such as hybrid poplar

7. Agricultural residues — defined as the unharvested portion of crops
8. Herbaceous energy crops — include fast-growing perennial plants, mainly grasses, such as switchgrass, miscanthus, sweet sorghum, etc.
9. Plastic — which is waste plastic
10. Paper — which is waste paper
11. Other wet waste — defined as 'wet wastes (e.g., sludge and manures) other than FOG' (defined below)
12. Gaseous resources, and
13. Fats, oils, and greases (FOG)

The BTS estimates that there are 1 billion dry tons of biomass resources in the United States that may be sustainably collected annually (Milbrandt, 2005; Perlack & Stokes, 2011). The BT23 update (M. H. Langholtz, 2024b) to the original BTS (Perlack et al., 2005) provides more granular detail regarding the availability of biomass feedstocks. BT23 considers several scenarios that consider market maturity levels, which are estimates based on demand pull and market push. An analysis of the BT23 datasets for the near term and mature market-medium scenarios for Louisiana is presented in Figure 2. All 13 subclasses are depicted showing not only currently unutilized feedstock but also projected increases in these categories under the mature market scenario. From Figure 2, the largest new source of biomass availability derives from the 'Energy crops, herbaceous' category, which includes non-woody purpose-grown energy crops such as switchgrass, miscanthus, biomass sorghum, and energy cane. It is important to note that these datasets have not been validated using regiospecific information for Louisiana.

Figure 2: Billion-ton analysis for the near-term and mature-market (medium) scenarios for biomass availability in Louisiana



Source: US Department of Energy, Bioenergy Technologies Office. 2023 Billion-Ton Report; author's calculations.

Policies and Demand

It has been argued that the growth of biofuels and the markets for feedstocks in the United States (and other parts of the world) is inextricably tied to policies which incentivize their adoption (Boutwell & Schubert, 2023). Globally, nations have implemented fuel mandates and incentives to reduce the carbon intensity associated with the transportation sector. The main regulations in the United States that drive increased biofuel consumption are the Renewable Fuel Standard (RFS) administered by the US Environmental Protection Agency (EPA), and the Low Carbon Fuel Standard (LCFS) administered by the California Air Resources Board, which is designed to reduce the carbon intensity associated with the state of California's transportation fuel pool. Finally, the IRS Section 45Z Clean Fuel Production Credit (CFPC) directly incentivizes the production of qualifying transportation fuels, and may be claimed by taxpayers producing and selling these fuels.

The RFS establishes volume requirements for blending biofuels into transportation fuels sold nationwide. The EPA sets these volume requirements based on the renewable identification number (RIN) associated with each type of biofuel, where one RIN is equivalent to one ethanol-equivalent gallon of renewable fuel. The LCFS, similarly, assigns credits which are commensurate with a particular fuel's GHG reduction potential.

The Section 45Z production tax credit applies to fuel production which meets lifecycle emissions that are lower than 50 kg CO_2 or CO_2e per 1 MMBtu produced. Fuel categories that qualify for CFPC tax credits include those that may be used in highway vehicles or aircraft, and the maximum credit values range between $1 per gallon and $1.75 per gallon, respectively (Buffie, 2025). The CFPC is also intended as replacement following the phasing out of the Biomass-Based Diesel Blenders Tax Credit (BTC) which was in use for blending biodiesel or renewable diesel with petroleum diesel. At the time of writing, Section 45Z CFPC remains in place, although with some major changes. These include the removal of the higher credit associated with SAF production and extension of the credits for two additional years, while stipulating domestic feedstock sourcing for eligibility.

For Louisiana, the implications of these policies are reflected in the point-of-use of fuels produced in the state: all of the renewable diesel produced in the state is traded into these markets and sold primarily to markets in California and western US. It is important to note that current state policies do not incentivize the use of these biofuels in Louisiana.

Biofuels in Louisiana: Currently Produced and Future Announcements

Biofuels are classified under three separate categories, or generations, depending on the feedstock that they are produced from (Lee & Lavoie, 2013):

1. First generation biofuels are generally made from feedstocks that can be considered edible, such as corn, sugarcane, soybean, etc.
2. Second generation biofuels are produced primarily from lignocellulosic feedstocks, municipal solid wastes, etc.
3. Third generation biofuels, whose potential can theoretically exceed that of first- and second-generation fuels, are produced primarily from algal biomass, or from the utilization of CO_2.

The predominant biofuel produced in the US is ethanol from the fermentation of corn, and this industry is concentrated primarily in the midwestern US, with the states of Iowa, Nebraska, and Illinois leading in production (EIA, 2024e). Louisiana ranks 7th in total biofuels production in the country, even though the state produces zero corn ethanol for transportation. Louisiana also leads the Petroleum Area Defense District 3 (PADD3) region in terms of production capacity ahead of Texas, which ranks 9th. As detailed below, most of this energy production is from the state's renewable diesel capacity.

Current Biofuel Production Capacity

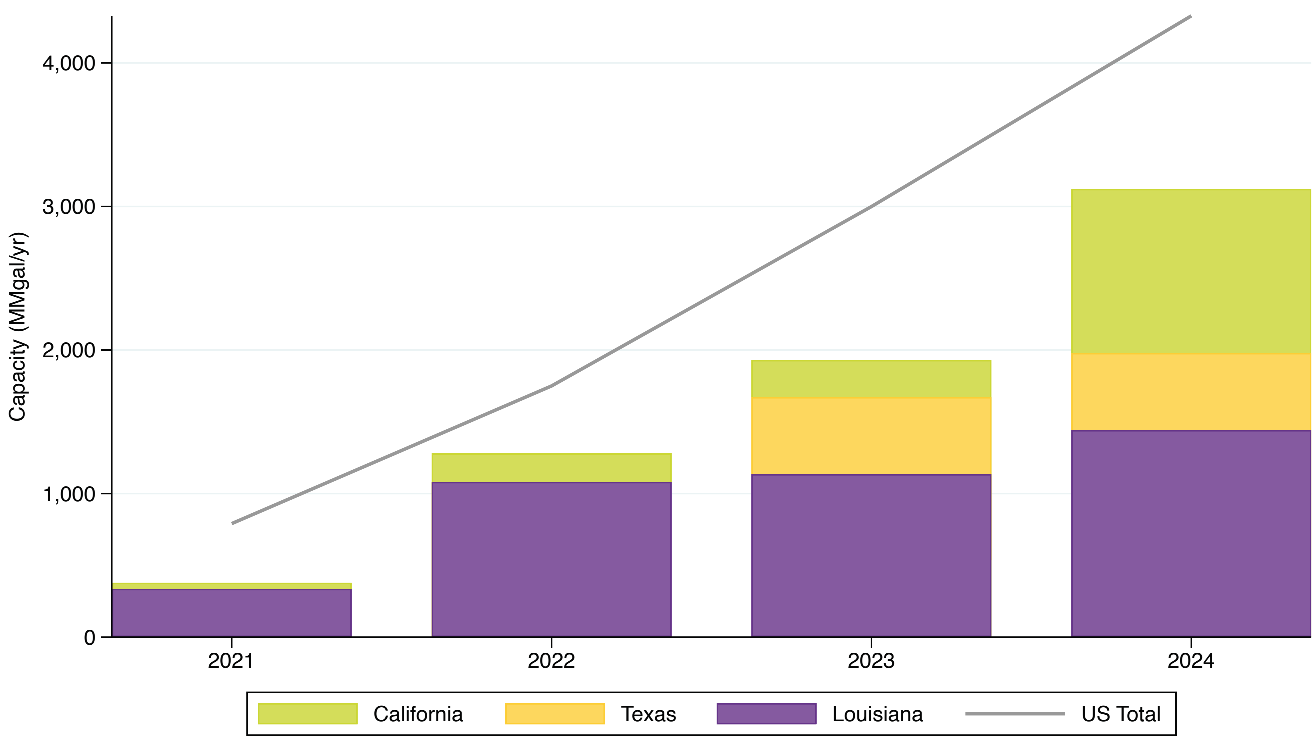
Renewable Diesel

Renewable diesel is a diesel alternative that used to be referred to as 'green diesel' and needs to conform to ASTM D975 specifications for petroleum diesel (EERE, 2022). Renewable diesel is produced using feedstocks rich in fats and lipids (such as seed oils, e.g., soybean and canola, used cooking oil, and waste FOG) and the production involves the process of hydrotreating.

As of 2023, a total of 17 plants in 6 states in the country, including Louisiana, produce 3,000 million gallons per year (MMgal/yr) of renewable diesel (EIA, 2023d). Much of domestic demand is also met through imports from Singapore, the Netherlands, and Finland, which accounted for 392 MMgal/yr in 2021 (EERE, 2022). Louisiana leads nationally with an annual production of 1,136 MMgal/yr, which accounts for ~38% of national production. The three renewable diesel plants in Louisiana are located in St. Charles (two plants: 982 MMgal/yr and 54 MMgal/yr) and Ascension (101 MMgal/yr) parishes.

