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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, DC 20549

FORM 10-K

(Mark One)

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
For the fiscal year ended December 31, 2019
or

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
FOR THE TRANSITION PERIOD FROM _____ TO _____
Commission file number: 001-35073

Gevo, Inc.

(Exact name of registrant as specified in its charter)

Delaware	**87-0747704**
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)
345 Inverness Drive South, Building C, Suite 310, Englewood, CO (Address of Principal Executive Offices)	**80112** (Zip Code)

(303) 858-8358
(Registrant's telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Act:

Title of Each Class	**Trading Symbol**	**Name of Each Exchange on Which Registered**
Common Stock, par value $0.01 per share	**GEVO**	**Nasdaq Capital Market**

Securities registered pursuant to Section 12(g) of the Act:
None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☐ No ☒

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes ☐ No ☒

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act. (Check one):

Large accelerated filer	☐	Accelerated filer	☐
Non-accelerated filer	☐	Smaller reporting company	☒
		Emerging growth company	☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes ☐ No ☒

The aggregate market value of common equity held by non-affiliates of the registrant was approximately $20.5 million as of June 28, 2019, the last trading day of the registrant's most recently completed second fiscal quarter, based on the closing price of the common stock as reported on the Nasdaq Capital Market on June 28, 2019. Shares of common stock held by each officer, director and holder of 10% or more of the outstanding common stock have been excluded in that such persons may be deemed to be affiliates. This determination of affiliate status is not necessarily a conclusive determination for other purposes.

As of February 29, 2020, the number of outstanding shares of the registrant's common stock, par value $0.01 per share, was 14,619,603.

DOCUMENTS INCORPORATED BY REFERENCE

Part III of this Annual Report on Form 10-K incorporates certain information by reference from the registrant's proxy statement for the 2020 annual meeting of stockholders to be filed no later than 120 days after the end of the registrant's fiscal year ended December 31, 2019.

GEVO, INC.
FORM 10-K—ANNUAL REPORT
For the Fiscal Year Ended December 31, 2019
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Forward-Looking Statements

This report contains forward-looking statements within the meaning of Section 21 E of the Securities Exchange Act of 1934, as amended (the "Exchange Act"). When used in this Annual Report on Form 10-K (this "Report"), the words "expect," "believe," "anticipate," "estimate," "intend," "plan" and similar expressions are intended to identify forward-looking statements. These statements relate to future events or our future financial or operational performance and involve known and unknown risks, uncertainties and other factors that could cause our actual results, levels of activity, performance or achievement to differ materially from those expressed or implied by these forward-looking statements. These statements reflect our current views with respect to future events and are based on assumptions and subject to risks and uncertainties. These forward-looking statements include, among other things, statements about: risks and uncertainties related to our ability to sell our products, our ability to expand or continue production of isobutanol, renewable hydrocarbon products and ethanol at our Luverne Facility (as defined below), our ability to meet our production, financial and operational guidance, our strategy to pursue low-carbon renewable fuels for sale into California and elsewhere, our ability to replace our fossil-based energy sources with renewable energy sources at the Luverne Facility and elsewhere, our ability and plans to construct a commercial hydrocarbon facility to produce alcohol-to-jet fuel ("ATJ") and renewable isooctane, our ability to raise additional funds to continue operations and/or expand the Luverne Facility, our ability to perform under our existing renewable hydrocarbon offtake agreements and other supply agreements we may enter into in the future, our ability to obtain project finance debt and third-party equity for our RNG (as defined below) project, our ability to produce isobutanol, renewable hydrocarbon products and ethanol on a commercial level and at a profit, achievement of advances in our technology platform, the success of our upgraded production facility, the availability of suitable and cost-competitive feedstocks, our ability to gain market acceptance for our products, the expected cost-competitiveness and relative performance attributes of our isobutanol, renewable hydrocarbon products and ethanol, additional competition and changes in economic conditions and the future price and volatility of petroleum and products derived from petroleum. Important factors could cause actual results to differ materially from those indicated or implied by forward-looking statements such as those contained in documents we have filed with the U.S. Securities and Exchange Commission (the "SEC"), including this Report in Item 7. "Management's Discussion and Analysis of Financial Condition and Results of Operations," Item 1A. "Risk Factors" and subsequent reports on Form 10-Q. All forward-looking statements in this Report are qualified entirely by the cautionary statements included in this Report and such other filings. These risks and uncertainties or other important factors could cause actual results to differ materially from results expressed or implied by forward-looking statements contained in this Report. These forward-looking statements speak only as of the date of this Report. We undertake no intention or obligation to update or revise any forward-looking statements, whether as a result of new information, future events or otherwise, and readers should not rely on the forward-looking statements as representing the Company's views as of any date subsequent to the date of the filing of this Report.

Unless the context requires otherwise, in this Report the terms "Gevo," "we," "us," "our" and "Company" refer to Gevo, Inc. and its wholly owned, direct and indirect subsidiaries.

Reverse Stock Split

On June 1, 2018, we effected a reverse stock split of the outstanding shares of our common stock by a ratio of one-for-twenty (the "Reverse Stock Split"), and our common stock began trading on the Nasdaq Capital Market on a Reverse Stock Split-basis on June 4, 2018.

PART I

Item 1. Business.

Company Overview

We are commercializing the next generation of jet fuel, gasoline and diesel fuel with the potential to achieve zero carbon emissions and address the market need of reducing greenhouse gas (“GHG”) emissions with sustainable alternatives. We use low-carbon renewable resource-based carbohydrates as raw materials (primarily from non-food corn, but also sugar cane, molasses or other cellulosic sugars) and are in an advanced state of developing renewable electricity and renewable natural gas (“RNG”) for use in production processes. As a result, we are able to produce low-carbon fuels with substantially reduced carbon intensity (as measured by the level of GHG emissions compared to standard petroleum fossil-based fuels across their lifecycle). Our products perform as well or better than traditional fossil-based fuels in infrastructure and engines, but with substantially reduced GHG emissions. In addition to addressing the environmental problems of fossil-based carbon fuels, our technology also enables certain plastics, such as polyester, to be made with more sustainable ingredients.

Our ability to penetrate the growing low-carbon fuels market depends on the price of oil and the value of abating carbon emissions that would otherwise increase GHG emissions. We believe that our proven, patented technology that enables the use of a variety of low-carbon sustainable feedstocks to produce price-competitive, low-carbon products, such as ATJ, gasoline components like isooctane and isobutanol and diesel fuel, yields the potential to generate project and corporate returns that justify the build-out of a multi-billion-dollar business.

Our proprietary fermentation yeast biocatalyst effectively produces isobutanol, a four-carbon alcohol, via fermentation of renewable plant biomass. The resulting renewable isobutanol has a variety of direct and adapted applications, including conversion into a wide variety of renewable hydrocarbon products.

Our renewable isobutanol production technology has been proven to work in a 1.5 million gallon per year (“MGPY”) capacity production line (~265,000 gallon fermenter scale) at our production facility in Luverne, Minnesota (the "Luverne Facility"). Our technology to convert our renewable isobutanol to renewable hydrocarbon products like ATJ, isooctane, isooctene and para-xylene (“PX”) has been proven at our hydrocarbons demonstration plant located at a production facility in Silsbee, Texas developed in partnership with South Hampton Resources (the "South Hampton Facility"). We currently have the capacity to produce approximately 100,000 gallons per year of renewable hydrocarbon products at the South Hampton Facility.

Global GHG emissions as a result of the widespread use of fossil fuels are increasing and will continue to increase unless there is a global systemic change in energy consumption. Many industries, including the commercial airline industry, expect to experience strong growth but have also committed to hold GHG emission flat and, in some cases, even committed to take steps to reduce GHG emissions in the future. In addition, governments are taking steps to reduce GHG gas emissions, and consumers are increasingly focusing on GHGs and their effect on the global climate. To address these concerns, we believe that industries must eliminate burning fossil-based carbon in the production of electricity and transportation fuels, and that we must use forestry and agriculture to capture carbon in soil, plants and trees. Because we have shown that our renewable-based products perform as well or better than traditional fossil-based fuels in existing fuels infrastructure, including internal combustion engines as well as transportation and storage infrastructure, we believe we are in a position to address the global GHG emission crisis head-on as a major player in the low-carbon fuel industry.

Existing Supply Commitments and Expansion of Our Production Facilities

In 2019, we entered into supply agreements pursuant to which we agreed to supply an aggregate of approximately 17 MGPY of ATJ, renewable isooctane and other renewable hydrocarbon products. Under certain of these supply agreements, the purchasers agreed to pay for and receive, or cause to be received by a third party, or pay for even if not taken, the renewable hydrocarbon products under contract (a “take-or-pay” arrangement). The timing and volume commitment of certain of these agreements are subject to our ability to complete an expansion to the Luverne Facility such that the expanded facility is capable of producing, refining and delivering, in some instances, up to 12-30 MGPY or more of renewable hydrocarbon products (the “Expanded Facility”). In order to commence construction of and complete the Expanded Facility, we must secure third party financing. We believe we can obtain this financing in part due to the strength of the fuel supply commitments that we have in place.

Specifically, as of the date of this Report, we have entered into the following arrangements, among others:

Delta Air Lines. In December 2019, we entered into a long-term, take-or-pay fuel supply agreement with Delta Air Lines, Inc. (“Delta”) pursuant to which we agreed to sell and deliver 10 MGPY of ATJ to Delta, subject to certain conditions and exceptions. We expect to supply the ATJ to Delta upon completion of the Expanded Facility, which we expect to occur by 2023.

Scandinavian Airlines System. In October 2019, we entered into a long-term, take-or-pay fuel supply agreement with Scandinavian Airlines System (“SAS”) pursuant to which we agreed to sell and deliver ATJ to SAS, subject to certain conditions and exceptions. We expect to supply the ATJ to SAS upon completion of the Expanded Facility, which we expect to occur by 2023.

Air Total. In August 2019, we entered into a take-or-pay renewable ATJ purchase and sale agreement with Air Total International, S.A. (“Air Total”) pursuant to which we agreed to supply ATJ to Air Total under a three-year offtake agreement. Air Total will initially purchase certain minimal quantities of ATJ produced at the South Hampton Facility, and we expect to sell Air Total increasing amounts of ATJ upon the completion of two expansion projects to increase ATJ production capabilities at the Luverne Facility. We expect the expansion projects to be completed in 2021 and 2022, respectively.

HCS Group GmbH. In February 2019, we entered into a take-or-pay renewable isooctane purchase and sale agreement with HCS Holding GmbH (“HCS”), pursuant to which we agreed to supply renewable isooctane to HCS under a ten-year offtake agreement. HCS will initially purchase certain minimum quantities of renewable isooctane produced at the South Hampton Facility. We expect to sell HCS increasing amounts of minimum quantities of renewable isooctane each year upon the completion of two expansion projects to increase renewable isooctane production capabilities at the Luverne Facility. We expect the expansion projects to be completed in 2021 and 2022, respectively.

Low-Carbon Fuels Opportunity

The Luverne Facility currently has the capability to produce low-carbon ethanol side-by-side with low-carbon isobutanol. With certain capital improvements, the Luverne Facility could also produce renewable jet fuel and isooctane and other related products that can be made from isobutanol. We have begun, and may undertake further, capital investments to improve our Luverne Facility, including, but not limited to: (i) improvements at the Luverne Facility to further lower the carbon intensity score of our fuel products; (ii) adding wind power to provide a portion of the electricity needed for biofuel production; (iii) procuring RNG to provide a portion of the natural gas needed for biofuel production; and (iv) installing fractionation technologies to produce value added protein feed products and food grade corn oil, as well as products using the fiber fraction of corn. Concurrently and subject to securing adequate financing, we plan to expand our renewable hydrocarbon production capabilities by constructing a larger production facility at the Luverne Facility for renewable hydrocarbon fuels such as ATJ and isooctane.

Wind Energy Project

In September 2019, Agri-Energy, LLC ("Agri-Energy"), our wholly-owned subsidiary, entered into an Environmental Attributes Purchase and Sale Agreement with an affiliate of Juhl Clean Energy Assets, Inc. (“Juhl”), which provides for Agri-Energy to purchase all environmental attributes, including renewable energy credits, related to the development of a wind electrical energy generating facility near the Luverne Facility. The wind project is comprised of two 2.5 megawatt wind turbines with a maximum output capacity of 5.0 megawatts and is expected to achieve commercial operation in the first half of 2020. Agri-Energy will purchase the electricity generated by the wind project from the City of Luverne, Minnesota, and the electricity will be delivered directly to the Luverne Facility through a direct transmission line from the wind generation units. This is expected to enable the wind electricity to meet California’s requirement to be counted in determining the carbon intensity of the renewable transportation fuels produced at the Luverne Facility under California’s Low Carbon Fuel Standard Program (“LCFS”).

Renewable Natural Gas Projects

In 2019, we began developing RNG projects to supply RNG to the Luverne Facility. As part of these projects, we may sell the RNG into natural gas pipelines to third party purchasers. Manure from cows and pigs can be digested anaerobically to produce low-carbon methane. We expect that securing low-carbon methane for our production energy will assist us in achieving carbon negative GHG emissions on our end products. The end products resulting from such a decarbonization process are rewarded with a lower carbon intensity score, which increases the market value of certain products, in addition to having a more positive impact on the environment. We expect that these projects will be funded by third parties.

Decarbonization and Renewable Hydrocarbon Markets

We believe that we have the technology and production platform to produce renewable fuels that reduce the emission of GHGs into the atmosphere as compared to the burning of fossil-based carbon fuels, and to do so profitably. Low-carbon fuels can best be produced by (i) replacing fossil-based carbon feedstock with renewable carbon, and (ii) replacing some or most of the fossil-based energy sources needed for heat and electricity during the fuel production process with more sustainable energy sources like RNG and wind energy. Renewable carbon comes from growing plants and crops. Growing plants efficiently provides the opportunity to capture carbon in the soil and generate protein, further lowering the carbon intensity of fuels produced from these renewable feedstocks. Eliminating or reducing fossil-based carbon is referred to as “decarbonization.” The products resulting from such a decarbonization process are rewarded with a lower carbon intensity score, which increases the market value of certain products. In addition to the U.S. Renewable Fuel Standard Program (“RFS Program”) and policy that rewards low-carbon fuels, certain markets in North America such as California, Oregon, Washington and Canada and countries such as Japan, China, India and other Asian countries either already have adopted or are adopting statutes and regulations that ascribe economic value to decarbonization. In Europe, the European Commission has adopted the Renewable Energy Directive to promote the use of energy from renewable sources. We believe that decarbonization is an emerging market opportunity, and we have the technologies, products and a base production facility to take advantage of this opportunity.

The State of California is a leader in the push for decarbonization with its LCFS, which is a market-based cap and trade approach to lowering the GHG emissions from petroleum-based transportation fuels. We believe that the LCFS approach to reducing GHGs will be implemented by Canada and other states in the U.S. and eventually could be implemented at the Federal level, which should create more demand for low-carbon fuel products such as ours. Our current production facility is small enough and specialized enough so that, with certain process optimizations, we could reduce our demand for fossil-based energy required in the production process. By doing this, we would increase the value of our low-carbon fuel products because they would carry a lower carbon intensity score, which should translate into increased revenues for us as a result of the credits associated with our renewable fuels under LCFS.

As discussed below, beyond direct use as a chemical and gasoline blendstock, isobutanol can be dehydrated to produce butenes, which can then be converted into other products such as PX, ATJ and many other renewable hydrocarbon fuels and blendstocks, and specialty chemicals offering substantial potential for additional demand. The conversion of isobutanol into butenes is a fundamentally important process that enables isobutanol to be used as a building block chemical in multiple markets.

Jet Fuel

In April 2016, ASTM International completed its process of approving a revision of ASTM D7566 (Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons) to include alcohol to jet synthetic paraffinic kerosene derived from renewable isobutanol. This allows our ATJ to be used as a blending component in standard Jet A-1 fuel for commercial airline use in the U.S. and around the globe.

Isooctane and Other Hydrocarbon Fuels

Isooctane, isooctene, diesel fuel and bunker fuel may also be produced from our isobutanol. We have been producing ATJ and isooctane for renewable gasoline at our South Hampton Facility since 2011. The products produced at our South Hampton Facility are sold on a commercial basis to help develop the markets for these products. We continue to optimize the technologies and production systems, and we believe this technology is ready to scale up on a full commercial basis.

Para-xylene and Polyethylene Terephthalate (“PET”)

Isobutanol can be used to produce PX, polyester and their derivatives, which are used in the beverage, food packaging, textile and fibers markets. PX is a key raw material in PET production.

We have demonstrated the conversion of our isobutanol into renewable PX at our South Hampton Facility. This demonstration plant produced renewable PX from October 2013 through March 2014.

Butenes

Traditionally butenes have been produced as co-products from the process of cracking naphtha in the production of ethylene. Historically, lower natural gas prices and reported reductions in the use of naphtha as the feedstock for the production of ethylene have resulted in a projected reduction in the volume of available butenes**.** This structural shift in feedstocks increases the potential market opportunity for our isobutanol in the production of butenes.

Isobutanol can be sold to isobutylene and n-butene (butenes) chemicals users for conversion into lubricants, methyl methacrylate and rubber applications.

Feed Products Market

Distillers grains are produced as a co-product of isobutanol and ethanol production. Distillers grains are valuable components of feed rations primarily to dairies and beef cattle markets, both nationally and internationally. The Luverne Facility has the capability to produce distillers grains from both isobutanol and ethanol. Producing distillers grains also allows us to lower the carbon footprint of our Luverne Facility, thereby increasing demand in California where premiums are paid for the low-carbon attributes. In addition, we recently installed a new system to manufacture value-added animal feed products. We expect that this system will capable of producing several feed products with a value higher than that of typical distiller grains. We expect this system to be fully operational in 2020.

Isobutanol Direct Use Markets

Without modification, isobutanol has applications in the specialty chemical and gasoline blendstock markets. Since our potential customers in these markets would not be required to develop any additional infrastructure to use our isobutanol, we believe that selling into these markets should result in a relatively low risk profile and produce attractive margins.

Gasoline Blendstocks

Isobutanol has direct applications as a gasoline blendstock. Fuel-grade isobutanol may be used as a high energy content, low Reid Vapor Pressure (“RVP”), gasoline blendstock and oxygenate. Based on isobutanol’s low water solubility, in contrast with ethanol, we believe that isobutanol will be compatible with existing refinery infrastructure, allowing for blending at the refinery rather than blending at the terminal.

Further, based on isobutanol’s high energy content and low water solubility, as well as testing completed by the National Marine Manufacturers Association, the Outdoor Power Equipment Institute and Briggs & Stratton, we believe that isobutanol has direct applications as a blendstock in high value fuels markets serving marine, off-road vehicles, small engine and sports vehicle markets.

Specialty Chemicals

Isobutanol has direct applications as a specialty chemical. High-purity and chemical-grade isobutanol can be used as a solvent and chemical intermediate. We plan to produce high-purity and chemical-grade isobutanol that can be used in the existing butanol markets as a cost-effective, environmentally sensitive alternative to petroleum-based products.

We believe that our production route will be cost-efficient and will allow for significant expansion of the historical isobutanol markets within existing butanol markets through displacing n-butanol, a related compound to isobutanol that is currently sold into butanol markets.

Ethanol Markets

Ethanol is not expected to be a core product for Gevo in the future. As we lower the carbon footprint for the Luverne Facility, we expect that it should be possible to increase the margins on ethanol by selling into California. We expect that we would cease ethanol production once the Expanded Facility is completed. The primary applications for fuel-grade ethanol in the U.S. include:

- *Octane enhancer*. On average, regular unleaded gasoline has an octane rating of 87 and premium unleaded gasoline has an octane rating of 91. In contrast, pure ethanol has an average octane rating of 113. Adding ethanol to gasoline enables refiners to produce greater quantities of lower octane blend stock with an octane rating of less than 87 before blending. In addition, ethanol is commonly added to finished regular grade gasoline as a means of producing higher octane mid-grade and premium gasoline.

- *Fuel blending*. In addition to its performance and environmental benefits, ethanol is used to extend fuel supplies. In light of the need for transportation fuel in the U.S., the U.S. is increasingly seeking domestic sources of fuel. Much of the ethanol blending throughout the U.S. is done for the purpose of extending the volume of fuel sold at the gasoline pump.

- *Renewable fuels*. Ethanol is blended with gasoline to enable gasoline refiners to comply with a variety of governmental programs, in particular, the RFS Program, which was enacted to promote alternatives to fossil fuels.

Compared to gasoline, ethanol is generally considered to be cleaner burning and contains higher octane. We anticipate that the increasing demand for renewable transportation fuels coupled with limited opportunities for gasoline refinery expansions and the growing importance of reducing CO^2 emissions through the use of renewable fuels will generate increased demand for ethanol.

Our Production Facilities

In September 2010, we acquired the Luverne Facility, a 22 MGPY ethanol production facility in Luverne, Minnesota. Since 2010, we have made improvements and modifications to the Luverne Facility to add isobutanol production capabilities. The Luverne Facility is currently configured to produce isobutanol and ethanol, side-by-side.

In addition to our isobutanol production line, our Luverne Facility has production capacity of about 22 MGPY of ethanol, 45-50 kilotons of animal feed per year and three million pounds of corn oil per year.

The technology that we used at the Luverne Facility may be deployed in the future and is designed to permit (i) the modification of an existing ethanol production facility whereby equipment is added to the facility and the existing fermenters are used to produce isobutanol rather than ethanol, or (ii) the modification of an existing ethanol facility to add fermenters and other equipment such that the facility is capable of producing both isobutanol and ethanol simultaneously "side-by-side" (collectively referred to as “Retrofit”).

Having the flexibility to switch between the production of isobutanol and ethanol, or produce both products simultaneously, should allow us to optimize asset utilization and cash flows at a facility by taking advantage of fluctuations in market conditions. Our technology is also designed to allow relatively low capital expenditure modifications of existing ethanol facilities, which should enable a relatively rapid route to isobutanol production from the fermentation of renewable feedstocks. Alternatively, our technology can be deployed at a greenfield or brownfield site to produce isobutanol and renewable hydrocarbons products without producing ethanol.

Alternatively, because of the increased demand of hydrocarbons under contract, it may make more economic sense to cease ethanol production and use the infrastructure of the Luverne Facility to produce larger quantities of hydrocarbons and isobutanol.

Conversion of Isobutanol into Hydrocarbons

We have demonstrated conversion of our isobutanol into a wide variety of renewable hydrocarbon products that are currently used to produce hydrocarbon fuels, plastics, fibers, polyester, rubber and other polymers. Hydrocarbon products consist entirely of hydrogen and carbon and have historically been derived almost exclusively from petroleum, natural gas and coal. Importantly, isobutanol can be dehydrated to produce butenes, which are an intermediate product in the production of hydrocarbon products with many industrial uses. The straightforward conversion of our isobutanol into butenes is a fundamentally important process that enables isobutanol to be used as a building block chemical. Much of the technology necessary to convert isobutanol into butenes and subsequently into these hydrocarbon products is commonly known and practiced in the chemicals industry today. For example, the dehydration of ethanol to ethylene, which uses a similar process and technology to the dehydration of isobutanol, is practiced commercially today to serve the ethylene market. The dehydration of butanol into butenes is commercially practiced today.

Third Party Retrofit and Construction Activities

We have commenced a licensing strategy whereby a licensee would invest the capital for the Retrofit of its own ethanol plant or for a new greenfield build out of an isobutanol-producing plant. In return, we, as the licensor, would expect to receive an up-front license fee and ongoing royalty payments from the projects, as well as other potential revenue streams such as yeast sales. This licensing strategy is expected to take some time to develop, and we cannot assure that it will be successful. The ability to license a technology is generally related to the commercial track record of the underlying technology itself. In addition, revenues from licensing our isobutanol and/or hydrocarbon technologies are expected to be directly linked to the build out of specific projects, which may take multiple years to construct.

Our Production Technology Platform

We have used tools from synthetic biology, biotechnology, chemical catalysis and process engineering to develop a proprietary set of technologies that enable the potential of cost-effective production of isobutanol and hydrocarbon fuels and chemicals. We believe the technologies have been proven to work as demonstrated by the fact that we have made and sold products using these technologies.

We have a proprietary fermentation yeast biocatalyst that effectively produces isobutanol. The advantage of this biocatalyst is that it (i) works in large scale fermentation systems, and (ii) can operate in complex biological mixtures such as corn mash or molasses and produce a suitable clean isobutanol product. The technology is designed to use similar carbohydrate feedstocks, similar to ethanol technology. For example, carbohydrates from non-food corn, sugar cane, molasses or cellulosic sugars each could be used depending upon cost and availability. We believe that our technology has the potential to add value to existing ethanol production sites by increasing the site profitability if our technologies are deployed.

We have demonstrated that our isobutanol to hydrocarbon technologies for the production of ATJ, isooctane, isooctene, and paraxylene appear to be viable from a technical and process point of view. These catalytic technologies appear to be effective and scalable.

Animal feed, protein and oil are important products produced at our Luverne Facility. Animal feed is made from the spent grain mash from isobutanol and ethanol fermentations. We market our distillers grains to the beef, swine and poultry industries as a high-protein, high-energy animal feed. The spent yeast from fermentation adds protein to the mix, resulting in a higher protein content than corn itself. By selling the feed, protein and oil products, we generate additional revenues and effectively reduce the net cost of fermentation feedstock.

Biocatalyst Overview

Our biocatalysts are microorganisms that have been designed to consume carbohydrates and produce isobutanol as a product. Our technology team developed these proprietary biocatalysts to efficiently convert fermentable sugars of all types into isobutanol by engineering isobutanol pathways into the biocatalysts. We designed our biocatalysts to equal or exceed the performance of the yeast currently used in commercial ethanol production in yield (percentage of the theoretical maximum percentage of isobutanol that can be made from a given amount of feedstock) and rate (how fast the sugar fed to the fermentation is converted to isobutanol). To achieve this, we believe that more than 100 genetic changes have been made to our yeast biocatalyst. We achieved our target fermentation performance goals at our Luverne Facility at a commercial scale in August 2015. We continue to seek to improve the performance parameters of our biocatalyst with a goal of reducing projected capital and operating costs, increasing operating reliability and increasing the volume of isobutanol production.

While we believe that the majority of the development work on a commercially viable isobutanol producing yeast is complete, we expect to continue to make incremental improvements targeted to its commercial performance.

Raw Material Feedstocks

In the U.S., non-food corn is a commercially attractive feedstock for both isobutanol and ethanol, because it is abundant and readily available, but more importantly because this corn generates low cost carbohydrates, protein and feed and corn oil for the food chain. In other parts of the world, sugar or molasses from cane, beets, or other sugar producing crops could be used. In the future, certain types of cellulosic sugars could be used once the cost to acquire those sugars becomes cost effective. We have designed our biocatalyst platform to be capable of producing isobutanol from any fuel ethanol

feedstock currently in commercial use, which we believe, in conjunction with our proprietary isobutanol separation unit, will permit us to modify any existing fuel ethanol facility to produce our products.

Our Luverne Facility is currently set up to use non-food corn as a feedstock. The starch is fermented to isobutanol and or ethanol, the fiber and protein are isolated from the process and sold as animal feed, and the corn oil is sold for industrial use.

We expect that our feedstock flexibility will allow our technology to be deployed worldwide and will enable us to offer our customers protection from the raw material cost volatility historically associated with petroleum-based products. For example, in some parts of the world, it may be that molasses is a lower cost feedstock; in others, sugar from beets or cane might be the lower cost feedstock. As cellulosic sugars become economical, we expect that these could be viable as a feedstock too.

In the future, we expect feedstocks to be chosen on the collective basis of (i) cost, (ii) carbon and/or sustainability footprint with associated value, (iii) positive contribution to food chain where possible, and (iv) availability of the feedstock at a practical scale.

In June 2015, Agri-Energy entered into a Price Risk Management, Origination and Merchandising Agreement, as amended as of December 21, 2017 (the "Origination Agreement"), with FCStone Merchant Services, LLC ("FCStone") and a Grain Bin Lease Agreement with FCStone, as amended as of December 21, 2017.

Pursuant to the Origination Agreement, FCStone originates and sells to Agri-Energy, the owner of the Luverne Facility, and Agri-Energy purchases from FCStone, the entire volume of corn grain used by the Luverne Facility.

In April 2019, we entered into a Construction License Agreement with Praj Industries Ltd. ("Praj") pursuant to which Praj will provide engineering procurement and construction services to certain third parties using the process design package (the "PDP") that incorporates our proprietary isobutanol biocatalyst and is designed for use with sugary-based feedstocks, such as sugarcane juice, sugarcane syrup, sugarcane molasses, sugar beet juice, sugar beet syrup, and sugar beet molasses. We also granted a license to Praj that will allow Praj to provide such services to third parties.

Subject to certain conditions, we will earn a license fee from certain plant operators for the use of our technology and the PDP for building and operating plants for producing isobutanol. In addition, subject to certain conditions, if a third party other than Praj provides the services to build a plant using the PDP for a plant not located in the United States, we will pay Praj a negotiated amount.

In April 2019, we also entered into a Joint Development Agreement with Praj, pursuant to which we and Praj will continue to: (i) jointly develop our technology for use in certain ethanol plants that utilize sugarcane juice, sugarcane syrup, sugarcane molasses, sugar beet juice, sugar beet syrup, sugar beet molasses, cassava, rice, wheat, sorghum, bagasse, rice straw, wheat straw, corn stover, cotton stalk and empty fruit bunches; (ii) develop and optimize the parameters to produce isobutanol from such feedstocks; and (iii) work together to optimize and improve the PDP (or other PDPs).

In April 2019, we also entered into a Development License Agreement with Praj, pursuant to which we granted Praj a license to our patents, patent applications, and know-how on a non-exclusive, royalty-free basis for use solely at Praj's Matrix plant in Pune, India (the "Praj Facility"), and a non-exclusive sublicense under our rights in and to certain patents owned or licensed by Butamax (as defined below) within the Praj Facility, in each instance, for purposes of process development and manufacturing isobutanol from certain feedstocks at the Praj Facility.

Our ETO Technology

We have also developed new technologies using ethanol as a feedstock for the production of hydrocarbons, renewable hydrogen and other chemical intermediates, which we describe as our ethanol-to-olefins ("ETO") technologies. The process produces tailored mixes of isobutylene, propylene, hydrogen and acetone, which are valuable as standalone molecules, or as feedstocks to produce other chemical products and longer chain alcohols. This technology has the potential to address additional markets in the chemicals and plastics fields, such as renewable polypropylene for automobiles and packaging and renewable hydrogen for use in chemical and fuel cell markets. At this time, this technology has only been operated at a laboratory scale, but if successfully scaled up to commercial level, this technology may provide a broader set of end-product market and margin opportunities.

Underpinning the ETO technology is our development of proprietary mixed metal oxide catalysts that produce either propylene, isobutylene or acetone in high yields in a single processing step. One of the benefits of the technology is that we can use conventional fuel grade specification ethanol that can be sourced from a variety of feedstocks with no apparent adverse impact on end product yields. Water, which is co-fed with the ethanol, is able to be recycled resulting in a process which generates minimal waste. The ethanol and water mixture is vaporized and fed across a fixed catalyst bed resulting in a gaseous product mix consisting of the propylene, isobutylene or acetone, in addition to hydrogen and carbon dioxide, along with lesser amounts of methane and ethylene. Separation of gaseous products can be achieved via conventional process technologies and unit operations within the petroleum industry.

We have found that our ETO technology is effective at converting fusel oils into flavors, fragrances and certain specialty chemicals. We are evaluating the business opportunities and commercial potential.

Butamax Advanced Biofuels LLC

Between 2011 and 2015, we were involved in an intellectual property dispute with Butamax Advanced Biofuels LLC ("Butamax"). We believe the dispute was satisfactorily resolved, enabling each of our companies to pursue their respective businesses.