Renewable diesel production began in 2021 during the COVID-19 lockdowns when travel and fuel consumption decreased, and petroleum refineries had much more idle capacity; substantial capacity has come online in the country in this time. Coupled with increasing demand from California's LCFS, renewable diesel production soared, particularly in Louisiana, Texas, and California (O'Neil, 2024). See Figure 3 for trends in renewable diesel production in Louisiana, Texas, California, and the total for the US. The fuel is consumed primarily on the West Coast, in the states of California, Oregon, and Washington, with California being the dominant consumer (EIA, 2025a).

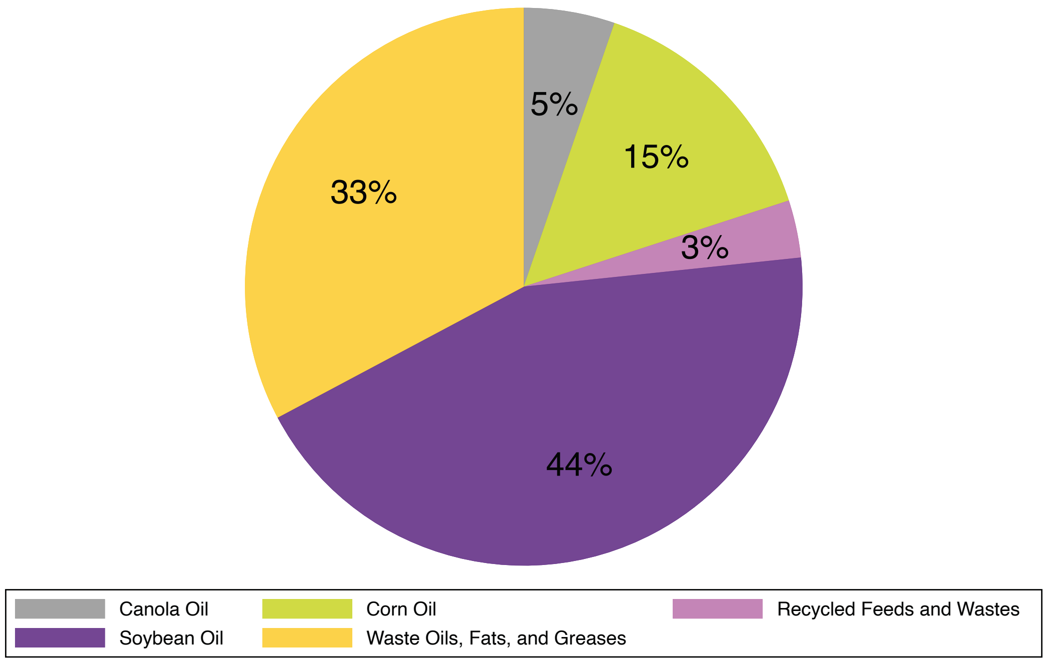
Figure 3: Trends for renewable diesel production capacity in Louisiana, Texas, California, and the total for the US



Source: US Energy Information Administration. U.S. Renewable Diesel Fuel and Other Biofuels Plant Production Capacity.

According to US EIA statistics from 2023, the principal feedstocks for producing renewable diesel (along with biodiesel and SAF) are soybean oil (44%) and waste FOG (33%), corn oil (15%), canola oil (5%), and recycled feeds and wastes (3%) (EIA, 2024a). This information is presented in Figure 4.

Figure 4: Breakdown of feedstocks used in the production of renewable diesel in the United States



Source: US Energy Information Administration. Monthly Biofuels Capacity and Feedstocks Update.

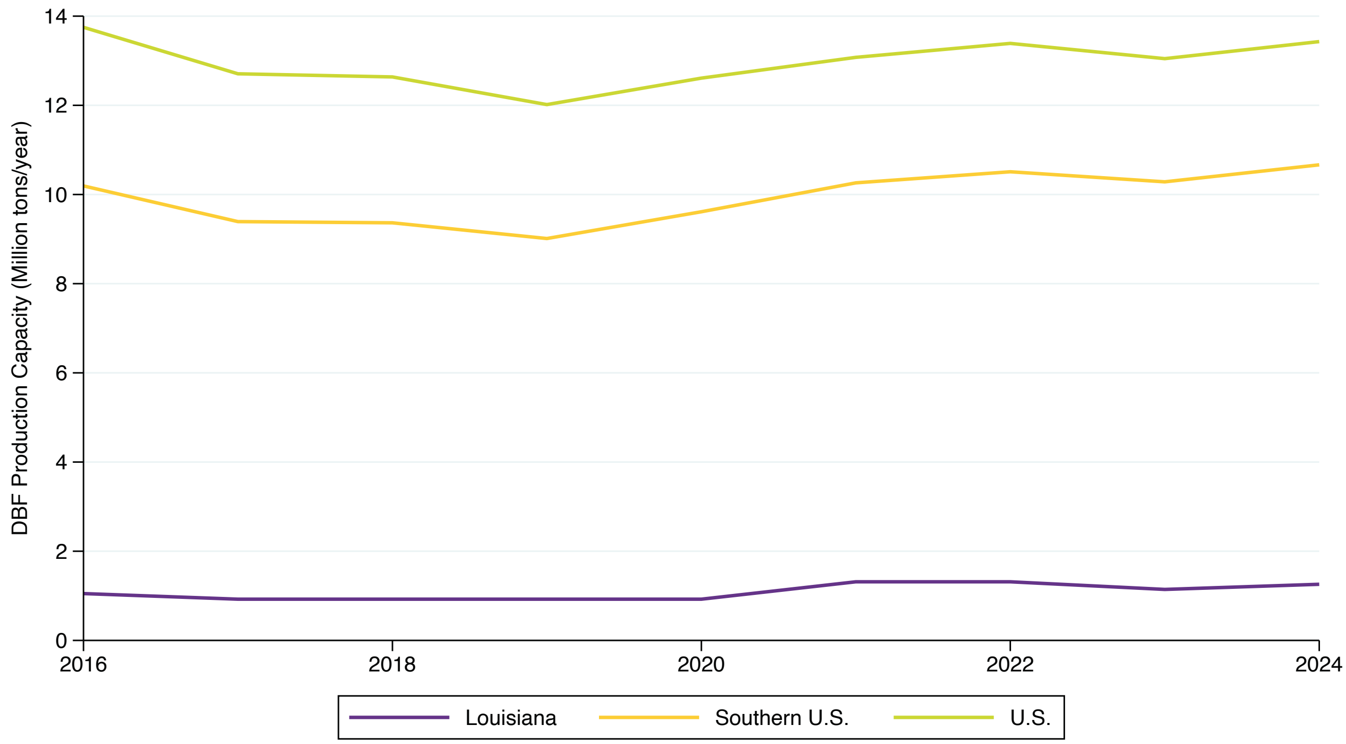
Densified Biomass Fuel

Densified Biomass Fuel (DBF) can refer to any type of solid lignocellulosic feedstock which has been compressed into denser material by additional energy inputs and unit operations to increase its energy density. The additional benefit of densification is the homogenization of forest products (forest slash, construction waste, etc.) as these are irregular in shape and have varying degrees of moisture levels, which hinders efficient transportation. Densification solves these issues by drying, milling, and compressing these feedstocks into consistent shapes, which not only improves transportability, but also increases the energy density of these underutilized materials (WSU, 2012). DBF is colloquially referred to as wood pellets or briquettes, although other biomass such as agricultural residues may also be used for this application. The vast majority of the DBF currently produced and traded globally are wood pellets and briquettes due to their superior calorific value and comparative ease of handling.

There are two main categories of wood pellets: premium/standard grade and utility grade, with the former more commonly referred to as heating pellets and the latter used for power generation. Utility pellets are produced only in the southern US, whereas premium pellets are produced in the eastern and western US. This distribution reflects the end-use of DBF as premium pellets are primarily used for heating applications domestically, whereas utility pellets are exported for power generation. There are two DBF production facilities in Louisiana in Morehouse and La Salle Parishes. In 2024, Louisiana and the US South accounted for 9.5% and ~80% of total US DBF production capacity, respectively (EIA, 2024c). While the DBF industry as a whole employed 2,464 FTE employees in 2024, the US South accounted for 1,665 of these, representing ~68% of the industry.

Figure 5 shows trends for DBF production capacity for Louisiana, the southern US, and the United States between 2016 and 2024, the period for which data is available (EIA, 2024c). While production capacity has fluctuated between 2016 and 2024, overall capacity has remained relatively unchanged over the last 8 years (4.6% increase in the South and 2.3% decrease in the US total), whereas the capacity has increased by 19.8% for Louisiana.