Cross License Agreement

On August 22, 2015, we entered into a Settlement Agreement and Mutual Release (the "Settlement Agreement") with Butamax, E.I. du Pont de Nemours & Company ("DuPont") and BP Biofuels North America LLC ("BP" and, together with Butamax and DuPont, the "Butamax Parties"), that resolved the various disputes, lawsuits and other proceedings between one or more of the Butamax Parties and us, as previously disclosed and as specifically identified in the Settlement Agreement (the "Subject Litigation"), and creates a new business relationship pursuant to which we and Butamax and we have granted rights to each other under certain patents and patent applications in accordance with the terms of a Patent Cross-License Agreement (the "License Agreement"), which was entered into by us and Butamax concurrently with the Settlement Agreement. For additional information concerning the settlement agreement, please see our Annual Report on Form 10-K for the year-ended December 31, 2015 — Item 3 Legal Proceedings.

Pursuant to the terms of the License Agreement, each party receives a non-exclusive license under certain patents and patent applications owned or licensed (and sublicensable) by the other party for the production and use of biocatalysts in the manufacture of isobutanol using certain production process technology for the separation of isobutanol, and to manufacture and sell such isobutanol in any fields relating to the production or use of isobutanol and

isobutanol derivatives, subject to the customer-facing field restrictions described below. Each party also receives a non-exclusive license to perform research and development on biocatalysts for the production, recovery and use of isobutanol.

Each party may produce and sell up to 30 MGPY of isobutanol in any field on a royalty-free basis. Butamax will be the primary customer-facing seller of isobutanol in the field of fuel blending (subject to certain exceptions, the "Direct Fuel Blending" field) and we will be the primary customer-facing seller of isobutanol in the field of jet fuel for use in aviation gas turbines (the "Jet" field, also subject to certain exceptions). As such, subject to each party's right to sell up to 30 MGPY of isobutanol in any field on a royalty-free basis, other than with Butamax's written consent, we will only sell isobutanol through Butamax in the Direct Fuel Blending field subject to a royalty based on the net sales price for each gallon of isobutanol sold or transferred by us, our affiliates or sublicensees within the Direct Fuel Blending field (whether through Butamax or not) and on commercially reasonable terms to be negotiated between the parties and Butamax will only sell isobutanol through us in the Jet field subject to a royalty based on the net sales price for each gallon of isobutanol sold or transferred by Butamax, its affiliates or sublicensees within the Jet field (whether through us or not) and on commercially reasonable terms to be negotiated between the parties; provided, that each party may sell up to 15 MGPY of isobutanol in a given year directly to customers in the other party's customer-facing field on a royalty-free basis so long as the isobutanol volumes are within the permitted 30 MGPY of isobutanol sold or otherwise transferred per year in any field described above and, in certain instances, each party may then sell up to the total permitted 30 MGPY in the other party's customer-facing field on a royalty-free basis. In addition, in order to maintain its status as the primary customer-facing seller in these specific fields, each party must meet certain milestones within the first five years of the License Agreement. If such milestones are not met as determined by an arbitration panel, then a party will have the right to sell directly to customers in the other party's customer-facing field subject to the payment of certain royalties to the other party on such sales.

In addition to the royalties discussed above for sales of isobutanol in the Direct Fuel Blending field, and subject to our right to sell up to 30 MGPY of isobutanol in any field on a royalty-free basis, we will pay to Butamax a royalty per gallon of isobutanol sold or transferred by us, our affiliates or sublicensees within the field of isobutylene (a derivative of isobutanol) applications (other than isobutylene for paraxylene, isooctane, Jet, diesel and oligomerized isobutylene applications). Likewise, in addition to the royalties discussed above for sales of isobutanol in the Jet field, and subject to Butamax's right to sell up to 30 MGPY of isobutanol in any field on a royalty-free basis, Butamax will pay to us a royalty per gallon of isobutanol sold or transferred by Butamax, its affiliates or sublicensees within the fields of marine gasoline, retail packaged fuels and paraxylene (except for gasoline blending that results in use in marine or other fuel applications). The royalties described above will be due only once for any volume of isobutanol sold or transferred under the License Agreement, and such royalties accrue when such volume of isobutanol is distributed for end use in the particular royalty-bearing field. All sales of isobutanol in other fields will be royalty-free, subject to the potential technology fee described below.

In the event that we, our affiliates or sublicensees choose to employ a certain solids separation technology for the production of isobutanol at one of their respective plants ("Solids Separation Technology"), we are granted an option to license such technology from Butamax on a non-exclusive basis subject to the payment of a one-time technology license fee based on the rated isobutanol capacity for each such plant (subject to additional fees upon expansion of such capacity). We also receive the option to obtain an engineering package from Butamax to implement the Solids Separation Technology on commercially reasonable terms to be negotiated between the parties and subject to the technology fee described above and an additional technology licensing fee for use of the Solids Separation Technology applicable to ethanol capacity as provided in such engineering package from Butamax (which capacity is not duplicative of the rated isobutanol capacity referenced above) in instances where Butamax provides an engineering package for use at a particular plant that will run isobutanol and ethanol production side-by-side using the licensed Solids Separation Technology at such plant.

The License Agreement encompasses both parties' patents for producing isobutanol, including biocatalysts and separation technologies, as well as for producing hydrocarbon products derived from isobutanol, including certain improvements and new patent applications filed within seven years of the date of the License Agreement. While the parties have cross-licensed their patents for making and using isobutanol, the parties will not share their own proprietary biocatalysts with each other. The parties may use third parties to manufacture biocatalysts on their behalf and may license their respective technology packages for the production of isobutanol to third parties, subject to certain restrictions. A third-party licensee would be granted a sub-license and would be subject to terms and conditions that are consistent with those under the License Agreement.

Under the License Agreement, the parties also agreed to certain limitations on the making or participating in a challenge of the other party's patents that are at issue in the Subject Litigation. The parties have also made certain representations, warranties and covenants to each other including, without limitation, with respect to obtaining certain consents, indebtedness, rights in the licensed patents, and relationships with certain other ethanol plant process technology providers.

The License Agreement will continue in effect until the expiration of the licensed patents, unless earlier terminated by a party as provided in the License Agreement. The parties also have certain termination rights with respect to the term of the license granted to the other party under the License Agreement upon the occurrence of, among other things, a material uncured breach by the other party. In the event that a party's license is terminated under the License Agreement, such party's sublicense agreements may be assigned to the other party, subject to certain restrictions.

The parties may not assign the License Agreement or any right or obligation thereunder without the prior written consent of the other party. However, the parties may assign the License Agreement to an affiliate or a person that acquires all of the business or assets of such party, subject to certain restrictions.

Competition

We face competitors in each market, some of which are limited to individual markets, and some of which will compete with us across all of our target markets. Many of our competitors have greater financial resources, more comprehensive product lines, broader market presence, longer standing relationships with customers, longer operating histories, greater production capabilities, stronger brand recognition and greater marketing resources than we do. In addition, if we fail to raise sufficient additional capital for our business and strategy, we may not be able to successfully compete.

Hydrocarbon fuels. Beyond direct use as a fuel additive, isobutanol can be converted into many hydrocarbon fuels and blendstocks, offering substantial potential for additional demand in the fuels markets. We compete with the incumbent petroleum-based fuels industry, as well as biofuels companies. The incumbent petroleum-based fuels industry makes the vast majority of the world's gasoline, jet and diesel fuels and blendstocks. The petroleum-based fuels industry is mature and includes a substantial base of infrastructure for the production and distribution of petroleum-derived products. However, the industry faces challenges from its dependence on petroleum. High and volatile oil prices will provide an opportunity for renewable producers relying on biobased feedstocks like corn, which in recent years have had lower price volatility than oil, to compete.

Biofuels companies will provide substantial competition in the gasoline market. These biofuels competitors are numerous and include both large established companies and numerous startups. Government tax incentives for renewable fuel producers and regulations such as the RFS Program help provide opportunities for renewable fuels producers to compete. In particular, in the gasoline and gasoline blendstock markets, Virent Energy Systems, Inc. ("Virent") offers a process for making gasoline and gasoline blendstocks in a mixture than subsequently needs to be refined. However, we have the

advantage of being able to target conversion of isobutanol into specific high-value molecules such as isooctane, which can be used to make gasoline blendstocks with a higher value than whole gasoline, which we do not believe Virent's process can match. Renewable Energy Group, Inc., Neste Corporation, World Energy, LLC and others are also targeting production of jet fuels from vegetable oils and animal fats. Red Rock Biofuels LLC, Fulcrum BioEnergy, Inc. and others are planning to produce jet fuel from renewable biomass using Fisher Tropsch types of technology. We believe that the Gevo production process is economically competitive with any other potential routes and that we are the only company with technology to convert carbohydrates into jet fuel.

Isooctane.

We currently have no competitors for renewable low-carbon isooctane for gasoline in the marketplace. We are aware that Global Bioenergies, S.A. is developing a technology to make renewable isooctane. Even with the increasing demand for electric vehicles ("EVs"), which are needed to help address the GHG emissions of the transportation sector, we believe that low-carbon liquid fuels will continue to be needed. The U.S. Energy Information Administration indicates that the vast majority of transportation will be still be powered by liquid transportation fuels in 2050 and beyond, with EV occupying only a small share of the market. Additionally, we expect isooctane demand to increase because of the advent of engines with higher compression that get more mileage. We expect that isooctane will be in increasing demand as these more efficient engines come to market, and when blended with certain other renewable ingredients such a renewable naptha, and isobutanol or ethanol, it is possible to produce a complete gallon of gasoline.

Renewable isobutanol. We are a leader in the development of renewable isobutanol via fermentation of renewable plant biomass. While the competitive landscape in renewable isobutanol production is limited at this time, we are aware of other companies that are seeking to develop isobutanol production capabilities, including Butamax with whom we have entered into the License Agreement. See —"Butamax Advanced Biofuels LLC—Cross License Agreement".

Our isobutanol is targeted for use in the following markets: direct use as a solvent and gasoline blendstock, use in the chemicals industry for producing rubber, plastics, fibers, polyester and other polymers and use in the production of hydrocarbon fuels.

Solvent markets. We also face competition from companies that are focused on the development of n-butanol, a related compound to isobutanol. These companies include Cathay Industrial Biotech Ltd., METabolic EXplorer S.A. and Eastman Chemicals Company. We understand that these companies produce n-butanol from an acetone-butanol-ethanol (“ABE”) fermentation process primarily for the small chemicals markets. ABE fermentation using a Clostridia biocatalyst has been used in industrial settings since 1919. As discussed in several academic papers analyzing the ABE process, such fermentation is handicapped in competitiveness by high energy costs due to low concentrations of butanol produced and significant volumes of water processed. It requires high capital and operating costs to support industrial scale production due to the low rates of the Clostridia fermentation, and results in a lower butanol yield because it produces ethanol and acetone as by-products. We believe our proprietary process has many significant advantages over the ABE process because of its relatively limited requirements for new capital expenditures, its production output of only isobutanol as a primary product and its limited water usage in production. We believe these advantages will produce a lower cost isobutanol compared to n-butanol produced by ABE fermentation. N-butanol’s lower octane rating compared to isobutanol gives it a lower value in the gasoline blendstock market, but n-butanol can compete directly in many solvent markets where n-butanol and isobutanol have similar performance characteristics.

Gasoline blendstocks. In the gasoline blendstock market, isobutanol competes with non-renewable alkylate and renewable ethanol. Alkylate is a premium value gasoline blendstock typically derived from petroleum. However, petroleum feeds for alkylate manufacture are pressured by continued increases in the use of natural gas to generate olefins for the production of alkylate, due to the low relative cost of natural gas compared to petroleum. Isobutanol has fuel properties similar to alkylate and, as such, we expect that isobutanol could be used as a substitute for some alkylate in fuel applications. Ethanol is renewable and has a high-octane rating, and although it has a high RVP, ethanol receives a one-pound RVP waiver in a large portion of the U.S. gasoline market. Renewability is important in the U.S. because the RFS Program mandates that a minimum volume of renewable blendstocks be used in gasoline each year. A high-octane rating is important for engine performance and is a valuable characteristic because many inexpensive gasoline blendstocks have lower octane ratings. Low RVP is important because the U.S. Environmental Protection Agency (“EPA”) sets maximum permissible RVP levels for gasoline. In markets where low RVP is important, isobutanol can enable refiners to meet fuel specifications at lower cost. Ethanol’s vapor pressure waiver is valuable because it offsets much of the negative value of ethanol’s high RVP. We believe that our isobutanol will be valued for its combination of low RVP, low water solubility, relatively high octane and renewability.

Many production and technology supply companies are working to develop ethanol production from cellulosic feedstocks, including Shell Oil Company, POET, LLC, ICM, Inc., Archer Daniels Midland Company, Zea2 LLC, Iogen Corporation and many smaller startup companies. Successful commercialization by some or all of these companies will increase the supply of renewable gasoline blendstocks worldwide, potentially reducing the market size or margins available to isobutanol.

Plastics, fibers, polyester, rubber and other polymers. Isobutanol can be dehydrated to produce butenes, hydrocarbon intermediates currently used in the production of plastics, fibers, polyester, rubber and other polymers. The straightforward conversion of our isobutanol into butenes is a fundamentally important process that enables isobutanol to be used as a building block chemical in multiple markets. These markets include butyl rubber, lubricants and additives derived from butenes such as isobutylene, poly methyl methacrylate from isobutanol, propylene for polypropylene from isobutylene, polyesters made via PX from isobutylene and polystyrene made via styrene.

In these markets, we compete with the renewable isobutanol companies and renewable n-butanol producers described previously and face similar competitive challenges. Our competitive position versus petroleum-derived plastics, fibers, rubber and other polymers varies, but we believe that the high volatility of petroleum prices, often tight supply markets for petroleum-based petrochemical feedstocks and the desire of many consumers for goods made from more renewable sources will enable us to compete effectively. However, petrochemical companies may develop alternative pathways to produce petrochemical-based hydrocarbon products that may be less expensive than our isobutanol or more readily available or developed in conjunction with major petrochemical, refiner or end user companies. These products may have economic or other advantages over the plastics, fibers, polyester, rubber and other polymers developed from our isobutanol. Further, some of these companies have access to significantly more resources than we do to develop products.

Additionally, Global Bioenergies, S.A. is pursuing the direct production of isobutylene from renewable carbohydrates. Through analysis of the fermentation pathway, we believe that the direct production of butenes such as isobutylene via fermentation will have higher capital and operating costs than production of butenes derived from our isobutanol.

Ethanol. We compete with numerous ethanol producers located throughout the U.S., many of which have much greater resources than we do, including Archer-Daniels-Midland Company, Green Plains, Inc., POET, LLC and Valero Energy Corporation. Competition for corn supply from other ethanol plants and other corn consumers will likely exist in all areas and regions in which our current and future plants will operate. We also face competition from foreign producers of ethanol and such competition may increase significantly in the future. Large international companies have developed, or are developing, increased foreign ethanol production capacities. Brazil is the world’s second largest ethanol producing country. Brazil’s ethanol production is sugarcane-based, as opposed to corn-based, and has historically been less expensive to produce.

Intellectual Property

Our success depends in large part on our proprietary products and technology for which we seek protection under patent, copyright, trademark and trade secret laws. Such protection is also maintained in part using confidential disclosure agreements. Protection of our technologies is important so that we may offer our customers and partners proprietary services and products unavailable from our competitors, and so that we may exclude our competitors from using technology that we have developed or exclusively licensed. If competitors in our industry have access to the same technology, our competitive position may be adversely affected.

We have submitted hundreds of patent applications in the U.S. and in various foreign jurisdictions. These patent applications are directed to our technologies and specific methods and products that support our business in the biofuel and bioindustrial markets. We continue to file new patent applications, for which terms extend up to 20 years from the filing date in the U.S.

We have also been issued multiple patents in the U.S. and in foreign jurisdictions.

In addition to the patents and applications described above, we have a global cross-license to certain patents and applications relating to the production, recovery, and use of isobutanol that are owned or licensed by Butamax. The global cross-license allows us to freely practice the licensed inventions, subject to the terms of the cross-license. For information regarding this license, see —"Butamax Advanced Biofuels LLC—Cross License Agreement".

We have filed and prosecuted, and intend to continue to file and prosecute, patent applications and maintain trade secrets, as is consistent with our business plan, in an ongoing effort to protect our intellectual property. It is possible that our licensors' current patents, or patents which we may later acquire or license, may be successfully challenged or invalidated in whole or in part. It is also possible that we may not obtain issued patents from our filed applications and may not be able to obtain patents regarding other inventions we seek to protect. We also may not file patents in each country in which we plan to do business or actually conduct business. Under appropriate circumstances, we may sometimes permit certain intellectual property to lapse or go abandoned. Due to uncertainties inherent in prosecuting patent applications, sometimes patent applications are rejected and we may subsequently abandon them. It is also possible that we will develop products or technologies that will not be patentable or that the patents of others will limit or preclude our ability to do business. In addition, any patent issued to us may provide us with little or no competitive advantage, in which case we may abandon such patent or license it to another entity.

We have obtained registered trademarks for GIFT™ and Gevo® in the U.S. These registered and pending U.S. trademarks are also registered or pending in certain foreign countries.

Our means of protecting our proprietary rights may not be adequate and our competitors may independently develop technology or products that are similar to or compete with ours. Patent, trademark and trade secret laws afford only limited protection for our technology platform and products. The laws of many countries do not protect our proprietary rights to as great an extent as do the laws of the U.S. Despite our efforts to protect our proprietary rights, unauthorized parties have in the past attempted, and may in the future attempt, to operate using aspects of our intellectual property or products or to obtain and use information that we regard as proprietary. Third parties may also design around our proprietary rights, which may render our protected technology and products less valuable. In addition, if any of our products or technologies is covered by third-party patents or other intellectual property rights, we could be subject to various legal actions. We cannot assure you that our technology platform and products do not infringe patents held by others or that they will not in the future.

Litigation may be necessary to enforce our intellectual property rights, to protect our trade secrets, to determine the validity and scope of the proprietary rights of others or to defend against claims of infringement, invalidity, misappropriation or other allegations. Any such litigation could result in substantial costs and diversion of our resources. We may be unable to finance litigation costs, which may harm our ability to enforce our intellectual property rights. Any settlement of or adverse judgment resulting from such litigation could require us to obtain a license to continue to make, use or sell the products or technology that is the subject of the claim, or otherwise restrict or prohibit our use of the technology.

Customers

In 2019, Eco-Energy, LLC ("Eco-Energy") accounted for approximately 71% of our consolidated revenue and Purina Animal Nutrition, LLC, formerly Land O'Lakes Purina Feed LLC ("Purina") accounted for approximately 17% of our consolidated revenue. Both companies are customers of our Gevo Development/Agri-Energy segment (see Note 17). Given the production capacity compared to the overall size of the North American market and the fungible demand for our products, we do not believe that a decline in a specific customer's purchases would have a material adverse long-term effect upon our financial results.

Government Regulation - Environmental Compliance Costs

Regulation by governmental authorities in the U.S. and other countries is a significant factor in the development, manufacture and marketing of second-generation biofuels. Our isobutanol and the next generation products isobutanol will be used to produce may require regulatory approval by governmental agencies prior to commercialization. In particular, biofuels are subject to rigorous testing and premarket approval requirements by the EPA's Office of Transportation and Air Quality and regulatory authorities in other countries. In the U.S., various federal, and, in some cases, state statutes and regulations also govern or impact the manufacturing, safety, storage and use of biofuels. The process of seeking required approvals and the continuing need for compliance with applicable statutes and regulations requires the expenditure of substantial resources. Regulatory approval, if and when obtained for any of the next generation products isobutanol is used to produce, may be limited in scope, which may significantly limit the uses for which our isobutanol and these next generation products may be marketed.

When built at a dry-mill facility, our GIFT™ fermentation process creates iDGs™, a potential animal feed component, as a co-product. We are currently approved to sell iDGs™ as animal feed through the self-assessed Generally Regarded as Safe ("GRAS") process of the United States Food and Drug Administration (the "FDA") via third party scientific review. While we believe we can rely on the GRAS process as we update our biocatalysts to increase isobutanol production, for further customer assurance, we also intend to pursue approval upon a completed biocatalyst from the Center for Veterinary Medicine of the FDA. Even if we receive such approval, the FDA's policies may change and additional government regulations may be enacted that could prevent, delay or require regulatory approval of our co-products. We cannot predict the likelihood, nature or extent of adverse governmental regulations that might arise from future legislative or administrative action, either in the U.S. or abroad.

Our process contains a genetically engineered organism which, when used in an industrial process, is considered a new chemical under the EPA's Toxic Substances Control Act program ("TSCA"). The EPA's Biotechnology Program under TSCA requires the submission of certain information of the Office of Pollution Prevention and Toxic Substances. Due to the nature of our microorganism, we can utilize the TSCA Biotechnology Program Tier I and Tier II exemption criteria at our Luverne Facility. As we expand our business activities, we will pursue the EPA's Microbial Commercial Activity Notice process for future plants. We do not anticipate a material adverse effect on our business or financial condition as a result of our efforts to comply with these requirements. However, the TSCA new chemical submission policies may change and additional government regulations may be enacted that could prevent or delay regulatory approval of our products. We cannot predict the likelihood, nature or extent of adverse governmental regulations that might arise from future legislative or administrative action, either in the U.S. or abroad.

There are various third-party certification organizations, such as ASTM International and Underwriters' Laboratories, Inc. ("UL"), involved in certifying the transportation, dispensing and use of liquid fuel in the U.S. and internationally. In 2013, a specification for fuel grade isobutanol titled ASTM D7862 "Standard Specification for Butanol for Blending with Gasoline for Use as Automotive Spark-Ignition Engine Fuel" was published. In April 2016, ASTM International completed its process of approving the revision of ASTM D7566 (Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons) to include alcohol to jet synthetic paraffinic kerosene (ATJ-SPK) derived from renewable isobutanol. In addition, UL has published guidance on the use of isobutanol-gasoline blends in its UL87A fuel dispensers. When ATJ-SPK, which meets the specifications of ASTM D7566, is blended at a level of 30% or lower with petroleum-based jet fuel, which meets the specifications of ASTM D1655, the entire blended product meets the specifications of ASTM D1655, conventional jet fuel. In other words, the blend containing the ATJ-SPK is completely fungible with any conventional D1655 jet fuel. Voluntary standards development organizations may change and additional requirements may be enacted that could prevent or delay marketing approval of our products. The process of seeking required approvals and the continuing need for compliance with applicable statutes and regulations require the expenditure of substantial resources. We do not anticipate a material adverse effect on our business or financial conditions as a result of our efforts to comply with these requirements, but we cannot predict the likelihood, nature or extent of adverse third-party requirements that might arise from future action, either in the U.S. or abroad.

We are subject to various federal, state and local environmental laws and regulations, including those relating to the discharge of materials into the air, water and ground, the generation, storage, handling, use, transportation and disposal of hazardous materials and the health and safety of our employees. These laws and regulations require us to obtain environmental permits and comply with numerous environmental restrictions as we construct and operate isobutanol assets. They may require expensive pollution control equipment or operation changes to limit actual or potential impacts to the environment. A violation of these laws, regulations or permit conditions can result in substantial fines, natural resource damage, criminal sanctions, permit revocations and facility shutdowns.

There is a risk of liability for the investigation and cleanup of environmental contamination at each of the properties that we own or operate and at off-site locations where we arrange for the disposal of hazardous substances. If these substances are or have been disposed of or released at sites that undergo investigation or remediation by regulatory agencies, we may be responsible under the Comprehensive Environmental Response, Compensation and Liability Act or other environmental laws for all or part of the costs of investigation and remediation. We may also be subject to related claims by private parties alleging property damage and personal injury due to exposure to hazardous or other materials at or from the properties. Some of these matters may require us to expend significant amounts for investigation and cleanup or other costs. We are not aware of any material environmental liabilities relating to contamination at or from our facilities or at off-site locations where we have transported or arranged for the disposal of hazardous substances.

In addition, new laws, new interpretations of existing laws, increased governmental enforcement of environmental laws or other developments could require us to make significant additional expenditures. Continued government and public emphasis on environmental issues can be expected to result in increased future investments in environmental controls at our facilities which cannot be estimated at this time. Present and future environmental laws and regulations applicable to our operations, more vigorous enforcement policies and discovery of currently unknown conditions could all require us to make substantial expenditures. For example, our air emissions are subject to the Clean Air Act, the Clean Air Act Amendments of 1990 and similar state and local laws and associated regulations. Under the Clean Air Act, the EPA has promulgated National Emissions Standards for Hazardous Air Pollutants ("NESHAP"), which could apply to facilities that we own or operate if the emissions of hazardous air pollutants exceed certain thresholds. If a facility we operate is authorized to emit hazardous air pollutants above the threshold level, then we might still be required to come into compliance with another NESHAP at some future time. New or expanded facilities might be required to comply with both standards upon startup if they exceed the hazardous air pollutant threshold. In addition to costs for achieving and maintaining compliance with these laws, more stringent standards may also limit our operating flexibility.

As a condition to granting the permits necessary for operating our facilities, regulators could make demands that increase our construction and operations costs, which might force us to obtain additional financing. For example, unanticipated water discharge limits could sharply increase construction costs for our projects. Permit conditions could also restrict or limit the extent of our operations. We cannot guarantee that we will be able to obtain or comply with the terms of all necessary permits to complete the retrofit of an ethanol plant. Failure to obtain and comply with all applicable permits and licenses could halt our construction and could subject us to future claims.

Our products benefit from the RFS Program in that our isobutanol and ethanol are currently eligible for Renewable Identification Numbers or RINS that have value based on the current RFS Program. The RFS Program could change, impacting our products, positively or negatively.

Various systems are being put in place around the world to measure carbon intensity and reduction of GHGs, with the intent of creating a system to monetize the value of the reduction of carbon. In order to benefit from such systems, companies need to have their products qualified through a regulatory process. There is no guarantee that any benefit could be gained. In 2019, we submitted a design pathway application to the California Air Resources Board to gain approval for low-carbon intensity ethanol utilizing beef manure biogas as a process input under the LCFS, and we may also seek approval under similar programs in the future.

Employees

As of December 31, 2019, we employed 57 employees, 25 of whom were employed by us in our principal offices located in Englewood, Colorado and 23 of whom were full-time. Of these employees at our principal offices, 13 were engaged in research and development activities and 12 were engaged in general, administrative and business development activities. As of December 31, 2019, our subsidiary, Agri-Energy, employed 32 employees, all of whom were located in Luverne, Minnesota, and involved in the operations of our production facility, of which 30 are full-time. None of our employees are represented by a labor union and we consider our employee relations to be good.

Corporate Information

We were incorporated in Delaware in June 2005 as a corporation under the name Methanotech, Inc. and filed an amendment to our certificate of incorporation changing our name to Gevo, Inc. on March 29, 2006. Our principal executive offices are located at 345 Inverness Drive South, Building C, Suite 310, Englewood, Colorado 80112, and our telephone number is (303) 858-8358.

Website Access to SEC Filings

We are subject to the reporting requirements under the Exchange Act. Consequently, we are required to file reports and information with the SEC, including reports on the following forms: Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K, and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act. These reports and other information concerning us may be accessed, free of charge, through the SEC's website at www.sec.gov and on our website at www.gevo.com. Such filings are placed on our website as soon as reasonably practical after they are filed with the SEC. Any information contained in, or that can be accessed through our website, is not incorporated by reference into, nor is it in any way part of, this Report.

Item 1A. Risk Factors

You should carefully consider the risk factors described below before you decide to invest in our securities. The risks described below are not the only ones facing us. Our business is also subject to the risks that affect many other companies, such as competition, technological obsolescence, labor relations, general economic conditions, geopolitical changes and international operations. Additional risks and uncertainties not presently known to us or that we currently believe are immaterial may also impair our business operations and our liquidity. The risks described below could cause our actual results to differ materially from those contained in the forward-looking statements we have made in this Report, the information incorporated herein by reference and those forward-looking statements we may make from time to time.

Risks Related to our Business and Strategy

We have substantial indebtedness outstanding and may incur additional indebtedness in the future. Our indebtedness exposes us to risks that could adversely affect our business, financial condition and results of operations.

As of December 31, 2019, we had approximately $14.1 million in outstanding 12% Convertible Senior Notes due 2020, which were issued to WB Gevo, Ltd. and its affiliates (collectively, "Whitebox") in June 2017 (the "2020 Notes"). On January 10, 2020, we and Whitebox exchanged all of the outstanding principal amount of the 2020 Notes for our newly created 12.0% Convertible Senior Secured Notes due 2020/21 (the "2020/21 Notes") in aggregate principal amount of approximately $14.4 million. In addition, we and any current and future subsidiaries of ours may incur substantial additional debt in the future, subject to the specified limitations in our existing financing documents and the indenture governing the 2020/21 Notes. The maturity date of the 2020/21 Notes is December 31, 2020, subject to extension to April 1, 2021 in certain circumstances. If new debt is added to our or any of our subsidiaries' debt levels, the risks described in "—Risks Related to Owning Our Securities" could intensify.

Our current and future indebtedness could have significant negative consequences for our business, results of operations and financial condition, including, among others:

- increasing our vulnerability to adverse economic and industry conditions;
- limiting our ability to obtain additional financing;
- requiring the dedication of a substantial portion of our cash flow from operations to service our indebtedness, thereby reducing the amount of our cash flow available for other purposes;
- limiting our flexibility in planning for, or reacting to, changes in our business; and
- placing us at a possible competitive disadvantage with less leveraged competitors and competitors that may have better access to capital resources.

We cannot assure you that we will continue to maintain sufficient cash reserves or that our business will generate cash flow from operations at levels sufficient to permit us to pay principal, premium, if any, and interest on our indebtedness, or that our cash needs will not increase. If we are unable to generate sufficient cash flow or otherwise obtain funds necessary to make required payments, or if we fail to comply with the various requirements of our existing indebtedness or any other indebtedness which we may incur in the future, we would be in default, which could permit the holders of our indebtedness, including the 2020/21 Notes, to accelerate the maturity of such indebtedness. Any default under such indebtedness could have a material adverse effect on our business, results of operations and financial condition.

In particular, our indebtedness with Whitebox is secured by liens on substantially all of our assets, including our intellectual property. If we are unable to satisfy our obligations under such instruments, Whitebox could foreclose on our assets, including our intellectual property. Any such foreclosure could force us to substantially curtail or cease our operations which could have a material adverse effect on our business, financial condition and results of operations.

As the maturity date for the 2020/21 Notes approaches, we will evaluate and continue to opportunistically pursue, our options to refinance or repay such indebtedness, including alternatives in the debt and equity capital markets or refinancing with our current lenders.

If we do not have the capital necessary to repay the 2020/21 Notes at maturity, it will be necessary for us to take significant actions, such as revising or delaying our strategic plans, reducing or delaying planned capital expenditures, selling assets, restructuring or refinancing our debt or seeking additional equity capital. We may be unable to effect any of these remedial steps on a satisfactory basis, or at all. If we are unable to refinance or otherwise repay the 2020/21 Notes upon their maturity, we would be in default under the terms of the indenture governing the 2020/21 Notes, which would result in material adverse consequences for us.

There is substantial doubt about our ability to continue as a going concern, which may hinder our ability to obtain further financing.

Our audited financial statements for the year ended December 31, 2019 were prepared under the assumption that we would continue our operations as a going concern. Our independent registered public accounting firm for the year ended December 31, 2019 included a "going concern" emphasis of matter paragraph in its report on our financial statements as of, and for the year ended, December 31, 2019, indicating that the amount of working capital at December 31, 2019 was not sufficient to meet the cash requirements to fund planned operations through the period that is one year after the date our 2019 financial statements are issued without additional sources of cash, which raises substantial doubt about our ability to continue as a going concern. Uncertainty concerning our ability to continue as a going concern may hinder our ability to obtain future financing. Continued operations and our ability to continue as a going concern are dependent on our ability to obtain additional funding in the near future and thereafter, and there are no assurances that such funding will be available to us at all or will be available in sufficient amounts or on reasonable terms. Our financial statements do not include any adjustments that may result from the outcome of this uncertainty. Based on our current operating plan, existing working capital at December 31, 2019 was not sufficient to meet the cash requirements to fund planned operations through the period that is one year after the date our 2019 financial statements are issued unless we are able to restructure and extend our debt obligations and/or raise additional capital to fund operations. Without additional funds from private and/or public offerings of debt or equity securities, sales of assets, sales of our licenses of intellectual property or technologies, or other transactions, we will exhaust our resources and will be unable to continue operations. If we cannot continue as a viable entity, our stockholders would likely lose most or all of their investment in us.