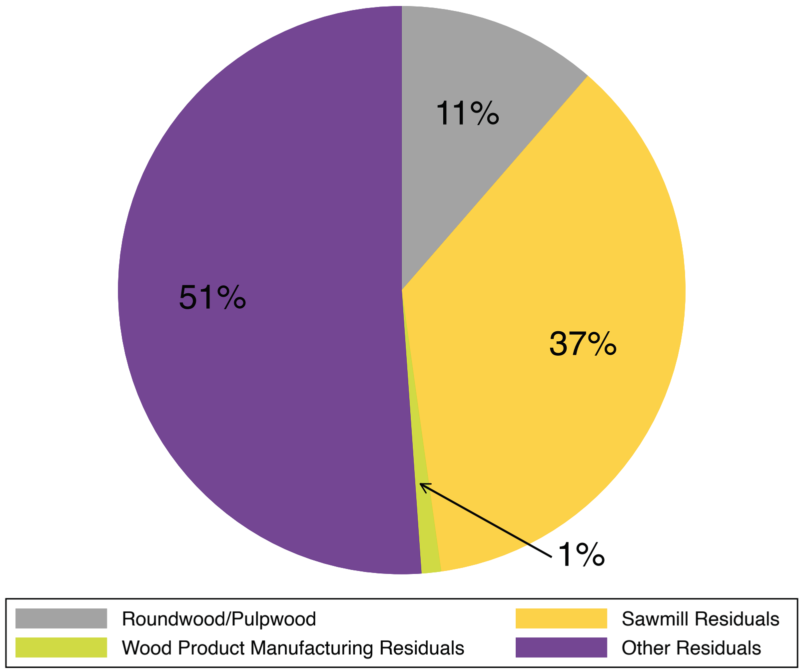
Figure 5: Trends in DBF production capacity between 2016 and 2024 for the state of Louisiana, the southern United States, and the United States total



Source: US Energy Information Administration. Monthly Densified Biomass Fuel Report.

The feedstock for producing DBF includes roundwood and pulpwood, sawmill residues, wood product manufacturing residuals, and other residuals. According to EIA statistics for 2024, 51% of the feedstock for producing DBF in the US originated from ‘other residuals’, which include bark, logging residues, wood chips, post-consumer wood, unmerchantable wood, etc. Sawmill residues accounted for 36% and roundwood/pulpwood, which are ‘logs harvested for industrial use from sustainably managed forests’ accounted for 11%. Finally, ‘wood product manufacturing residuals’ accounted for 1% of DBF feedstock (EIA, 2024c). This information is presented in Figure 6.

Figure 6: Composition of the feedstock used in the manufacture of DBF in the United States (average for 2024 for the United States)



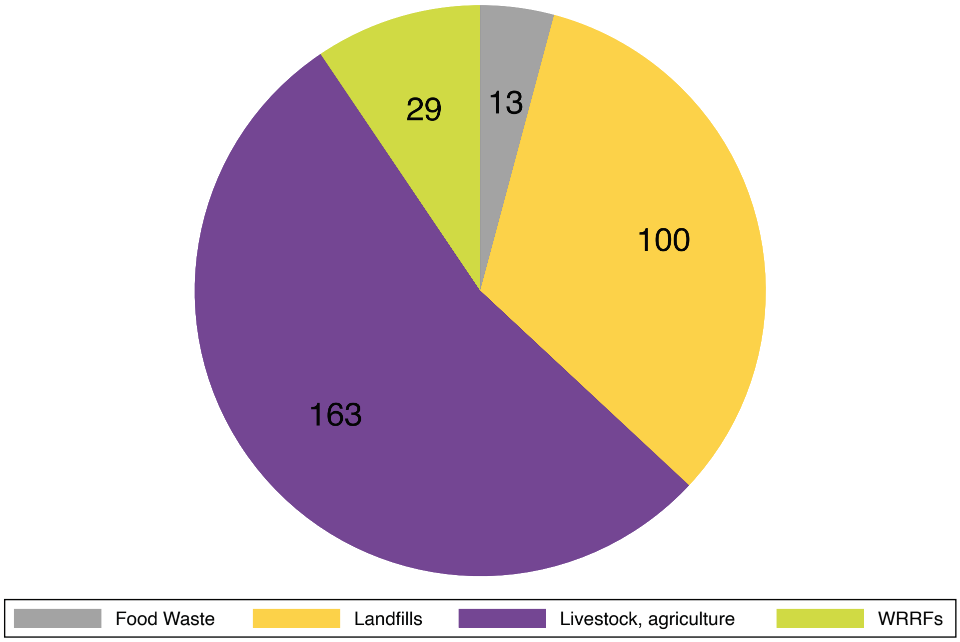
Source: US Energy Information Administration. Monthly Densified Biomass Fuel Report.

Renewable Natural Gas

Renewable natural gas (RNG) is the product of anaerobic degradation of organic biomass matter and originates from two main sources: landfills and anaerobic digesters (typically manure from farming operations). RNG is primarily composed of methane (45-65%), carbon dioxide, and other trace gases. It is upgraded to >90% CH_4 purity by scrubbing CO_2 and other contaminants, following which it can be injected into existing natural gas infrastructure and used for energy. As of 2022, RNG accounted for just 0.2% of total natural gas consumption in the US (Inbal & York, 2023). In Louisiana, the only RNG facilities currently in operation are those that collect gas from landfills and are based in Jefferson Davis and Caddo Parishes. These landfills each contain 11 billion tons of waste in place and generate 1.2 and 1.6 billion standard cubic feet per day (SCFD) of gas, respectively. Together, they are responsible for generating 942 trillion Btu of energy incorporated in upgraded gas, respectively (ANL, 2024).

Due to natural degradation reactions that occur in landfills, methane is produced due to microbial activity. Since this methane can leak into the atmosphere (methane is a more potent GHG than carbon dioxide), there is incentive to capture this gas and use it for energy. Anaerobic digestion can also be accomplished in purpose-built reactors which are fed organic matter such as wastes and residues (e.g., FOG, MSW, animal manure, etc.) to produce methane. Figure 7 shows the distribution of operational RNG projects by the type of feedstock utilized (ANL, 2024). Livestock manure from agricultural operations dominate at 53%, followed by landfill wastes at 33%. Wastewater treatment (WRRF, water resource recovery facilities) and food wastes account for the remainder of feedstock for RNG production in the US.

Figure 7: Distribution of operational RNG projects by feedstock type in the United States

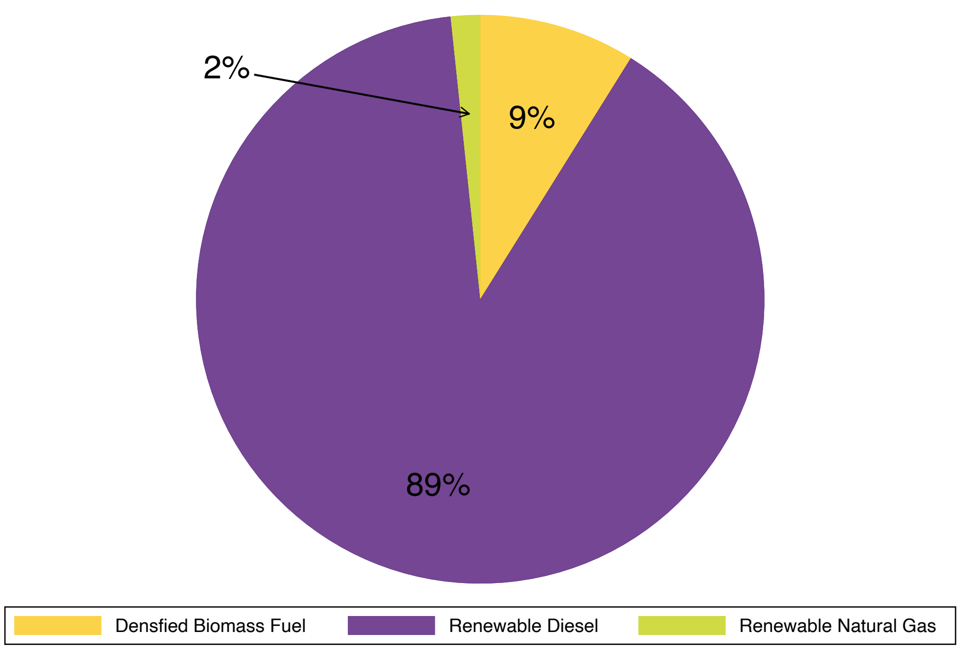


Source: Argonne National Laboratory. Renewable Natural Gas Database.

Total Current

In sum, total current biofuel production in Louisiana is estimated at 199.6 trillion Btu per year, primarily through the production of renewable diesel (accounting for 89%). DBF (9%) and RNG (2%) account for the remainder of biofuels production capacity. For comparison, total primary energy production in Louisiana in 2022 was 4,786.8 trillion Btu; biofuels thus accounted for ~4.2% of total primary energy produced in Louisiana. This breakdown of energy derived from biofuel-type is summarized in Figure 8 and derives from calculations in A1.

Figure 8: Summary of current biofuels production capacity in Louisiana (by energy content)



Source: US Energy Information Administration. U.S. Renewable Diesel Fuel and Other Biofuels Plant Production Capacity, Monthly Densified Biomass Fuel Report; Argonne National Laboratory. Renewable Natural Gas Database; author's calculations.