We have a history of net losses, and we may not achieve or maintain profitability.

We incurred net losses of $28.7 million, $28.0 million and $24.6 million during the years ended December 31, 2019, 2018 and 2017, respectively. As of December 31, 2019, we had an accumulated deficit of $458.0 million. We expect to incur losses and negative cash flows from operating activities for the foreseeable future. We currently derive revenue primarily from the sale of ethanol, isobutanol and related products at the Luverne Facility, although over certain periods of time, we may and have operated the plant for the sole production of ethanol and related products to maximize cash flows.

Additionally, we have generated limited revenue from the sale of products such as ATJ, isooctane and isooctene produced from isobutanol that has been used for demonstration commercial flights, jet engine qualification and flight demonstration by the U.S. Air Force and other branches of the U.S. military, as well as gasoline applications such as racing fuel. We have also generated revenue through grants and cooperative agreements. If we are unable to obtain new grants, cooperative agreements or product supply contracts, our revenues could be adversely affected.

Furthermore, we expect to spend significant amounts on the further development and commercial implementation of our technology. Our technology is designed to permit the Retrofit of existing ethanol production facilities.

We also expect to spend significant amounts acquiring and deploying additional equipment to attain final product specifications that may be required by future customers, on marketing, general and administrative expenses associated with our planned growth, on management of operations as a public company and on debt service obligations. In addition, the cost of preparing, filing, prosecuting, maintaining and enforcing patent, trademark and other intellectual property rights and defending ourselves against claims by others that we may be violating their intellectual property rights may be significant.

In particular, over time, costs related to defending the validity of our issued patents and challenging the validity of the patents of others at the United States Patent and Trademark Office ("USPTO") may be significant. As a result, even if our revenues increase substantially, we expect that our expenses will exceed revenues for the foreseeable future. We do not expect to achieve profitability during the foreseeable future and may never achieve it. If we fail to achieve profitability, or if the time required to achieve profitability is longer than we anticipate, we may not be able to continue our business. Even if we do achieve profitability, we may not be able to sustain or increase profitability on a quarterly or annual basis.

We will require substantial additional financing to achieve our goals, and a failure to obtain this capital when needed or on acceptable terms could force us to delay, limit, reduce or terminate our development and commercialization efforts.

Significant portions of our resources have been dedicated to research and development, as well as demonstrating the effectiveness of our technology at the Luverne Facility. We believe that we will continue to expend substantial resources for the foreseeable future on further developing our technologies, developing future markets for our products and constructing facilities necessary for the production of our products on a commercial scale. These expenditures may include costs associated with research and development, modifying and expanding the plants to produce our products, developing biogas processing facilities, obtaining government and regulatory approvals, acquiring or constructing storage facilities and negotiating supply agreements for the products we produce. In addition, other unanticipated costs may arise. Because the costs of developing our technology at a commercial scale are highly uncertain, we cannot reasonably estimate the amounts necessary to successfully commercialize our production.

To date, we have funded our operations primarily through equity offerings, issuances of debt and revenues earned primarily from the sale of ethanol and related products. Based on our current plans and expectations, we will require additional funding to achieve our goals. In addition, the cost of preparing, filing, prosecuting, maintaining and enforcing patent, trademark and other intellectual property rights and defending against claims by others that we may be violating their intellectual property rights may be significant. Moreover, our plans and expectations may change as a result of factors currently unknown to us, and we may need additional funds sooner than planned and may seek to raise additional funds through public or private debt or equity financings in the near future. We may also choose to seek additional capital sooner than required due to favorable market conditions or strategic considerations.

Our future capital requirements will depend on many factors, including:

- the timing of and costs involved in building out a full scale isobutanol and renewable hydrocarbons plant;
- the timing of and costs involved in obtaining permits;
- the ability for us to deploy strains of yeast with improved performance that help to lower capital cost;
- the costs involved in acquiring and deploying additional equipment to attain final product specifications including at the Luverne Facility, that may be required by future customers;
- the timing and costs associated with developing our RNG project;
- the costs involved in increasing production capacity of our products, including at the Luverne Facility;
- our ability to negotiate agreements supplying suitable biomass to our plants and the timing and terms of those agreements;
- the timing of and the costs involved in developing adequate storage facilities for the products we produce;
- our ability to gain market acceptance for isobutanol as a raw material for the production of renewable hydrocarbons and as a specialty chemical and gasoline blendstock ;
- our ability to negotiate additional supply agreements for the products we produce, and the timing and terms of those agreements, including terms related to sales price;
- our ability to negotiate sales of our products and the timing and terms of those sales, including terms related to sales price;
- our ability to sell the iDGs left as a co-product of fermenting isobutanol from corn as animal feedstock;
- our ability to establish and maintain strategic partnerships, licensing or other arrangements and the timing and terms of those arrangements; and
- the cost of preparing, filing, prosecuting, maintaining, defending and enforcing patent, trademark and other intellectual property claims, including litigation costs and the outcome of such litigation.

Additional funds may not be available when we need them, on terms that are acceptable to us, or at all. In addition, our ability to raise additional funds will be subject to certain limitations in the agreements governing our indebtedness, including the 2020/21 Notes. If needed funds are not available to us on a timely basis, we may be required to delay, limit, reduce or terminate:

- our research and development activities;
- our plans to build out additional renewable hydrocarbon and isobutanol capacity;
- our production of products at the Luverne Facility;
- our development of RNG products;
- our production of renewable hydrocarbons at the South Hampton Facility, or any other future facilities;
- our efforts to prepare, file, prosecute, maintain and enforce patent, trademark and other intellectual property rights and defend against claims by others that we may be violating their intellectual property rights; and/or
- our activities in developing storage capacity and negotiating and performing under supply agreements that may be necessary for the commercialization of our products.

In the future, we may need to cease production at the Luverne Facility due to repair and replacement work on our fermentation vessels.

As an older production facility, the Luverne Facility is more susceptible to maintenance issues that result in production challenges than newer production facilities. In the second quarter of 2017, we hired a third-party engineering firm to test the structural integrity of two of our oldest fermentation vessels. These fermentation vessels are fabricated from carbon steel and are dedicated to ethanol production. In 2018, we hired a third-party engineering firm to test a third carbon steel fermenter. In 2019, we repaired each of our carbon steel fermentation vessels. After the repairs, the estimated useful life of the fermentation vessels is expected to be 20 years. If our fermenters have engineering issues in the future and we do not repair them, it is possible we would have had to shut down ethanol production until repaired. If we were to shut down ethanol production, we could not produce isobutanol. Any such production stoppages or costs incurred to repair or replace our fermentation vessels could have a material adverse effect on our business, financial condition and results of operations.

We may be unable to successfully perform under current or future supply and distribution agreements to provide our isobutanol, ATJ and other renewable hydrocarbon products, which could harm our commercial prospects.

In 2019, we entered into supply agreements pursuant to which we agreed to supply an aggregate of approximately 17 MGPY of ATJ, renewable isooctane and other renewable hydrocarbon products. Under certain of these supply agreements, the purchasers agreed to pay for and receive, or cause to be received by a third party, or pay for even if not taken, the renewable hydrocarbon products under contract (a “take-or-pay” arrangement). The timing and volume commitment of certain of these agreements are conditioned upon, and subject to, our ability to complete the Expanded Facility. In order to commence construction of and complete the Expanded Facility, we must secure third party financing. While we believe that we can secure adequate financing in order to commence construction of and complete the Expanded Facility and, in turn, perform under these agreements, we cannot assure you that we will be able to obtain adequate financing on favorable terms, or at all. Furthermore, we have not demonstrated that we can meet the production levels and specifications contemplated in certain of our current supply agreements, and we may enter into additional supply agreements in the future with similar production and specification level requirements. If our production scale-up proceeds more slowly than we expect, or if we encounter difficulties in successfully completing the Expanded Facility, our counterparties may terminate our existing supply agreements and potential customers may be less willing to negotiate definitive supply agreements, or demand terms less favorable to us, and our performance may suffer.

The Luverne Facility is our first commercial isobutanol and ethanol production facility, and, as such, we may be unable to produce planned quantities of isobutanol and ethanol and any such production may be costlier than we anticipate.

Since commencing initial startup operations for the production of isobutanol at the Luverne Facility in May 2012, we have encountered some production challenges, including contamination issues, which have resulted in lower than planned isobutanol production. While we were able to resume production of isobutanol at the Luverne Facility, this is our first commercial isobutanol production facility and we may encounter further production challenges, including, but not limited to, being unable to manage plant contamination, and we may add additional processing steps or incur additional capital expenditures to achieve our target customers’ product specifications and/or to increase production levels at the facility.

The Luverne Facility has the capability to produce low-carbon ethanol side-by-side with low-carbon isobutanol. With certain capital improvements, the Luverne Facility could also produce renewable jet fuel and isooctane and other related renewable hydrocarbon products that can be made from isobutanol. Furthermore, by investing additional capital at the Luverne Facility and in the surrounding area, we believe that we can lower the carbon intensity (i.e. lower the carbon dioxide emissions from the plant), creating additional profit margin opportunities in low-carbon markets for isobutanol, renewable hydrocarbon products and ethanol. However, we cannot assure you that we will be able to secure adequate financing to make such improvements or that our capital investments at the Luverne Facility will successfully lower the carbon intensity and/or create additional profit margin opportunities.

In addition, the Luverne Facility was constructed in 1998. As an older production facility, the Luverne Facility may be more susceptible to maintenance issues that result in production challenges than newer production facilities. Any such production challenges may delay our ramp up of production capacity, prevent us from producing significant quantities of isobutanol, significantly increase our cost to produce isobutanol or cause us to switch to producing ethanol or produce both products simultaneously, which could have a material adverse effect on our business, financial condition and results of operations.

Fluctuations in the price of corn and other feedstocks may affect our cost structure.

Our approach to the biofuels and chemicals markets will be dependent on the price of corn and other feedstocks that will be used to produce isobutanol, renewable hydrocarbon products and ethanol. A decrease in the availability of plant feedstocks or an increase in the price may have a material adverse effect on our financial condition and operating results. At certain levels, prices may make these products uneconomical to use and produce as we may be unable to pass the full amount of feedstock cost increases on to our customers.

The price and availability of corn and other plant feedstocks may be influenced by general economic, market and regulatory factors. These factors include weather conditions, farming decisions, government policies and subsidies with respect to agriculture and international trade and global demand and supply. For example, corn prices may increase significantly in response to drought conditions in the midwestern region of the U.S. and any resulting decrease in the supply of corn could lead to the restriction of corn supplies, which in turn could cause further increases in the price of corn. The significance and relative impact of these factors on the price of plant feedstocks is difficult to predict, especially without knowing what types of plant feedstock materials we may need to use.

Fluctuations in the price and availability of energy to power the Luverne Facility may harm our performance.

The Luverne Facility uses significant amounts of natural gas to produce isobutanol and ethanol. Accordingly, our business is dependent upon natural gas supplied by third parties. The prices for and availability of natural gas are subject to volatile market conditions. These market conditions are affected by factors beyond our control, such as weather conditions, overall economic conditions and governmental regulations. Should the price of natural gas increase, our performance could suffer. Likewise, disruptions in the supply of natural gas could have a material impact on our business and results of operations.

In September 2019, Agri-Energy entered into an agreement with the City of Luverne, Minnesota to purchase electricity generated from a wind electrical energy generating facility for use by the Luverne Facility (the “Wind Project”). The Wind Project is being developed by an affiliate of Juhl and will be comprised of two 2.5 megawatt wind turbines with a maximum output capacity of 5.0 megawatts. The Wind Project is expected to achieve commercial operation in the first half of 2020. If the Wind Project is not completed on the timing anticipated, or at all, we may be unable to power the Luverne Facility in line with current expectations, which could have a material impact on our business and results of operations.

In 2019, we also began developing RNG projects to supply RNG to the Luverne Facility. As part of these projects, we may sell the RNG into natural gas pipelines to third party purchasers. We also expect that securing low-carbon methane for our production energy will assist us in achieving carbon negative GHG emissions on our end products. If we are unable to complete the RNG projects on the timing anticipated, or at all, we may be unable to source RNG in line with current expectations, which could have a material adverse effect on our business and results of operations.

Fluctuations in petroleum prices and customer demand patterns may reduce demand for biofuels and bio-based chemicals.

We anticipate marketing our biofuel as an alternative to petroleum-based fuels. Therefore, if the price of oil falls, any revenues that we generate from biofuel products could decline and we may be unable to produce products that are a commercially viable alternative to petroleum-based fuels. Additionally, demand for liquid transportation fuels, including biofuels, may decrease due to economic conditions or otherwise. We will encounter similar risks in the chemicals industry, where declines in the price of oil may make petroleum-based hydrocarbons less expensive, which could reduce the competitiveness of our bio-based alternatives.

Changes in the prices of distillers grains and iDGs could have a material adverse effect on our financial condition.

We sell distillers grains as a co-product from the production of ethanol at the Luverne Facility during any period in which the production of isobutanol is temporarily paused and our management decides that the Luverne Facility will be temporarily reverted to ethanol production, or during periods in which we produce both isobutanol and ethanol simultaneously. We may also sell distillers grains produced by other ethanol facilities that we acquire, enter into a joint venture or tolling arrangement with, or license to in the future. We also sell the iDGs that are produced as a co-product of our commercial isobutanol production. Distillers grains and iDGs compete with other animal feed products and decreases in the prices of these other products could decrease the demand for and price of distillers grains and iDGs. Additionally, we have produced limited quantities of commercial iDGs and, as such, there is a risk that our iDGs may not meet market requirements. If the price of distillers grains and iDGs decreases or our iDGs do not meet market requirements, our revenue from the sale of distillers grains and future revenue from the sale of iDGs could suffer, which could have a material adverse effect on our financial condition.

To the extent that we produce ethanol rather than isobutanol, or during periods in which we make the strategic decision to revert to ethanol production, or produce both products simultaneously, we will be vulnerable to fluctuations in the price of and cost to produce ethanol.

We believe that, like the Luverne Facility, the other third-party ethanol production facilities that we may access can continue to produce ethanol during most of a Retrofit process. In certain cases, we may obtain income from this ethanol production. Further, we have designed our isobutanol production technology (including the upgrade of the Luverne Facility) to allow us to produce ethanol and isobutanol simultaneously or to produce just ethanol or just isobutanol depending on market conditions. Our earnings from ethanol revenue will be dependent on the price of, demand for and cost to produce ethanol. Decreases in the price of ethanol, as have been experienced during 2019 and in early 2020, whether caused by decreases in gasoline prices, changes in regulations, seasonal fluctuations or otherwise, will reduce our revenues, while increases in the cost of production will reduce our margins. To the extent that ethanol production costs increase or price decreases, earnings from ethanol production could suffer, which could have a material adverse effect on our business.

Sustained narrow commodity margins may cause us to operate at a loss or to reduce or suspend production at the Luverne Facility, and we may or may not be able to recommence production when margins improve.

Our results from operations will be substantially dependent on commodity prices. Many of the risks associated with volatile commodity prices, including fluctuations in feedstock costs and natural gas costs, apply to the production of isobutanol, renewable hydrocarbon products and ethanol. Sustained unfavorable commodity prices, as have been experienced during 2019 and in early 2020, have and may in the future cause our combined revenues from sales of ethanol, isobutanol and related co-products to decline below our marginal cost of production. As market conditions change, our management has from time-to-time decided to reduce or suspend production of isobutanol and/or ethanol at the Luverne Facility and may do so in the future.

The decision to reduce or suspend production at a facility may create additional costs related to continued maintenance, termination of staff, certain unavoidable fixed costs, termination of customer contracts and increased costs to increase or recommence production in the future. These costs may make it difficult or impractical to increase or recommence production of isobutanol and/or ethanol at the Luverne Facility even if margins improve. In addition, any reduction or suspension of the production of isobutanol and/or ethanol at the Luverne Facility may slow or stop our commercialization process, which could have a material adverse effect on our business, financial condition and results of operations.

We may not be successful in the development of individual steps in the production of commercial quantities of isobutanol, renewable hydrocarbon products or ethanol from plant feedstocks in a timely or economic manner, or at all.

As of the date of this Report, we have produced only limited quantities of isobutanol and renewable hydrocarbon products at commercial scale. We may not be successful in increasing our production of isobutanol or renewable hydrocarbon products or initially producing low-carbon ethanol.