Potential Future Biofuel Capacity

Given current biofuel production infrastructure in Louisiana, there is the push to further add new biofuel buildout, primarily as a response to demand created through policies such as net zero and volume mandates. This has led to project announcements in the state for the production of these advanced (second generation) biofuels, which are aggregated and discussed below. The data used to construct potential future biofuel capacity derives from public announcements made by the Louisiana Economic Development (LED) (LED, 2020a, 2020b, 2021a, 2021b, 2022, 2023a, 2023b, 2023c, 2024) and includes both new projects as well as announced retrofits. It is important to note that the analysis reflects neither any changes that may have been made since the original announcement by LED, nor does it make any predictions about their viability or deployment. Additionally, not all announcements have the biofuels breakdown listed, so the primary fuel listed was assumed to account for the total volume of a facility producing multiple biomass-based fuels.

Sustainable Aviation Fuel (SAF)

As discussed earlier, recent federal policies and incentives were designed to target SAF production and buildout. One such initiative, referred to as the SAF Grand Challenge, is a governmentwide effort including the US Departments of Energy, Transportation, Agriculture, and Defense, the National Aeronautics and Space Administration (NASA), and the EPA. This initiative targets the production of 3 billion gallons of SAF annually by 2030 and ultimately ramping up to meet all aviation fuel needs (35 billion gallons annually) by 2050 using SAF (BETO, 2024). SAF is produced from biomass feedstocks and upgraded to resemble jet fuel in properties so that it does not need to be blended into jet fuel A, but can substitute it entirely (i.e., drop-in). That said, current SAF blending limits are between 10 and 50% depending on the feedstock used and the pathway employed (AFDC, 2025). According to the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) framework, SAFs have the potential to achieve a reduction in GHG emissions of up to 94% in comparison to using petroleum-derived baseline jet fuel (Prussi et al., 2021). Feedstock for SAF production include those already under consumption (as first-generation/edible feedstocks) and are high in fat and lipid content.

Methanol

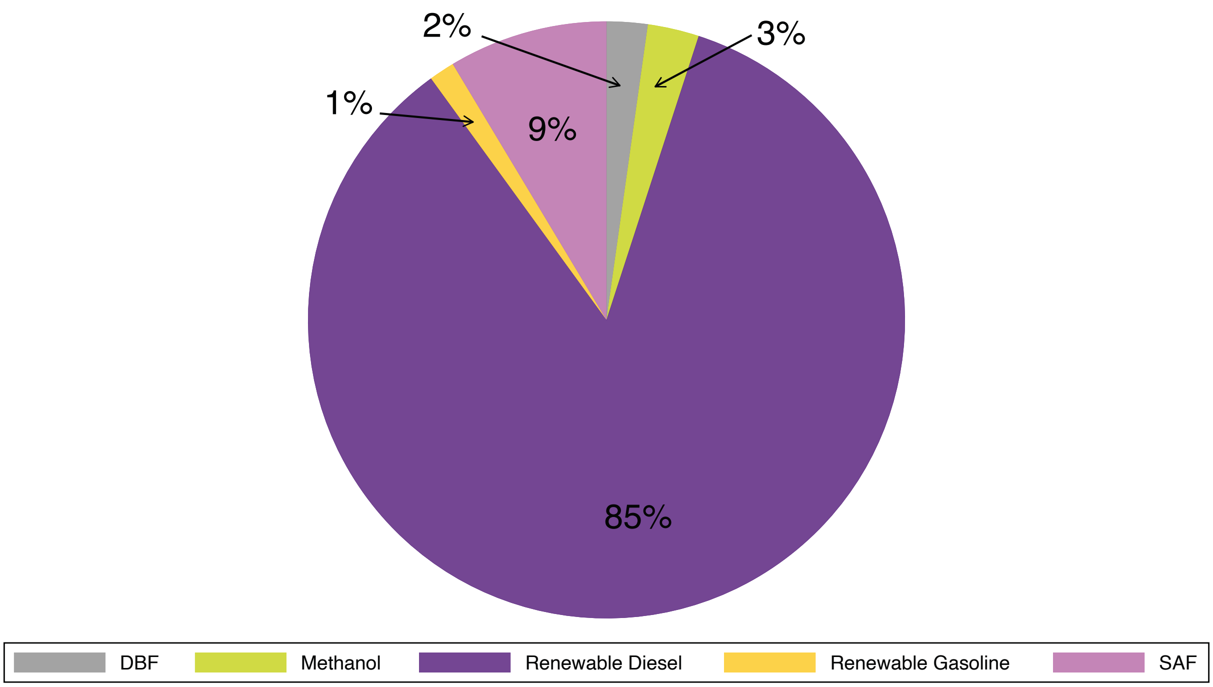
Methanol is considered to be a low-carbon fuel. It is the lightest alcohol (formula, CH_3OH), containing only one carbon atom per molecule, with a mass that is 71% of that of ethanol (containing two carbon atoms per molecule, C_2H_5OH), the more common source of fuel. Recent attention on methanol arises primarily from its potential to be utilized as a fuel for long-distance shipping. Methanol is also considered to be a chemical energy carrier, with the potential to overcome some of the challenges associated with shipping energy in the form of LNG (emissions and boil off losses) and liquefied hydrogen (energy density and boil off losses).

Currently, methanol is produced from the steam reforming of natural gas, which produces a synthesis gas that is further converted into methanol. While this process does not make it a biofuel, it is still an alternative fuel. If methanol is produced using biomass feedstock using pathways such as anaerobic digestion, gasification, or electro-fuel pathways (e-fuels, where CO_2 is removed from the atmosphere and combined with hydrogen generated from electrolysis using renewable electricity), it can be considered a biofuel (IEA, 2020).

Total Potential Future

At the time of this writing, ten additional biofuels projects have been announced in Louisiana as both new construction and expansion projects. These are expected to bring in investments in capital expenses totaling $19.4 billion. The primary fuels produced by these projects are renewable diesel (accounting for 86% of new generation), SAF (9%), methanol (3%), and DBF (2%), measured as the total energy of the biofuel capacity (Figure 9). In sum, new biofuels generation has the potential to add an additional 241.9 trillion Btu of new capacity to existing biofuels production in the state, totaling 441.5 trillion Btu each year. This has the potential to increase the share of energy from biofuels from ~4.2% to ~9.2% of total primary energy produced in the state (compared to 2022 generation). These calculations derive from equations in A 1.

Figure 9: Summary of potential future biofuels production capacity in Louisiana (by energy content)



Source: Louisiana Economic Development (LED); author's calculations.

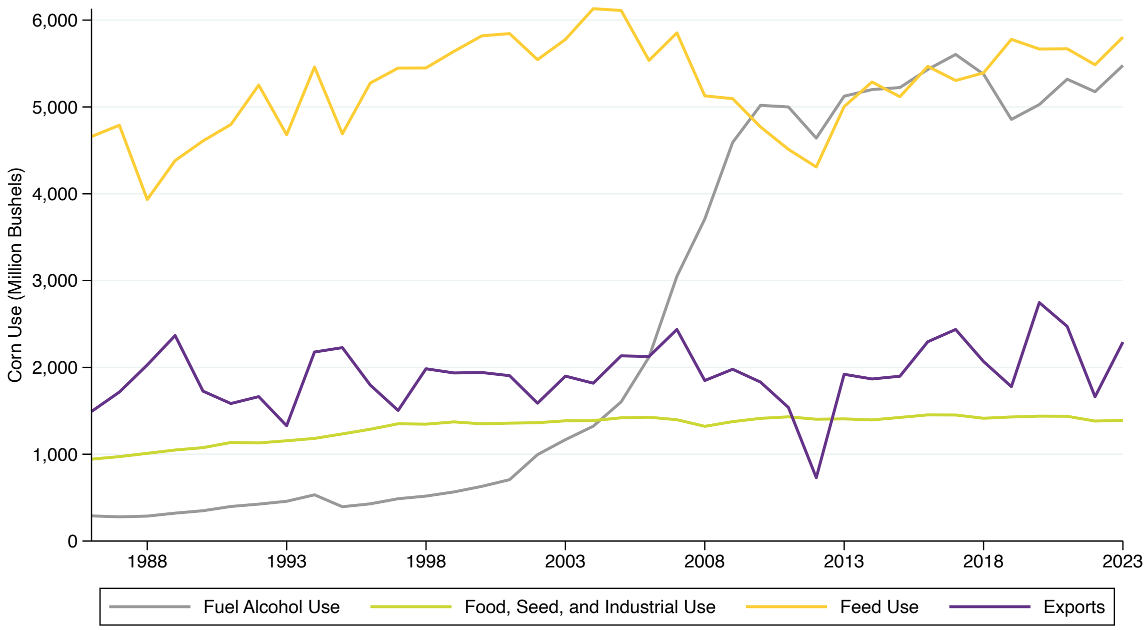
Concerns

The large-scale deployment of biofuels from biomass sources does not come without additional considerations that are important for sustainable biomass utilization and growth. While there are benefits in using biomass as a renewable source of energy and carbon removal from the atmosphere, careful attention needs to be given to the negative consequences associated with utilizing biomass. Some of these concerns are highlighted in this section.

Food vs Fuel

One of the most important considerations for expanding the role of biomass in producing biofuels is the impact on food and food prices. In particular, the use of first-generation feedstocks which are food sources, such as corn, soybeans, canola, etc., for producing biofuels may be seen as questionable. In the US, corn grain is the predominant feedstock for biofuel (ethanol) production. According to the USDA Economic Research Service (ERS), ~36.6% of US corn supply was devoted to producing fuel alcohol, with the remainder used for food, feed, and exports (ERS, 2025b). From Figure 10, the current major uses of US corn supply are for animal feed and fuel ethanol production; smaller shares are from consumption for food, seed, and industrial use, as well as exports. It can be seen the use of corn for fuel alcohol has been on a steady rise while the share used for other applications is relatively constant. When per cent uses of corn for these applications is cited as evidence for a 'feed vs. fuel' argument, it belies the trends underneath that corn utilization for fuel applications seems to arise independently of any other sectors. While the amount of corn used for fuel ethanol has grown from 290 to 5,478 million bushels (an increase of 1,788.9%), the amount used for feed has only grown from 4,659 to 5,804 million bushels (an increase of 24.6%) between 1986 and 2023. In the same period, corn use for food, seed, and industrial consumption grew from 943 to 1,391 million bushels, signifying a 47.5% increase. It is also important to note that none of these use cases have seen a drop in the quantity of corn (in million bushels), so it can be argued that new corn cultivation was dedicated directly to biofuels production as opposed to reducing the share of corn consumption from other, existing uses (also noted by the ERS) (ERS, 2025a).

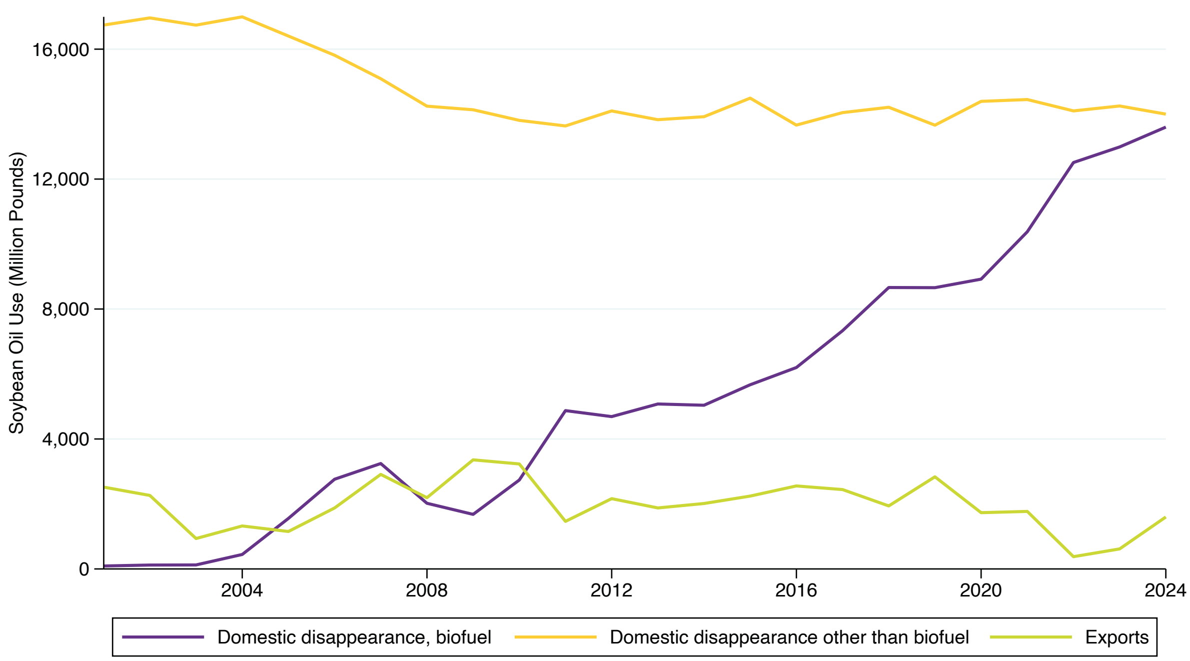
Figure 10: Trends in the use cases of corn in the United States



Source: US Department of Agriculture, Economic Research Service. Feed Grains Database; author's calculations.

Similar to the use of corn as a biofuel feedstock, the use of soybean oil (among other sources of fats and lipids) has also seen a drastic increase for biofuels production. In 2024, nearly 47% of soybean oil (13,600 million pounds) was used to produce biomass-based diesel fuel, up from less than 0.5% (92 million pounds) in 2001, representing a 14,682% increase during this time (ERS, 2025c). While this may indicate that the growth in biofuels production siphons off uses of soybean oil from other applications, trends of soybean oil uses in Figure 11 indicate that while uses of soybean oil for non-biofuels applications have indeed decreased since 2001 (year of data availability), these have been relatively flat over the last two decades despite the growth in the use of soybean oil for biofuels.

Figure 11: Trends in the use cases of soybean oil in the United States

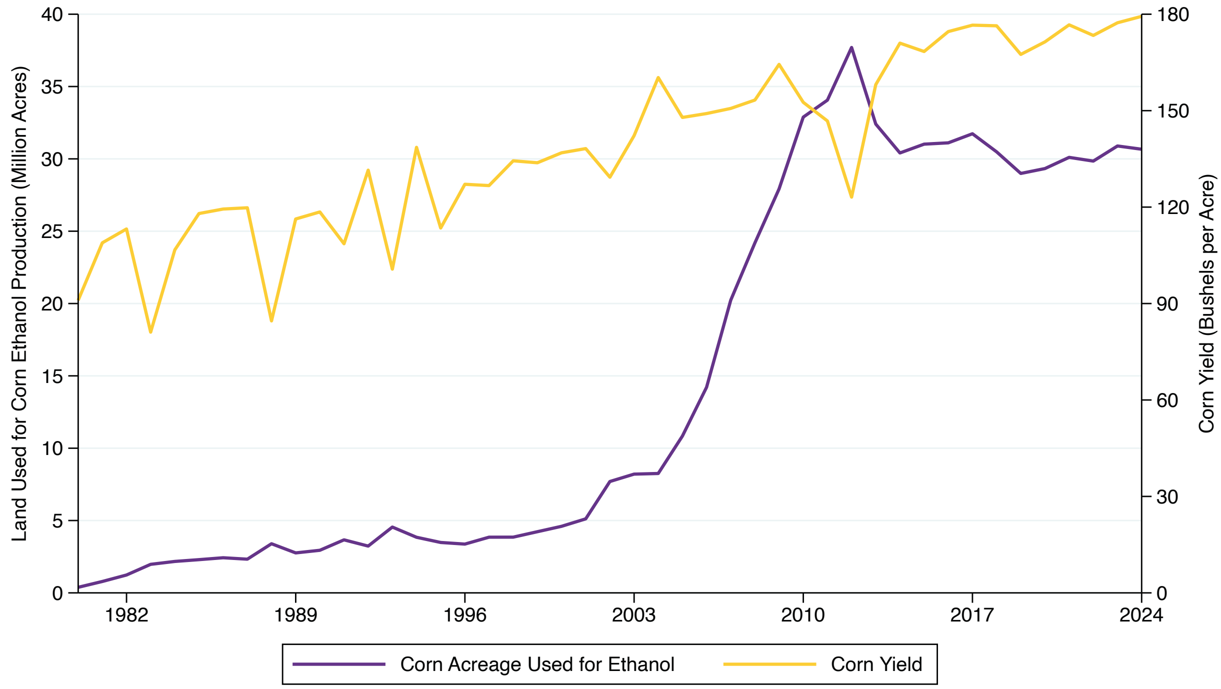


Source: US Department of Agriculture. Economic Research Service. Oil Crops Yearbook; author's calculations.

Land Use

Land use is an extension of the food vs. fuel argument as devoting land area for producing biofuels can impact available acreage for producing food. Production of biofuels, in most cases, requires the use of arable land for cultivation of biomass feedstock. Following from the utilization of corn for producing fuel ethanol, land use for producing biofuels can be estimated using the amount of corn used for ethanol and the average annual corn yields (bushels per acre); see A 6 for calculation. This is shown in Figure 12 and it is evident that there has been a steep increase in the amount of acreage devoted to producing ethanol from corn grain between 1980 and 2024 (years of data availability from the USDA ERS) (ERS, 2025b). After 2012, there is a drop followed by plateauing of the acreage and the current area under cultivation for ethanol production is ~30.7 million acres. The recent trend in the flatlining of the area under cultivation is likely due improvements in corn yields over time (also depicted). Total area under corn cultivation in the US for all uses is relatively unchanged between 1926 (99.7 million acres) and 2024 (90.6 million acres) driven by increasing yields.

Figure 12: Estimated land used (in millions of acres) for the production of fuel ethanol derived from corn in the United States (calculated from corn production for fuel alcohol (bushels) and corn grain yield (bushels per acre)



Source: US Department of Agriculture. Economic Research Service. Feed Grains Database; author's calculations.