Our future success depends on our ability to produce commercial quantities of low-carbon isobutanol and renewable hydrocarbon products and, to a lesser extent, ethanol, in a timely and economic manner. While we have produced isobutanol using our biocatalysts at the Luverne Facility in commercial-scale fermenters, our biocatalysts have not yet produced isobutanol at fully optimized levels in fermenters typical of full scale operation at a commercial facility. The risk of contamination and other problems rises as we increase the scale of our isobutanol production. If we are unable to successfully manage these risks, we may encounter difficulties in achieving our target isobutanol production yield, rate, concentration or purity at a commercial scale, which could delay or increase the costs involved in commercializing our isobutanol production.

The technological and logistical challenges associated with producing, marketing, selling and distributing isobutanol, renewable hydrocarbon products and ethanol are extraordinary, and we may not be able to resolve any difficulties that arise in a timely or cost-effective manner, or at all.

Prior to our purchase of the Luverne Facility, we had never operated or built (through Retrofit or otherwise) a commercial isobutanol, renewable hydrocarbon or ethanol facility. We believe that we understand the engineering and process characteristics necessary to successfully build the additional facilities that we are contemplating and to scale up to larger facilities. We expect to incur additional capital expenditures to increase production of low-carbon isobutanol and renewable hydrocarbon products and to commence low-carbon ethanol production at the Luverne Facility. Our assumptions, however, may prove to be incorrect. Accordingly, we cannot be certain that we can consistently produce low-carbon isobutanol, renewable hydrocarbon products and ethanol in an economical manner in commercial quantities. If our costs to build a commercial facility to produce low-carbon isobutanol, renewable hydrocarbon products and/or ethanol are significantly higher than we expect or if we fail to consistently produce low-carbon isobutanol, renewable hydrocarbon products and/or ethanol economically on a commercial scale or in commercial volumes, our commercialization of low-carbon isobutanol, renewable hydrocarbon products and ethanol and our business, financial condition and results of operations will be materially adversely affected.

Our development strategy relies on our relationships with partners like Praj.

In November 2015, we entered into a joint development agreement and a development license agreement with Praj with the goal for Praj to adapt our isobutanol technology to using non-corn based sugars and lignocellulose feedstocks. Subsequently, in April 2019, we entered into a new joint development agreement, a development license agreement and a construction license agreement with Praj with the goal of continuing to develop and optimize the parameters to produce our isobutanol technology from non-corn based feedstocks. Praj is one of the leading suppliers of engineering, procurement and construction services to the ethanol industry globally. As a result, we believe that our alliance with Praj will allow us to more quickly achieve commercial-scale production of isobutanol derived from feedstock outside of the U.S. However, Praj may fail to fulfill its obligations to us under our agreements such as failing to meet milestones associated with our joint development agreement. If Praj fails to fulfill its obligations to us under our agreements, our ability to realize continued development and commercial benefits from our alliance could be adversely affected and our business and prospects could be harmed.

In addition, we may be unable to secure other partners beyond Praj to assist us in developing commercial isobutanol projects globally. If we are unable to secure such additional partnerships, our business and prospects could be harmed.

Our facilities and processes may fail to produce products at the volumes, rates and costs we expect.

Some or all of our future production facilities may be in locations distant from corn or other feedstock sources, which could increase our feedstock costs or prevent us from acquiring sufficient feedstock volumes for commercial production. General market conditions might also cause increases in feedstock prices, which could likewise increase our production costs.

Even if we secure access to sufficient volumes of feedstock, our production facilities may fail to perform as expected. The equipment and subsystems that we install in our production facilities may never operate as planned. Our systems may prove incompatible with the original facility or require additional modification after installation. Unexpected problems may force us to cease or delay production and the time and costs involved with such delays may prove prohibitive. Any or all of these risks could prevent us from achieving the production throughput and yields necessary to achieve our target annualized production run rates and/or to meet the volume demands or minimum requirements of our customers, including pursuant to definitive supply or distribution agreements that we may enter into, which may subject us to monetary damages. Failure to achieve these rates or meet these minimum requirements, or achieving them only after significant additional expenditures, could substantially harm our commercial performance.

We may be unable to produce isobutanol, renewable hydrocarbon products like ATJ or other products in accordance with customer specifications.

Even if we produce isobutanol, renewable hydrocarbon products like ATJ or other products at our targeted rates, we may be unable to produce these products to meet customer specifications, including those defined in ASTM D7862 “Standard Specification for Butanol for Blending with Gasoline for Use as Automotive Spark-Ignition Engine Fuel," ASTM D7566 “Standard Specifications for Aviation Turbine Fuel Containing Synthesized Hydrocarbons” or specifications to carbon intensity standards. We may need to add additional processing steps or incur capital expenditures in order to meet customer specifications which could add significant costs to our production process. If we fail to meet specific product or volume specifications contained in a supply agreement, the customer may have the right to seek an alternate supply of isobutanol or renewable hydrocarbon products and/or terminate the agreement completely, and we could be required to pay shortfall fees or otherwise be subject to damages. A failure to successfully meet the specifications of our potential customers could decrease demand and significantly hinder market adoption of our products.

We lack significant experience operating commercial-scale isobutanol, renewable hydrocarbon and ethanol facilities and may encounter substantial difficulties operating commercial plants or expanding our business.

We have very limited experience operating commercial-scale isobutanol, renewable hydrocarbon and ethanol facilities concurrently. Accordingly, we may encounter significant difficulties operating at a commercial scale once both production facilities are built out in a side-by-side operation. We believe that our future facilities, like the Luverne Facility, will be able to continue producing ethanol during much of the Retrofit process. We will need to successfully administer and manage this production. Although the employees at the Luverne Facility are experienced in the operation of ethanol facilities, and our future development partners or the entities that we acquire may likewise have such experience, we may be unable to manage ethanol-producing operations, especially given the possible complications associated with a simultaneous Retrofit. Once we complete a commercial Retrofit, operational difficulties may increase, because neither we nor anyone else has significant experience operating a pure isobutanol fermentation facility at a commercial scale. The skills and knowledge gained in operating commercial ethanol facilities or small-scale isobutanol plants may prove insufficient for successful operation of a large-scale isobutanol facility or the Expanded Facility, and we may be required to expend significant time and money to develop our capabilities in isobutanol and renewable hydrocarbon facility operation. We may also need to hire new employees or contract with third parties to help manage our operations, and our performance will suffer if we are unable to hire qualified parties or if they perform poorly.

We may face additional operational difficulties as we further expand our production capacity, including the Expanded Facility. Integrating new facilities with our existing operations may prove difficult. Rapid growth, resulting from our operation of, or other involvement with, isobutanol and renewable hydrocarbon facilities or otherwise, may impose a significant burden on our administrative and operational resources. To effectively manage our growth and execute our expansion plans, we will need to expand our administrative and operational resources substantially and attract, train, manage and retain qualified management, technicians and other personnel. We may be unable to do so. Failure to meet the operational challenges of developing and managing increased production of isobutanol, renewable hydrocarbon products and/or ethanol, or failure to otherwise manage our growth, may have a material adverse effect on our business, financial condition and results of operations.

We may have difficulty adapting our technology to commercial-scale fermentation, which could delay or prevent our commercialization of isobutanol.

While we have demonstrated the ability to produce isobutanol under the demonstration plant operating conditions and under commercial scale operating conditions at the Luverne Facility, and we have succeeded in reaching our commercial fermentation performance targets for isobutanol concentration, fermentation productivity and isobutanol yield in laboratory tests, we have not yet reached all performance targets in a commercial plant environment at the larger scale we contemplate constructing involving multiple fermenters. Ultimately, our yeast biocatalyst may not be able to meet the commercial performance targets in a timely manner, or ever. In addition, the risk of contamination and other problems may increase as we seek to ramp up our production capacity, which could negatively impact our cost of production or require additional capital expenditures to solve for these problems. If we encounter difficulties in optimizing our production, our commercialization of isobutanol and our business, financial condition and results of operations will be materially adversely affected.

We may have difficulties gaining market acceptance and successfully marketing our isobutanol and renewable hydrocarbon products to customers, including chemical producers, fuel distributors and refiners.

A key component of our business strategy is to market our isobutanol and renewable hydrocarbon products to chemical producers, fuels distributors, refiners and other fuel and chemical industry market participants. We have limited experience marketing isobutanol and renewable hydrocarbon products on a commercial scale and we may fail to successfully negotiate marketing agreements in a timely manner or on favorable terms. If we fail to successfully market our isobutanol or renewable hydrocarbon products to refiners, fuels distributors, chemical producers and others, our business, financial condition and results of operations will be materially adversely affected.

A very limited market currently exists for isobutanol as a fuel or as a gasoline blendstock. Therefore, to gain market acceptance and successfully market our isobutanol to fuels distributors and refiners, we must effectively demonstrate the commercial advantages of using isobutanol over other biofuels and blendstocks, as well as our ability to produce isobutanol reliably on a commercial scale at a sufficiently low cost. We must show that isobutanol is compatible with existing infrastructure and does not damage pipes, engines, storage facilities or pumps. We must also overcome marketing and lobbying efforts by producers of other biofuels and blendstocks, including ethanol, many of whom may have greater resources than we do. If the markets for isobutanol as a fuel or as a gasoline blendstock do not develop as we currently anticipate, or if we are unable to penetrate these markets successfully, our revenue and growth rate could be materially and adversely affected.

We also intend to market our isobutanol to chemical producers for use in making various chemicals such as isobutylene, a type of butene that can be produced through the dehydration of isobutanol. Although a significant market currently exists for isobutylene produced from petroleum, which is widely used in the production of plastics, specialty chemicals, alkylate for gasoline blending and high octane aviation gasoline, no one has successfully created isobutylene on a commercial scale from bio-isobutanol. Therefore, to gain market acceptance and successfully market our isobutanol to chemical producers, we must show that our isobutanol can be converted into isobutylene at a commercial scale. As no company currently dehydrates commercial volumes of isobutanol into isobutylene, we must demonstrate the large-scale feasibility of the process and potentially reach agreements with companies that are willing to invest in the necessary dehydration infrastructure. Failure to reach favorable agreements with these companies, or the inability of their plants to convert isobutanol into isobutylene at sufficient scale, may slow our development in the chemicals market and could significantly affect our profitability.

Obtaining market acceptance in the chemicals industry is complicated by the fact that many potential chemicals industry customers have invested substantial amounts of time and money in developing petroleum-based production channels. These potential customers generally have well-developed manufacturing processes and arrangements with suppliers of chemical components and may display substantial resistance to changing these processes. Pre-existing contractual commitments, unwillingness to invest in new infrastructure, distrust of new production methods and lengthy relationships with current suppliers may all slow market acceptance of isobutanol.

We believe that consumer demand for environmentally sensitive products will drive demand among large brand owners for isobutanol, renewable hydrocarbon products and low-carbon ethanol. One of our marketing strategies is to leverage this demand to obtain commitments from large brand owners to purchase our products. We believe these commitments will, in turn, promote chemicals industry demand for our isobutanol and renewable hydrocarbon products. If consumer demand for environmentally sensitive products fails to develop at sufficient scale or if such demand fails to drive large brand owners to seek sources of renewable isobutanol or renewable hydrocarbon products, our revenue and growth rate could be materially and adversely affected.

We may have difficulties scaling up our renewable hydrocarbon technology, and, as such, we may be unable to produce commercial quantities of our renewable hydrocarbon products and any such production may be costlier than we anticipate.

We have developed the South Hampton Facility in Silsbee, Texas in partnership with South Hampton Resources. Currently, the South Hampton Facility can produce approximately 100,000 gallons of renewable hydrocarbon products from our renewable isobutanol for use as fuels and chemicals. We have demonstrated the ability to convert our isobutanol at this level into products such as ATJ, isooctane, isooctene and par-xylene.

The production and sale of commercial volumes of renewable hydrocarbon products, such as ATJ, isooctane and isooctene, produced from our isobutanol is an important part of our business plans. However, we may encounter challenges in scaling up our process to convert isobutanol into renewable hydrocarbon products successfully. In addition, the cost to construct commercial hydrocarbons facilities or the production costs associated with the operation of such facilities may be higher than we project. If we encounter such difficulties, this may significantly impact the development of the markets for our renewable hydrocarbon products, impact performance under our supply agreements and could significantly affect our profitability.

We may be reliant on Butamax to develop certain markets for isobutanol.

As part of the License Agreement entered into with Butamax, it was agreed that Butamax would take the lead in developing the markets for on-road gasoline blendstocks. This would entail progressing the required approvals for these markets, as well as managing the marketing and distribution of our isobutanol and our potential licensee's isobutanol in these markets beyond certain minimum volumes. On June 12, 2018, the EPA announced that it approved the registration of isobutanol as a fuel additive for blending into gasoline at levels up to 16 volume percent for on-road automotive use. If Butamax is unable to maintain or obtain the necessary approvals to sell isobutanol into the on-road gasoline blendstock markets, or if it is unsuccessful in building market demand for isobutanol as an on-road gasoline blendstock, our revenue and growth rate could be materially and adversely affected.

We may be required to pay Butamax royalties for selling isobutanol into certain markets, which could hinder our ability to competitively sell our isobutanol into those markets.

As part of the License Agreement entered into with Butamax, it was agreed that we, and our potential licensees, may be required to pay Butamax royalties for selling isobutanol into the on-road gasoline blendstock markets and the chemical isobutylene applications markets beyond certain minimum volumes. The addition of these royalties may make our isobutanol uncompetitive from a price perspective, which may hinder our ability to sell into these markets. If this is the case, our revenue and growth rate could be materially and adversely affected.

Even if we are successful in consistently producing isobutanol and renewable hydrocarbon products on a commercial scale, we may not be successful in negotiating sufficient supply agreements or pricing terms for our production.

We expect that many of our customers will be large companies with extensive experience operating in the fuels or chemicals markets. As an early stage company, we lack commercial operating experience, and may face difficulties in developing marketing expertise in these fields. Our business model relies upon our ability to successfully negotiate and structure long-term supply agreements for the isobutanol, renewable hydrocarbon products and other products we produce and to negotiate pricing terms that generate positive results from the operations of the Luverne Facility. Certain agreements with existing and potential customers may initially only provide for the purchase of limited quantities from us. Our ability to increase our sales will depend in large part upon our ability to expand these existing customer relationships into long-term supply agreements. Maintaining and expanding our existing relationships and establishing new ones can require substantial investment without any assurance from customers that they will place significant orders. In addition, many of our potential customers may be more experienced in these matters than we are, and we may fail to successfully negotiate these agreements in a timely manner or on favorable terms which, in turn, may force us to slow our production, dedicate additional resources to increasing our storage capacity and/or dedicate resources to sales in spot markets. Furthermore, should we become more dependent on spot market sales, our profitability will become increasingly vulnerable to short-term fluctuations in the price and demand for petroleum-based fuels and competing substitutes.

Our isobutanol may be less compatible with existing refining and transportation infrastructure than we believe, which may hinder our ability to market our product on a large scale.

We developed our business model based on our belief that our isobutanol is fully compatible with existing refinery infrastructure. For example, when making isobutanol blends, we believe that gasoline refineries will be able to pump our isobutanol through their pipes and blend it in their existing facilities without damaging their equipment. If our isobutanol proves unsuitable for such handling, it will be more expensive for refiners to use our isobutanol than we anticipate, and they may be less willing to adopt it as a gasoline blendstock, forcing us to seek alternative purchasers.

Likewise, our plans for marketing our isobutanol are based upon our belief that it will be compatible with the pipes, tanks and other infrastructure currently used for transporting, storing and distributing gasoline. If our isobutanol or products incorporating our isobutanol cannot be transported with this equipment, we will be forced to seek alternative transportation arrangements, which will make our isobutanol and products produced from our isobutanol more expensive to transport and less appealing to potential customers. Reduced compatibility with either refinery or transportation infrastructure may slow or prevent market adoption of our isobutanol, which could substantially harm our performance.

A sustained low oil price environment may negatively impact the price we receive for the sale of our isobutanol, renewable hydrocarbon products and ethanol.