Based on estimates from the BT23 analysis for Louisiana in the near and mature-market medium terms, the state can produce 7 and 17 million dry tons of biomass each year, respectively (Figure 2, introduced earlier). For these market scenarios, it would be possible to produce 380 million gallons and 933 million gallons of biofuels (SAF) annually, respectively. This corresponds with 1 and 3% of the SAF Grand Challenge quota which can be produced in the state if this biomass is used entirely to produce biofuels (calculations derived from A 2). This would require between 0.58 and 1.41 million acres of land for the near-term and mature market-medium terms, respectively, assuming that the biomass is all switchgrass at an optimistic yield of 12 dry tons per acre (McDonald et al., 2011). This land area requirement is contextualized in terms of the state's harvested cropland (3.3 million acres) (NASS, 2025), forested area (15 million acres) (USFS, 2022), wetland area (3 million acres) (USGS, n.d.), and total area (33.5 million acres) (USCB, 2010) (Table 2, see A 3 for calculations).

For context, were all of Louisiana's farmland acreage (7.9 million acres) (NASS, 2025) devoted to the production of biofuels, the state would be able to account for 15.1% of the SAF Grand Challenge targets for 2050 (35 billion gallons per year) by producing ~5.3 billion gallons of biofuels per year (assuming that the biofuel is produced from switchgrass at an optimistic harvested yield of 12 dry tons per acre (McDonald et al., 2011), and a conversion ratio of 55 gal/dry ton (M. Langholtz, 2024a). This equates to ~13.2% of the primary energy (4,787 trillion Btu in 2022) (EIA, 2025e) produced in Louisiana (see A 4 for calculations).

Table 2: Estimates of the amount of Louisiana farmland required for the production of the amount of SAF from biomass availability information from the BT23 dataset for the near-term and mature-market medium scenarios

	Near-term	Mature-market Medium
Biomass Production (millions dry tons/year)	~7	~17
Biofuel Production (million gallons/year)	~382	~933
% of SAF Grand Challenge	~1	~3
Land Area Needed (million acres/year)	~0.6	~1.4
% of Louisiana Harvested Cropland	17%	42
% of Louisiana Forested Land	4	9
% of Louisiana Wetland Area	19	47
% of Louisiana Total Area	2	4

Source: US Department of Agriculture. National Agricultural Statistics Service and Forest Service; US Geological Survey. Coastal & Marine Geological Program; author's calculations.

Another approach to contextualizing land use requirements for biofuels is to ask whether biomass can supply existing Louisiana refinery capacity with the requisite amount of feedstock. The 5-yr average atmospheric crude oil distillation capacity of Louisiana refineries was ~3.1 million barrels per calendar day (EIA, 2024b). Producing sufficient biomass to supply refineries will require the cultivation of 77,146 square miles of land area specifically for biomass (147% the total area of the state of Louisiana, using the optimistic biocrude yield of 79.6 gal//ton or 3.27 kg wood/L (van Dyk et al., 2019). In terms of refined products, catering to the production of finished motor gasoline (EIA, 2025c), finished aviation gasoline (EIA, 2025b), and kerosene-type jet fuel (EIA, 2025d) in Louisiana refineries will require 26%, 0.2%, and 21% of the total area of Louisiana, respectively (assuming a yield of 55 gal/ton biomass (M. Langholtz, 2024a). This high-level calculation (Table 3, see A 5 for calculations) lends further credence to the argument that biomass use for biofuel production is better suited to niche applications in harder-to-decarbonize sectors such as aviation, owing primarily to vast land use requirements.

Table 3: Estimated land area requirements for biomass to supply Louisiana refinery input and match refinery outputs

Refinery Product	Capacity *(MMbbl)*	Biomass Amount *(Million Tons)*	Land Area *(Square Miles)*	LA Area *(%)*
Crude Oil Atmospheric Distillation Capacity	1.123	592.5	77,148	147.3
Finished Motor Gasoline	135.9	103.8	13,515	25.8
Finished Aviation Gasoline	1.3	1	129.1	0.2
Kerosene-type Jet Fuel	108.4	82.8	10,779.50	20.6

Source: US Energy Information Administration. Petroleum & Other Liquids; author's calculations.

Growing feedstocks such as algae are more attractive from a land use perspective as the yields can be much greater. While it is possible that greater adoption of second and third generation fuels can potentially alleviate some of these concerns, these technologies are not currently considered to be market ready. Utilizing biomass residues for biofuels is a potential opportunity to mitigate increased pressures on the land for producing energy while avoiding carbon emissions to the environment from the deterioration of biomass. Opportunities for biomass wastes or residues, invasives, and farming on marginal lands can be perceived to be more attractive, and the risks of competition to food crops are lowered in these scenarios. However, this comes at an increased cost of production (minimum fuel selling price, MFSP) when switching from woody biomass feedstocks to agricultural residues in many technoeconomic models. The current literature is still coming in with regard to sustainability of new, second-and third-generation biofuels, but there are reasons to believe that these are very likely more sustainable than their first-generation counterparts. Regiospecific case studies are needed to identify potential low-carbon intensity feedstocks and assess technoeconomic and life cycle emissions associated with biofuel adoption. That said, BT23 estimates for future biomass production scenarios are largely based on the use of dedicated herbaceous energy crops, which will require substantial amounts of land for growing this feedstock (as shown above).

Environmental Concerns

Biofuels are considered to be carbon neutral because the emissions released during combustion are assumed to be taken up during the growth of the biomass feedstocks. However, this framing does not consider the variety of agricultural and forestry inputs (cultivation and fertilization, harvesting and transportation, etc.) that are typically fossil fuel-derived. Considering that the adoption of biofuels is founded on the premise of lowering GHG emissions in comparison to conventional fossil fuels, it is essential that their life cycle emissions are lower, as well as the immediate impacts of their production on the environment. There are additional concerns that expanded use of biofuels, particularly via clearing forests to plant energy crops, may lead to a reduction in terrestrial carbon stocks. Studies have found that biofuel-related emissions have not been offset by additional carbon uptake on cropland during the period of biofuels expansion in the US (DeCicco et al., 2016). A 'carbon debt' is associated with the use of biofuels which results in increased net cumulative emissions over a period of approximately two decades (driven primarily by land use changes), following which, models indicate that these tend to decline from reduced emissions through a reduction in the use of fossil fuels (Wise et al., 2014). Locating and siting projects near communities invariably has environmental implications for the local population. Future buildout of biofuels and biomass for energy needs to ensure that adverse impacts locally are avoided from the production of these fuels. To summarize, environmental and ecological impacts of biofuels deployment need to be studied on a regiospecific basis with localized inputs taken into consideration.

SWOT Analysis

Integrations between agriculture and conventional energy (fossil fuel-based oil and gas) offer the potential to enhance the ongoing energy transition in Louisiana, in addition to the incorporation of renewables such as solar photovoltaics and wind energy. Generally, waste biomass streams offer the greatest prospect for expansion of the bioenergy and biofuels industries and avert some of the ecological criticisms of bioenergy. Being a historically energy-producing state with strong roots in agriculture and forestry, Louisiana is uniquely positioned to deliver on its potential for renewable biomass energy and allow for greater coordination between conventional fossil energy producers and biomass generators. To better understand the biofuels landscape in Louisiana, a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis is presented in Table 4.

Table 4: SWOT analysis of the biofuels landscape in Louisiana

	Internal	
External	**Strengths** Mature agricultural and forestry industries with abundant feedstock that can be sustainably sourced (residues). Existing energy generation and transportation network due to the presence of the oil and gas industry. The agricultural and forestry industries are strongly supported by active industry boards and have historically secured advantageous outcomes for Louisiana industries, ensuring their long-term sustainability.	**Weaknesses** Absence of integrated communication between conventional (fossil fuel) energy industry and emerging (biomass-based) energy industries. Drivers for expansion of the DBF sector appear to be primarily external, namely policies in the EU and the UK. Louisiana industries may be susceptible to policy changes in these countries which can disincentivize production and expansion, absent robust domestic support.
	Opportunities Collaboration between conventional and emerging energy sectors. Ability to transform existing agricultural and forestry industries to expand the range of products and better utilize waste streams. Coastal and rural energy resilience can be addressed by leveraging local agricultural and forestry industries. Decarbonization of heavy industry in Louisiana can spur the growth of bio-based energy and carbon sequestration sectors.	**Threats** The nascent biomass industry is reliant on incentives and subsidies—loss of these could hamper growth and deter sustainability. The emerging industry needs to be attuned to environmental considerations when planning, siting, and expanding operations. One of the risks identified for the expansion of fuels such as renewable diesel is the availability of feedstock such as fats, oils, and greases, as feedstock prices have risen with increasing price of renewable diesel.

Conclusions

Louisiana is a major producer of biofuels, ranking 7th in the United States. Although Louisiana does not produce any ethanol, which is the dominant biofuel produced in the country, the state has the largest production capacity of renewable diesel, accounting for 38% of US production capacity. Louisiana also accounts for ~9% of DBF production capacity in the United States with a capacity increase of ~20% over the last 8 years. A minor amount of biofuel production comes in the form of landfill-based RNG production which is used on-site. Much of potential future biofuel production in the state is expected to come from SAF, if announced projects move towards completion. Current demand for biofuels is predominantly a product of policy which incentivizes increased utilization. While 'food vs. fuel' narratives dominate the popular discourse around biofuels, the data does not appear to support this argument (as investigated for corn and soybean oil use for biofuels in the United States). However, land use is likely to be a major consideration for increased deployment of biofuels sourced from biomass produced in the state. Environmental concerns pertaining to the widespread implementation of biofuels need to be seriously considered to ensure the sustainability of these fuels in the long run.

Appendices

Biofuel Capacity

A1: Total Energy Content

Annual capacity calculations for biofuels are calculated as the product of capacity, C_{year} (volume per year) and the lower heating value (LHV), as shown in Equation 1:

$$E_{fuel} = C_{year} \times LHV$$ Equation 1

The biofuels produced in Louisiana may be categorized as liquid, solid, and gaseous fuels. The annual capacity of energy production from liquid and solid biofuels production may be calculated using Equation 2 and Equation 3, respectively, whereas the energy produced from gaseous fuels (RNG) is provided in terms of energy per year (and therefore, is not necessary to calculate; however, this calculation is provided in Equation 4).

Liquid Fuels

$$E_{LF} = C_{LF}\left(\frac{million\ gallons}{yr}\right) \times LHV_{LF}\left(\frac{Btu}{gal}\right) = (C_{LF}LHV_{LF})\frac{MMBtu}{yr}$$ Equation 2

Solid Fuels

$$E_{SF} = C_{SF}\left(\frac{tons}{yr}\right) \times LHV_{SF}\left(\frac{Btu}{lb}\right) \times \left(\frac{2{,}000lb}{tons}\right) \times \left(\frac{1\ MMBtu}{10^6\ Btu}\right) = \left(\frac{2{,}000 \times C_{SF}LHV_{SF}}{10^6}\right)\frac{MMBtu}{yr}$$ Equation 3

Gaseous Fuels

$$E_{GF} = C_{GF} \times LHV_{GF}$$ Equation 4

LHV for biofuels analyzed in the white paper:

Biofuel	LHV	Sources
Renewable Diesel	123,710 Btu/gal	AFDC (AFDC, 2024)
DBF	7,715.06 Btu/lb	EIA (EIA, 2024c)
SAF	119,810.4 Btu/gal	DOE (DOE, 2024)
Renewable Gasoline	112,114 Btu/gal	AFDC (AFDC, 2024)
RNG	Provided as MMBtu/yr	ANL (ANL, 2024)

Total annual energy capacity (for current and potential future) is calculated as the sum of liquid, solid, and gaseous fuels, using Equation 5:

$$E_{total} = E_{LF} + E_{SF} + E_{GF}$$ Equation 5

Billion Ton Calculations

State-specific data for Louisiana from the BT23 dataset was downloaded from the BT23 portal and selected for Louisiana for the near-term and mature market-medium scenarios using code written in R. These datasets were processed in MS Excel.

A2: Fraction of SAF Grand Challenge

SAF Grand Challenge 2050 Target: 35 billion gallons per year

Total annual biomass availability in either of the near-term or mature market-medium scenarios is denoted by B_{ann} (in billion dry tons per year, or BDT/yr). SAF yield per ton of biomass is assumed to be 55 gal/ton (Langholtz, 2024a). The potential amount of biofuel that can be produced from biomass available in Louisiana over either term, V_{ann}, is given by Equation 6:

$$V_{ann} = B_{ann}\left(\frac{10^6 tons}{yr}\right) \times 55 \left(\frac{gal}{ton}\right)$$ Equation 6

The fraction of SAF Grand Challenge that can be met by B_{ann} in Louisiana is given by $F_{SAF,LA}$ (Equation 7):

$$F_{SAF,LA} = \frac{V_{ann}}{35 \times 10^6\ gal} \times 10$$ Equation 7

A3: Louisiana land area requirements to meet SAF Grand Challenge goals

Due to the diversity of potential biomass sources, it is assumed that all biomass is derived from switchgrass production at optimistic yields. An optimistic yield of switchgrass is assumed to be 12 tons/ac (McDonald et al.).

Louisiana acreage required to produce this volume of SAF (for both near-term and mature market-medium scenarios) is given by A_{LA} (in acres per year) in Equation 8:

$$A_{LA} = \frac{B_{ann}(10^6 \frac{tons}{yr})}{12 \frac{tons}{ac}}$$ Equation 8

Areal requirements for biomass production

Fraction of land area required to fulfill BT23 biomass estimates ($F_{LU,LA}$) to current Louisiana land uses (given as A_{LU}) in Equation 9:

$$F_{LU,LA} = \frac{A_{LA}(\frac{ac}{yr})}{A_{LU}(ac)} \times 100\%$$ Equation 9

Values of A_{LU} for different current land uses are as follows:

Land Use Category	Area (acres)
Harvested Cropland	3,331,625
Forested Area	15,000,000
Wetlands	3,000,000
Rest	12,190,295
Louisiana Total Area	33,521,920

A4: Comparison to Louisiana primary energy production

Total primary energy production in Louisiana was 4,786.8 trillion Btu in 2022. Fraction of primary energy production is determined as $F_{P,LA}$ in Equation 10 using the LHV of SAF as 119,810.4 Btu/gal.

$$F_{P,LA} = V_{ann}\left(\frac{gal}{yr}\right) \times \left(123{,}710\frac{Btu}{gal}\right) = 119{,}810.4 \times V_{ann}\frac{Btu}{yr}$$ Equation 10

A5: Comparison to Refinery Capacity

The areal requirement of biomass grown in Louisiana to meet the input and match the outputs of Louisiana refineries (V_{Ref} in thousand barrels per year) is given by Equation 11:

$$V_{Ref}\left(\frac{10^3 bbl}{day}\right)\times\left(365\,\frac{day}{yr}\right)\times\left(42\,\frac{gal}{bbl}\right)\times\left(\frac{1}{Y\,\frac{gal}{ton}}\right)\times\left(\frac{1}{12\frac{ton}{ac}}\right)$$ Equation 11

Where Y is the yield of biocrude at 79.6 gal/ton (van Dyk et al., 2019) which is used to estimate the biomass requirement to match refinery inputs. Y is the yield of SAF at 55 gal/ton (Langholtz, 2024a) which is used to estimate the boimass required to match refinery outputs.

V_{Ref} values for Louisiana refining are as follows:

Refinery Input/Output	Annual Capacity (thousand barrels)
Crude oil atmospheric distillation capacity	1,123,432.04
Finished motor gasoline	135,924
Finished aviation gasoline	1,298.8
Kerosene-type jet fuel	108,410.6

Biofuels Concerns

A6: Calculation of Corn Acreage for Ethanol Production

The acreage under cultivation for ethanol production from corn grain is calculated as the quotient of the amount of corn used annually for ethanol production (million bushels) and the average annual corn yield (bushels per acre), as shown in Equation 12:

$$Area\left(\frac{acres}{year}\right)=\frac{Amount\,(\frac{bushels}{year})}{Yield\,(\frac{bushels}{acre})}$$ Equation 12

References

AFDC. (2024). *Fuel Properties Comparison*. US Department of Energy.

AFDC. (2025). *Sustainable Aviation Fuel*. US Department of Energy.

ANL. (2024). Renewable Natural Gas Database. In. Lemont, IL: Argonne National Laboratory.

BETO. (2024). *SAF Grand Challenge Roadmap Implementation Framework*. US Department of Energy.

Boutwell, M., & Schubert, A. (2023). Regulations Driving the Biofuels Feedstocks Markets. *Stillwater Associates Insights*.

Buffie, N. (2025). *The Section 45Z Clean Fuel Production Credit*. Congressional Research Service.

CITF. (2022). *Climate Initiatives Task Force*. Office of the Governor.

de Hoop, C. F., Chang, J., Kizhakkepurakkal, A., & Bullock, B. (2006). Biomass Energy Resources in Louisiana. In *Research Information Sheet #102*: LSU AgCenter.

de Jong, W. (2014). Biomass Composition, Properties, and Characterization. In *Biomass as a Sustainable Energy Source for the Future* (pp. 36-68).

DeCicco, J. M., Liu, D. Y., Heo, J., Krishnan, R., Kurthen, A., & Wang, L. (2016). Carbon balance effects of U.S. biofuel production and use. *Climatic Change*, 138(3), 667-680.

DOE. (2024). *Guidelines to Determine Life Cycle Greenhouse Gas Emissions of Sustainable Aviation Fuel Production Pathways using 40BSAF-GREET*. US Department of Energy.

EERE. (2022). *Renewable Diesel*. US Department of Energy.

EERE. (2023). *The US National Blueprint for Transportation Decarbonization: A Joint Strategy to Transform Transportation*. US Department of Energy.

EIA. (2023a). *Biofuels explained*. US Energy Information Administration.

EIA. (2023b). *Energy use for transportation*. US Energy Information Administration.