Many of our end-products such as isobutanol, renewable hydrocarbon products and ethanol have some level of price correlation with crude oil. If crude oil prices were to remain at low levels over a sustained period of time, this may have an impact on the pricing that we are able to achieve in the marketplace for many of those end-products. This may cause us to operate at a lower, or negative, operating margin and, as a result, our management may decide to reduce or suspend production of isobutanol and/or ethanol at the Luverne Facility. Unfavorable operating margins may also impact our ability to enter into commercial agreements with development partners or licensees.

If we engage in acquisitions, we will incur a variety of costs and may potentially face numerous risks that could adversely affect our business and operations.

If appropriate opportunities become available, we may acquire businesses, assets, technologies or products to enhance our business in the future. In connection with any future acquisitions, we could, subject to certain limitations in the agreements governing our indebtedness, including our secured indebtedness with Whitebox:

- issue additional equity securities which would dilute our current stockholders;
- incur substantial debt to fund the acquisitions; or
- assume significant known or unknown liabilities.

Acquisitions involve numerous risks, including problems integrating the purchased operations, technologies or products, unanticipated costs and other liabilities, diversion of management's attention from our core business, adverse effects on existing business relationships with current and/or prospective partners, customers and/or suppliers, risks associated with entering markets in which we have no or limited prior experience and potential loss of key employees. Other than our acquisition of the Luverne Facility, we have not engaged in acquisitions in the past, and do not have experience in managing the integration process. Therefore, we may not be able to successfully integrate any businesses, assets, products, technologies or personnel that we might acquire in the future without a significant expenditure of operating, financial and management resources, if at all. The integration process could divert management time from focusing on operating our business, result in a decline in employee morale and cause retention issues to arise from changes in compensation, reporting relationships, future prospects or the direction of the business. In addition, we may acquire companies that have insufficient internal financial controls, which could impair our ability to integrate the acquired company and adversely impact our financial reporting. If we fail in our integration efforts with respect to acquisitions and are unable to efficiently operate as a combined organization, our business, financial condition and results of operations may be materially adversely affected.

If we engage in additional joint ventures, we will incur a variety of costs and may potentially face numerous risks that could adversely affect our business and operations.

If appropriate opportunities become available, we may enter into joint ventures with the owners of existing ethanol production facilities in order to acquire access to additional isobutanol production capacity. We currently anticipate that in each such joint venture, the ethanol producer would contribute access to its existing ethanol production facility and we would be responsible for Retrofitting such facility to produce isobutanol. Upon completion of the Retrofit, and in some cases the attainment of certain performance targets, both parties to the joint venture would receive a portion of the profits from the sale of isobutanol, consistent with our business model. In connection with these joint ventures, we could incur substantial debt to fund the Retrofit of the accessed facilities and we could assume significant liabilities.

Realizing the anticipated benefits of joint ventures, including projected increases to production capacity and additional revenue opportunities, involves a number of potential challenges. The failure to meet these challenges could seriously harm our financial condition and results of operations. Joint ventures are complex and time consuming and we may encounter unexpected difficulties or incur unexpected costs related to such arrangements, including:

- difficulties negotiating joint venture agreements with favorable terms and establishing relevant performance metrics;
- difficulties completing the Retrofits of the accessed facilities using our integrated fermentation technology;
- the inability to meet applicable performance targets related to the production of isobutanol;
- difficulties obtaining the permits and approvals required to produce and sell our products in different geographic areas;
- complexities associated with managing the geographic separation of accessed facilities;
- diversion of management attention from ongoing business concerns to matters related to the joint ventures;
- difficulties maintaining effective relationships with personnel from different corporate cultures; and
- the inability to generate sufficient revenue to offset Retrofit costs.

Additionally, our joint venture partners may have liabilities or adverse operating issues that we fail to discover through due diligence prior to entering into the joint ventures. In particular, to the extent that our joint venture partners failed to comply with or otherwise violated applicable laws or regulations, or failed to fulfill their contractual obligations, we may suffer financial harm and/or reputational harm for these violations or otherwise be adversely affected.

Our joint venture partners may have significant amounts of existing debt and may not be able to service their existing debt obligations, which could cause the failure of a specific project and the loss by us of any investment we have made to Retrofit the facilities owned by the joint venture partner. In addition, if we are unable to meet specified performance targets related to the production of isobutanol at a facility owned by one of our joint venture partners, we may never become eligible to receive a portion of the profits of the joint venture and may be unable to recover the costs of Retrofitting the facility.

Additionally, we plan to be a leading marketer for all isobutanol and co-products produced using our proprietary technology and sold in markets other than on-road gasoline blendstocks including, without limitation, all isobutanol that is produced by any facilities that we access via joint venture. Marketing agreements can be very complex and the obligations that we assume as a leading marketer of isobutanol may be time consuming. We have no experience marketing isobutanol on a commercial scale and we may fail to successfully negotiate marketing agreements in a timely manner or on favorable terms. If we fail to successfully market the isobutanol produced using our proprietary technology to refiners and chemical producers, our business, financial condition and results of operations will be materially adversely affected.

If we lose key personnel, including key management personnel, or are unable to attract and retain additional personnel, it could delay our product development programs and harm our research and development efforts, make it more difficult to pursue partnerships or develop our own products or otherwise have a material adverse effect on our business.

Our business is complex and we intend to target a variety of markets. Therefore, it is critical that our management team and employee workforce are knowledgeable in the areas in which we operate. The departure, illness or absence of any key members of our management, including our named executive officers, or the failure to attract or retain other key employees who possess the requisite expertise for the conduct of our business, could prevent us from developing and commercializing our products for our target markets and entering into partnerships or licensing arrangements to execute our business strategy. In addition, the loss of any key scientific staff, or the failure to attract or retain other key scientific employees, could prevent us from developing and commercializing our products for our target markets and entering into partnerships or licensing arrangements to execute our business strategy. We may not be able to attract or retain qualified employees in the future due to the intense competition for qualified personnel among biotechnology and other technology-based businesses, particularly in the advanced biofuels area, or due to the limited availability of personnel with the qualifications or experience necessary for our renewable chemicals and advanced biofuels business. If we are not able to attract and retain the necessary personnel to accomplish our business objectives, we may experience staffing constraints that will adversely affect our ability to meet the demands of our partners and customers in a timely fashion or to support our internal research and development programs. In particular, our product and process development programs are dependent on our ability to attract and retain highly skilled scientists. Competition for experienced scientists and other technical personnel from numerous companies and academic and other research institutions may limit our ability to do so on acceptable terms. All of our employees are at-will employees, meaning that either the employee or we may terminate their employment at any time.

Our planned activities will require additional expertise in specific industries and areas applicable to the products and processes developed through our technology platform or acquired through strategic or other transactions, especially in the end markets that we seek to penetrate. These activities will require the addition of new personnel, and the development of additional expertise by existing personnel. The inability to attract personnel with appropriate skills or to develop the necessary expertise could impair our ability to grow our business.

Government grants are subject to uncertainty, which could harm our business and results of operations.

We may seek to obtain government grants and subsidies in the future to offset all or a portion of our operating costs and the costs of our research and development activities. We cannot be certain that we will be able to secure any such government grants or subsidies. Any new grants that we may obtain may be terminated, modified or recovered by the granting governmental body under certain conditions.

We may also be subject to audits by government agencies as part of routine audits of our activities funded by our government grants. As part of an audit, these agencies may review our performance, cost structures and compliance with applicable laws, regulations and standards. Funds available under grants must be applied by us toward the research and development programs specified by the granting agencies, rather than for all of our programs

generally. If any of our costs are found to be allocated improperly, the costs may not be reimbursed and any costs already reimbursed may have to be refunded. Accordingly, an audit could result in an adjustment to our revenues and results of operations.

We may face substantial competition from companies with greater resources and financial strength, which could adversely affect our performance and growth.

We may face substantial competition in the markets for isobutanol, renewable hydrocarbon products, polyester, rubber, plastics, fibers, other polymers and ethanol. Our competitors include companies in the incumbent petroleum-based industry as well as those in the nascent biorenewable industry. The incumbent petroleum-based industry benefits from a large established infrastructure, production capability and business relationships. The incumbents' greater resources and financial strength provide significant competitive advantages that we may not be able to overcome in a timely manner. Academic and government institutions may also develop technologies which will compete with us in the chemicals, solvents and blendstock markets.

Our ability to compete successfully will depend on our ability to develop proprietary products that reach the market in a timely manner and are technologically superior to and/or are less expensive than other products on the market. Many of our competitors have substantially greater production, financial, research and development, personnel and marketing resources than we do. In addition, certain of our competitors may also benefit from local government subsidies and other incentives that are not available to us. As a result, our competitors may be able to develop competing and/or superior technologies and processes, and compete more aggressively and sustain that competition over a longer period of time than we could. Our technologies and products may be rendered obsolete or uneconomical by technological advances or entirely different approaches developed by one or more of our competitors. As more companies develop new intellectual property in our markets, the possibility of a competitor acquiring patent or other rights that may limit our products or potential products increases, which could lead to litigation. Furthermore, to secure purchase agreements from certain customers, we may be required to enter into exclusive supply contracts, which could limit our ability to further expand our sales to new customers. Likewise, major potential customers may be locked into long-term, exclusive agreements with our competitors, which could inhibit our ability to compete for their business.

In addition, various governments have recently announced a number of spending programs focused on the development of clean technologies, including alternatives to petroleum-based fuels and the reduction of carbon emissions. Such spending programs could lead to increased funding for our competitors or a rapid increase in the number of competitors within those markets.

We also may face substantial competition as we develop our RNG project and seek to work with farmers and landowners to source our biogas feedstock and lease land to install and operate RNG processing facilities. Our competitors include established companies and developers with significantly greater resources and financial strength, which may provide them with competitive advantages that we may not be able to overcome in a timely manner, or at all.

Our limited resources relative to many of our competitors may cause us to fail to anticipate or respond adequately to new developments and other competitive pressures. This failure could reduce our competitiveness and market share, adversely affect our results of operations and financial position and prevent us from obtaining or maintaining profitability.

Our future success will depend on our ability to maintain a competitive position with respect to technological advances.

The biorenewable industry is characterized by rapid technological change. Our future success will depend on our ability to maintain a competitive position with respect to technological advances. Technological development by others may impact the competitiveness of our products in the marketplace. Competitors and potential competitors who have greater resources and experience than we do may develop products and technologies that make ours obsolete or may use their greater resources to gain market share at our expense.

We may face significant and substantial competition as it relates to our proprietary biofuels which could adversely affect our performance and growth.

Biofuels companies may provide substantial competition in the renewable hydrocarbons market. With respect to production of renewable gasoline, biofuels competitors are numerous and include both large established companies and numerous startups. For example, Virent Energy Systems, Inc. has developed a process for making gasoline and gasoline blendstocks. Many other competitors may do so as well. In the jet fuel market, we will face competition from companies such as Neste Corporation, Synthetic Genomics, Inc., and Exxon-Mobil Corporation that are pursuing production of jet fuel from algae-based technology. Renewable Energy Group, Inc. and others are also targeting production of jet fuels from vegetable oils and animal fats. Red Rock Biofuels LLC, Fulcom BioEnergy, Inc. and others are planning to produce jet fuel from renewable biomass. We may also face competition from companies working to produce jet fuel from hydrogenated fatty acid methyl esters. In the diesel fuels market, competitors such as Amyris Biotechnologies, Inc. have developed technologies for production of alternative hydrocarbon diesel fuel.

In the production of other biofuels, including our renewable hydrocarbon products, key competitors include Shell Oil Company, POET, LLC, ICM, Inc., Archer Daniels Midland Company, Zea 2 LLC, Iogen Corporation and many smaller startup companies. If these companies are successful in establishing low cost cellulosic ethanol or other fuel production, it could negatively impact the market for our isobutanol as a gasoline blendstock. In the markets for the hydrocarbon fuels that we plan to produce from our isobutanol, we will face competition from the incumbent petroleum-based fuels industry. The incumbent petroleum-based fuels industry makes the vast majority of the world's gasoline, jet and diesel fuels and blendstocks. It is a mature industry with a substantial base of infrastructure for the production and distribution of petroleum-derived products. The size, established infrastructure and significant resources of many companies in this industry may put us at a substantial competitive disadvantage and delay or prevent the establishment and growth of our business in the market for hydrocarbon fuels.

In the production of isobutanol, we face competition from Butamax. Additionally, a number of companies including Cathay Industrial Biotech, Ltd., METabolic EXplorer, S.A. and Eastman Chemical Company are developing n-butanol production capability from a variety of renewable feedstocks.

In the gasoline blendstock market, we will compete with our isobutanol against renewable ethanol producers (including those working to produce ethanol from cellulosic feedstocks), producers of alkylate from petroleum and producers of other blendstocks, all of whom may reduce our ability to obtain market share or maintain our price levels. If any of these competitors succeed in producing blendstocks more efficiently, in higher volumes or offering superior performance than our isobutanol, our financial performance may suffer. Furthermore, if our competitors have more success marketing their products or reaching development or supply agreements with major customers, our competitive position may also be harmed.

In the ethanol market, we operate in a highly competitive industry in the U.S. According to the BBI International, there are over 200 ethanol facilities in the U.S. with an installed nameplate capacity of over 16 billion gallons. Some of the key competitors in the U.S. include Archer-Daniels-Midland Company, Green Plains, Inc., POET, LLC and Valero Energy Corporation. We also face competition from foreign producers of ethanol. Brazil is

believed to be the world’s second largest ethanol producing country. Many producers have much larger production capacities and operate at a lower cost of production than we do. As a result, these companies may be able to compete more effectively in narrower commodity margin environments.

Our competitive position in the polyester, rubber, plastics, fibers and other polymers markets versus the incumbent petroleum-derived products and other renewable butanol producers may not be favorable.

In the polyester, rubber, plastics, fibers and other polymers markets, we face competition from incumbent petroleum-derived products, other renewable isobutanol producers and renewable n-butanol producers. Our competitive position versus the incumbent petroleum-derived products and other renewable butanol producers may not be favorable. Petroleum-derived products have dominated the market for many years and there is substantial existing infrastructure for production from petroleum sources, which may impede our ability to establish a position in these markets. Other isobutanol and n-butanol companies may develop technologies that prove more effective than our isobutanol production technology, or such companies may be more adept at marketing their production. Additionally, one company in France, Global Bioenergies, S.A., is pursuing the production of isobutylene from renewable carbohydrates directly. Since conversion of isobutanol to butenes such as isobutylene is a key step in producing many polyester, rubber, plastics, fibers and other polymers from our isobutanol, this direct production of renewable isobutylene, if successful, could limit our opportunities in these markets.

In the polyester, rubber, plastics, fibers and other polymers markets, we expect to face vigorous competition from existing technologies. The companies we may compete with may have significantly greater access to resources, far more industry experience and/or more established sales and marketing networks. Additionally, since we do not plan to produce most of these products directly, we will depend on the willingness of potential customers to purchase and convert our isobutanol into their products. These potential customers generally have well-developed manufacturing processes and arrangements with suppliers of the chemical components of their products and may have a resistance to changing these processes and components. These potential customers frequently impose lengthy and complex product qualification procedures on their suppliers, influenced by consumer preference, manufacturing considerations such as process changes and capital and other costs associated with transitioning to alternative components, supplier operating history, regulatory issues, product liability and other factors, many of which are unknown to, or not well understood by, us. Satisfying these processes may take many months or years. If we are unable to convince these potential customers that our isobutanol is comparable or superior to the alternatives that they currently use, we will not be successful in entering these markets and our business will be adversely affected.

Business interruptions, including those related to the novel strain of coronavirus (COVID-19), could adversely impact our operations, including among others, our manufacturing and supply chain, sales and marketing and product development operations and could have an adverse impact on our business and our financial results.

We are vulnerable to natural disasters and other events that could disrupt our operations, such as riots, civil disturbances, war, terrorist acts, floods, infections in our laboratory or production facilities or those of our contract manufacturers and other events beyond our control. We do not have a detailed disaster recovery plan. In addition, we may not carry sufficient business interruption insurance to compensate us for losses that may occur. Any losses or damages we incur could have a material adverse effect on our cash flows and success as an overall business.