EIA. (2023c). *Louisiana State Profile and Energy Estimates*. US Energy Information Administration.

EIA. (2023d). *US Renewable Diesel Fuel and Other Biofuels Plant Production Capacity*. US Energy Information Administration.

EIA. (2024a). *Biofuels Explained*. US Energy Information Administration.

EIA. (2024b). *Louisiana Refinery Operable Atmospheric Crude Oil Distillation Capacity as of January 1*. US Energy Information Administration.

EIA. (2024c). *Monthly Densified Biomass Fuel Report*. US Energy Information Administration.

EIA. (2024d). *Renewable energy explained*. US Energy Information Administration.

EIA. (2024e). *U.S. capacity to produce biofuels increased 7% in 2023*. US Energy Information Administration.

EIA. (2025a). *Consumption of renewable diesel continues general growth trend on the U.S. West Coast*. US Energy Information Administration.

EIA. (2025b). *Refinery District Louisiana Gulf Coast Refinery and Blender Net Production of Aviation Gasoline*. US Energy Information Administration.

EIA. (2025c). *Refining District Louisiana Gulf Coast Refinery and Blender Net Production of Conventional Motor Gasoline*. US Energy Information Administration.

EIA. (2025d). *Refining District Louisiana Gulf Coast Refinery and Blender Net Production of Kerosene-Type Jet Fuel* . US Energy Information Administration.

EIA. (2025e). *State Profiles and Energy Estimates*. US Energy Information Administration.

ERS. (2025a). *Corn and Other Feed Grains - Feed Grains Sector at a Glance*. US Department of Agriculture Economic Research Service.

ERS. (2025b). *Feed Grains Database*. US Department of Agriculture Economic Research Service.

ERS. (2025c). *Soybean U.S. stocks: On-farm, off-farm, and total by quarter, U.S. soybean acreage planted, harvested, yield, Soybean and soybean meal production, value, price and supply and disappearance, prices 1999/00-2024/25*. US Department of Agriculture Economic Research Service.

IEA. (2020). *Case Story: Green methanol from biogas in Denmark*. International Energy Agency.

IEA. (2023). Tracking Clean Energy Progress 2023. In *Biofuels*. Paris: International Energy Agency.

IEA. (2024). Renewables 2023. In. Paris: International Energy Agency.

Inbal, J., & York, S. (2023). *New Renewable Fuel Standard volume targets facilitate renewable natural gas production*. US Energy Information Administration.

Kelkar, S., Li, Z., Bovee, J., Thelen, K. D., Kriegel, R. M., & Saffron, C. M. (2014). Pyrolysis of North-American grass species: Effect of feedstock composition and taxonomy on pyrolysis products. *Biomass and Bioenergy*, 64, 152-161.

Kizhakkepurakkal, A. R. (2012). *Biomass energy production in Louisiana: a GIS study on the supply chain*. Louisiana State University and Agricultural & Mechanical College.

Langholtz, M. (2024a). Chapter 1: Background and Introduction. In *2023 Billion-Ton Report*. Oak Ridge National Laboratory.

Langholtz, M. H. (2024b). *2023 Billion-Ton Report*. Oak Ridge National Laboratory.

LED. (2020a). Grön Fuels. Louisiana Economic Development.

LED. (2020b). REG Announces Major Renewable Diesel Expansion In Louisiana. Louisiana Economic Development.

LED. (2021a). Chalmette Refining Announces Potential $550 Million Renewable Diesel Project. Louisiana Economic Development.

LED. (2021b). *Louisiana Green Fuels Plans $700 Million Renewable Diesel Refinery in Caldwell Parish*. Louisiana Economic Development.

LED. (2022). Clean Energy Start-Up Reveals Plan for $800 Million Renewable Fuels Facility in Port Allen. Louisiana Economic Development.

LED. (2023a). Delta Biofuel Announces $100 Million Final Investment Decision for Renewable Fuel Facility in Jeanerette. Louisiana Economic Development.

LED. (2023b). DG Fuels Proposes $3.1 Billion Sustainable Aviation Fuel Complex in St. James Parish. Louisiana Economic Development.

LED. (2023c). *SunGas Renewables Chooses Rapides Parish for Proposed $1.8 Billion Clean Fuel Facility*. Louisiana Economic Development.

LED. (2024). Proposed $1.35 Billion Investment in Southeast Louisiana Would Establish Large-Scale Renewable Natural Gas Plant and Green Hydrogen Facility. Louisiana Economic Development.

Lee, R. A., & Lavoie, J.-M. (2013). From first- to third-generation biofuels: Challenges of producing a commodity from a biomass of increasing complexity. *Animal Frontiers*, 3(2), 6-11.

Liao, W., Liu, Y., Liu, C., & Chen, S. (2004). Optimizing dilute acid hydrolysis of hemicellulose in a nitrogen-rich cellulosic material––dairy manure. *Bioresource Technology*, 94(1), 33-41.

McDonald, C., Boby, L., & Hubbard, B. (2011) *Switchgrass as a Feedstock for Bioenergy in the Southeast*. Southern Partnership for Integrated Biomass Supply Systems.

Milbrandt, A. (2005). *Geographic perspective on the current biomass resource availability in the United States*. National Renewable Energy Laboratory

Moorhouse, J., & Minier, Q. (2024). Bioenergy. In. Paris, France: International Energy Agency.

NASS. (2025). *Census of Agriculture: Land Area, Land in Farms, and Cropland - Louisiana by Parish: 2022*. US Department of Agriculture

NREL. (2014). *Biomass Resource Data, Tools, and Maps*. National Renewable Energy Laboratory.

O'Neil, T. (2024). *U.S. Renewable Diesel Production Growth Drastically Impacts Global Feedstock Trade* (International Agricultural Trade Report). US Department of Agriculture Foreign Agricultural Service

Perlack, R., & Stokes, BJ. (2011). *U.S. Billion-Ton Update: Biomass Supply for a Bioenergy and Bioproducts Industry*. Oak Ridge, TN: Oak Ridge National Laboratory

Perlack, R., Wright, L., Turhollow, A., Graham, R., Stokes, B., & Erbach, D. (2005). *A bioenergy and bioproducts industry: The techincal feasibility of a billion-ton annual supply*. Oak Ridge, TN: Oak Ridge National Laboratory

Prussi, M., Lee, U., Wang, M., Malina, R., Valin, H., Taheripour, F.,...Hileman, J. I. (2021). CORSIA: The first internationally adopted approach to calculate life-cycle GHG emissions for aviation fuels. *Renewable and Sustainable Energy Reviews*, 150, 111398.

Rehman, K. u., Cai, M., Xiao, X., Zheng, L., Wang, H., Soomro, A. A.,...Zhang, J. (2017). Cellulose decomposition and larval biomass production from the co-digestion of dairy manure and chicken manure by mini-livestock (Hermetia illucens L.). *Journal of Environmental Management*, 196, 458-465.

RFA. (2024). *Annual Ethanol Production*. Renewable Fuels Association

Turhollow, A., Perlack, R., Eaton, L., Langholtz, M., Brandt, C., Downing, M.,...Lebow, P. (2014). The updated billion-ton resource assessment. *Biomass and Bioenergy,* 70, 149-164.

UNFCCC (2015). *The Paris Agreement*. United Nations Climate Change.

USCB. (2010). *State Area Measurements and Internal Point Coordinates*. US Census Bureau.

USFS. (2022). *Louisiana Forest Health Highlights 2022*. US Department of Agriculture Forest Service

USGS.(n.d.) *Louisiana Coastal Wetlands: A Resource At Risk*. US Geological Survey

Usman Khan, M., & Kiaer Ahring, B. (2021). Improving the biogas yield of manure: Effect of pretreatment on anaerobic digestion of the recalcitrant fraction of manure. *Bioresource Technology*, 321, 124427.

van Dyk, S., Su, J., Ebadian, M., O'Connor, D., Lakeman, M., & Saddler, J. (2019). Potential yields and emission reductions of biojet fuels produced via hydrotreatment of biocrudes produced through direct thermochemical liquefaction. *Biotechnology for Biofuels*, 12(1), 281.

Vassilev, S. V., Baxter, D., Andersen, L. K., & Vassileva, C. G. (2010). An overview of the chemical composition of biomass. *Fuel*, 89(5), 913-933.

Wang, L., Shahbazi, A., & Hanna, M. A. (2011). Characterization of corn stover, distiller grains and cattle manure for thermochemical conversion. *Biomass and Bioenergy*, 35(1), 171-178.

Wise, M., Dooley, J., Luckow, P., Calvin, K., & Kyle, P. (2014). Agriculture, land use, energy and carbon emission impacts of global biofuel mandates to mid-century. *Applied Energy*, 114, 763-773.

WSU. (2012). *Developing a Wood Pellet/Densified Biomass Industry in Washington State: Opportunities and Challenges*. Washington State University Extension Energy Program.

Zhai, J., Burke, I. T., Mayes, W. M., & Stewart, D. I. (2021). New insights into biomass combustion ash categorisation: A phylogenetic analysis. *Fuel*, 287, 119469.

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