In addition, public health epidemics or outbreaks could adversely impact our business. For example, in December 2019, a novel strain of coronavirus (COVID-19) emerged in Wuhan, Hubei Province, China. While initially the outbreak was largely concentrated in China and caused significant disruptions to its economy, it has now spread to several other countries and infections have been reported globally. The extent to which the coronavirus impacts our operations will depend on future developments, which are highly uncertain and cannot be predicted with confidence, including the duration of the outbreak, new information which may emerge concerning the severity of the coronavirus and the actions to contain the coronavirus or treat its impact, among others. In particular, the continued spread of the coronavirus globally could result in a widespread health crisis that could adversely affect the global economy and financial markets, resulting in an economic downturn, and could also adversely impact our operations, including among others, our manufacturing and supply chain, sales and marketing and product development operations, particularly our prospective jet fuel sales if the airline industry suffers long-term damage, and could have an adverse impact on our business and our financial results.

Our business and operations would suffer in the event of system failures.

Our business is dependent on proprietary technologies, processes and information that we have developed, much of which is stored on our computer systems. Despite the implementation of security measures, our internal computer systems are vulnerable to damage from computer viruses, human error, unauthorized access, natural disasters, intentional acts of vandalism, terrorism, war and telecommunication and electrical failures. Any system failure, accident or security breach that causes interruptions in our operations could result in a material disruption of our business. To the extent that any disruption or security breach results in a loss or damage to our data or inappropriate disclosure of confidential or proprietary information, we may incur liability, reputation damage and harm to our business operations.

We may engage in hedging transactions, which could harm our business.

In the future, we may engage in hedging transactions to offset some of the effects of volatility in commodity prices. Hedging activities may cause us to suffer losses, such as if we purchase a position in a declining market or sell a position in a rising market. Furthermore, hedging would expose us to the risk that we may have under- or over-estimated our need for a specific commodity or that the other party to a hedging contract may default on its obligation. If there are significant swings in commodity prices, or if we purchase more corn for future delivery than we can process, we may have to pay to terminate a futures contract, resell unneeded corn inventory at a loss, or produce our products at a loss, all of which would have a material adverse effect on our financial performance. We may vary the hedging strategies we undertake, which could leave us more vulnerable to increases in commodity prices or decreases in the prices of isobutanol, distillers grains, iDGs or ethanol. Future losses from hedging activities and changes in hedging strategy could have a material adverse effect on our operations.

Ethical, legal and social concerns about genetically engineered products and processes, and similar concerns about feedstocks grown on land that could be used for food production, could limit or prevent the use of our products, processes and technologies and limit our revenues.

Some of our processes involve the use of genetically engineered organisms or genetic engineering technologies. Additionally, our feedstocks may be grown on land that could be used for food production, which subjects our feedstock sources to “food versus fuel” concerns. If we are not able to overcome the ethical, legal and social concerns relating to genetic engineering or food versus fuel, our products and processes may not be accepted. Any of the risks discussed below could result in increased expenses, delays or other impediments to our programs or the public acceptance and commercialization of products and processes dependent on our technologies or inventions.

Our ability to develop and commercialize one or more of our technologies, products or processes could be limited by the following factors:

- public attitudes about the safety and environmental hazards of, and ethical concerns over, genetic research and genetically engineered products and

processes, which could influence public acceptance of our technologies, products and processes;

- public attitudes regarding and potential changes to laws governing ownership of genetic material, which could harm our intellectual property rights with respect to our genetic material and discourage others from supporting, developing or commercializing our products, processes and technologies;

- public attitudes and ethical concerns surrounding production of feedstocks on land which could be used to grow food, which could influence public acceptance of our technologies, products and processes;

- governmental reaction to negative publicity concerning genetically engineered organisms, which could result in greater government regulation of genetic research and derivative products; and

- governmental reaction to negative publicity concerning feedstocks produced on land which could be used to grow food, which could result in greater government regulation of feedstock sources.

The subjects of genetically engineered organisms and food versus fuel have received negative publicity, which has aroused public debate. This adverse publicity could lead to greater regulation and trade restrictions on imports of genetically engineered products or feedstocks grown on land suitable for food production.

The biocatalysts that we develop have significantly enhanced characteristics compared to those found in naturally occurring enzymes or microbes. While we produce our biocatalysts only for use in a controlled industrial environment, the release of such biocatalysts into uncontrolled environments could have unintended consequences. Any adverse effect resulting from such a release could have a material adverse effect on our business and financial condition, and we may be exposed to liability for any resulting harm.

As isobutanol has not previously been used as a commercial fuel in significant amounts, its use subjects us to product liability risks.

Isobutanol has not been used as a commercial fuel in large quantities or for a long period of time. Research regarding isobutanol and its distribution infrastructure is ongoing. Although isobutanol has been tested on some engines, there is a risk that it may damage engines or otherwise fail to perform as expected. If isobutanol degrades the performance or reduces the lifecycle of engines, or causes them to fail to meet emissions standards, market acceptance could be slowed or stopped, and we could be subject to product liability claims. A significant product liability lawsuit could substantially impair our production efforts and could have a material adverse effect on our business, reputation, financial condition and results of operations.

We may not be able to use some or all of our net operating loss carry-forwards to offset future income.

We have net operating loss carryforwards due to prior period losses generated before January 1, 2020, which if not utilized will begin to expire at various times over the next 20 years. If we are unable to generate sufficient taxable income to utilize our net operating loss carryforwards, these carryforwards could expire unused and be unavailable to offset future income tax liabilities.

In addition, under Section 382 of the Internal Revenue Code of 1986, as amended, a corporation that undergoes an “ownership change” (generally defined as a greater than 50% change (by value) in its equity ownership over a three-year period) is subject to limitation on its ability to utilize its pre-change net operating loss carry-forwards, or net operating losses, to offset future taxable income. We may have experienced one or more ownership changes in prior years, and the issuance of shares in connection with our initial public offering may itself have triggered an ownership change. In addition, future changes in our stock ownership, which may be outside of our control, may trigger an ownership change, as may future equity offerings or acquisitions that have equity as a component of the purchase price. If an ownership change has occurred or does occur in the future, our ability to utilize our net operating losses to offset income if we attain profitability may be limited.

If we fail to maintain an effective system of internal controls, we might not be able to report our financial results accurately or prevent fraud; in that case, our stockholders could lose confidence in our financial reporting, which would harm our business and could negatively impact the price of our stock.

Effective internal controls are necessary for us to provide reliable financial reports and prevent fraud. In addition, Section 404 of the Sarbanes-Oxley Act of 2002 (“Section 404”) requires us to evaluate and report on our internal control over financial reporting and have our principal executive officer and principal financial officer certify as to the accuracy and completeness of our financial reports. The process of maintaining our internal controls and complying with Section 404 is expensive and time consuming, and requires significant attention of management. We cannot be certain that these measures will ensure that we maintain adequate controls over our financial processes and reporting in the future. Even if we conclude that our internal control over financial reporting provides reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles, because of their inherent limitations, our internal controls over financial reporting may not prevent or detect fraud or misstatements. Failure to maintain required controls or implement new or additional controls as circumstances warrant, or difficulties encountered in maintaining or implementing controls, could harm our results of operations or cause us to fail to meet our reporting obligations.

Our management has concluded that there are no material weaknesses in our internal controls over financial reporting as of December 31, 2019. However, there can be no assurance that our controls over financial processes and reporting will be effective in the future or that additional material weaknesses or significant deficiencies in our internal controls will not be discovered in the future. If we, or our independent registered public accounting firm, discover a material weakness, the disclosure of that fact, even if quickly remedied, could reduce the market’s confidence in our financial statements and harm our stock price. In addition, a delay in compliance with Section 404 could subject us to a variety of administrative sanctions, including SEC action, ineligibility for short form resale registration, the suspension or delisting of our common stock from the stock exchange on which it is listed and the inability of registered broker-dealers to make a market in our common stock, which would further reduce our stock price and could harm our business.

We may enter into letters of intent, memoranda of understanding and other largely non-binding agreements with potential customers or partners that may not result in legally binding, definitive agreements.

From time to time, we may enter into letters of intent, memoranda of understanding and other largely non-binding agreements or understandings with potential customers or partners in order to develop our business and the markets that we serve. We can make no assurance that legally binding, definitive agreements reflecting the terms of such non-binding agreements will be completed with such customers or partners, or at all.

Competitiveness of our products for fuel use in the U.S. depends in part on the RFS Program at the federal level, and the benefits to our products derived from the RFS Program could change.

The RFS Program and policy are currently being discussed by policy makers. The RFS Program and policy could change impacting the RIN benefits our products could receive, making our products less competitive to the incumbent products made from petroleum. Negative changes in the RFS Program could have a material adverse effect on our business, reputation, financial condition and results of operations.

We may not qualify for significant carbon value benefit in those states, regions and countries where renewable carbon value in fuel products is being assigned.

In 2019, we submitted a design pathway application to the California Air Resources Board to gain approval for low-carbon intensity ethanol utilizing beef manure biogas as a process input under the LCFS, and we may also seek approval under similar programs in the future. It is possible that our products may not qualify for the benefits of the LCFS or similar programs in other states and countries.

We are in the process of developing our RNG project to produce RNG that can be used to power certain of our operations, as well as to sell to markets with low-carbon fuel standard programs. In addition, in September 2019, we entered into the Wind Project, which we expect to provide power to the Luverne Facility. There is no guarantee that the RNG project or the Wind Project will be completed in a timely manner, if ever, or that we will successfully meet low-carbon fuel standards in California or other states or countries. Failure of our products to qualify for LCFS or other similar programs could have a material adverse effect on our business.

Risks Related to Intellectual Property

Our ability to compete may be adversely affected if we are unsuccessful in defending against any claims by competitors or others that we are infringing upon their intellectual property rights.

The various bioindustrial markets in which we plan to operate are subject to frequent and extensive litigation regarding patents and other intellectual property rights. In addition, many companies in intellectual property-dependent industries, including the renewable energy industry, have employed intellectual property litigation as a means to gain an advantage over their competitors. As a result, we may be required to defend against claims of intellectual property infringement that may be asserted by our competitors against us and, if the outcome of any such litigation is adverse to us, it may affect our ability to compete effectively.

Litigation, interferences, opposition proceedings or other intellectual property proceedings inside and outside of the U.S. may divert management time from focusing on business operations, could cause us to spend significant amounts of money and may have no guarantee of success. Any future intellectual property litigation could also force us to do one or more of the following:

- stop selling, incorporating, manufacturing or using our products that use the subject intellectual property;
- obtain from a third party asserting its intellectual property rights, a license to sell or use the relevant technology, which license may not be available on reasonable terms, or at all;
- redesign those products or processes, such as our processes for producing isobutanol and ethanol, that use any allegedly infringing or misappropriated technology, which may result in significant cost or delay to us, or which redesign could be technically infeasible;
- pay attorneys' fees and expenses; or
- pay damages, including the possibility of treble damages in a patent case if a court finds us to have willfully infringed certain intellectual property rights.

We are aware of a significant number of patents and patent applications relating to aspects of our technologies filed by, and issued to, third parties. We cannot assure you that we will ultimately prevail if any of this third-party intellectual property is asserted against us.

Our ability to compete may be adversely affected if we do not adequately protect our proprietary technologies or if we lose some of our intellectual property rights through costly litigation or administrative proceedings.

Our success will depend in part on our ability to obtain patents and maintain adequate protection of our intellectual property covering our technologies and products and potential products in the U.S. and other countries. We have adopted a strategy of seeking patent protection in the U.S. and in certain foreign countries with respect to certain of the technologies used in or relating to our products and processes. We own rights to hundreds of issued patents and filed patent applications in the U.S. and in various foreign jurisdictions. When and if issued, patents would expire at the end of their term and any patent would only provide us commercial advantage for a limited period of time, if at all. Our patent applications are directed to our enabling technologies and to our methods and products which support our business in the advanced biofuels and renewable chemicals markets. We intend to continue to apply for patents relating to our technologies, methods and products as we deem appropriate.

Only some of the patent applications that we have filed in the U.S. or in any foreign jurisdictions, and only certain of the patent applications filed by third parties in which we own rights, have been issued. A filed patent application does not guarantee a patent will issue and a patent issuing does not guarantee its validity, nor does it give us the right to practice the patented technology or commercialize the patented product. Third parties may have or obtain rights to "blocking patents" that could be used to prevent us from commercializing our products or practicing our technology. The scope and validity of patents and success in prosecuting patent applications involve complex legal and factual questions and, therefore, issuance, coverage and validity cannot be predicted with any certainty. Patents issuing from our filed applications may be challenged, invalidated or circumvented. Moreover, third parties could practice our inventions in secret and in territories where we do not have patent protection. Such third parties may then try to sell or import products made using our inventions in and into the U.S. or other territories and we may be unable to prove that such products were made using our inventions. Additional uncertainty may result from implementation of the Leahy-Smith America Invents Act, enacted in September 2011, as well as other potential patent reform legislation passed by the U.S. Congress and from legal precedent handed down by the Federal Circuit Court and the U.S. Supreme Court, as they determine legal issues concerning the scope, validity and construction of patent claims. Because patent applications in the U.S. and many foreign jurisdictions are typically not published until 18 months after filing, or in some cases not at all, and because publication of discoveries in the scientific literature often lags behind the actual discoveries, there is additional uncertainty as to the validity of any patents that may issue and the potential for "blocking patents" coming into force at some future date. Accordingly, we cannot ensure that any of our currently filed or future patent applications will result in issued patents, or even if issued, predict the scope of the claims that may issue in our and other companies' patents. Any proceedings challenging our patents may result in the claims being amended or canceled. If the claims are amended or canceled, the scope of our patent claims may be narrowed, which may reduce the scope of protection afforded by our patent portfolio. Given that the degree of future protection for our proprietary rights is uncertain, we cannot ensure that (i) we were the first to make the inventions covered by each of our filed applications, (ii) we were the first to file patent applications for these inventions, (iii) the proprietary technologies we develop will be patentable, (iv) any patents issued will be broad enough in scope to provide commercial advantage and prevent circumvention, and (v) competitors and other parties do not have or will not obtain patent protection that will block our development and commercialization activities.

These concerns apply equally to patents we have licensed, which may likewise be challenged, invalidated or circumvented, and the licensed technologies may be obstructed from commercialization by competitors' "blocking patents." In addition, we generally do not control the patent prosecution and maintenance of subject matter that we license from others. Generally, the licensors are primarily or wholly responsible for the patent prosecution and maintenance activities pertaining to the patent applications and patents we license, while we may only be afforded opportunities to comment on such activities. Accordingly, we are unable to exercise the same degree of control over licensed intellectual property as we exercise over our own intellectual property and we face the risk that our licensors will not prosecute or maintain it as effectively as we would like.

In addition, unauthorized parties may attempt to copy or otherwise obtain and use our products or technology. Monitoring unauthorized use of our intellectual property is difficult, particularly where, as here, the end products reaching the market generally do not reveal the processes used in their manufacture, and particularly in certain foreign countries where the local laws may not protect our proprietary rights as fully as in the U.S., so we cannot be certain that the steps we have taken in obtaining intellectual property and other proprietary rights will prevent unauthorized use of our technology. If competitors are able to use our technology without our authorization, our ability to compete effectively could be adversely affected. Moreover, competitors and other parties such as universities may independently develop and obtain patents for technologies that are similar to or superior to our technologies. If that happens, the potential competitive advantages provided by our intellectual property may be adversely affected. We may then need to license these competing technologies, and we may not be able to obtain licenses on reasonable terms, if at all, which could cause material harm to our business. Accordingly, litigation may be necessary for us to assert claims of infringement, enforce patents we own or license, protect trade secrets or determine the enforceability, scope and validity of the intellectual property rights of others.

Our commercial success also depends in part on not infringing patents and proprietary rights of third parties, and not breaching any licenses or other agreements that we have entered into with regard to our technologies, products and business. We cannot be certain that patents have not or will not be issued to third parties that could block our ability to obtain patents or to operate our business as we would like, or at all. There may be patents in some countries that, if valid, may block our ability to commercialize products in those countries if we are unsuccessful in circumventing or acquiring rights to these patents. There may also be claims in patent applications filed in some countries that, if granted and valid, may also block our ability to commercialize products or processes in these countries if we are unable to circumvent or license them.

As is commonplace in the biotechnology industries, some of our directors, employees and consultants are or have been employed at, or associated with, companies and universities that compete with us or have or will develop similar technologies and related intellectual property. While employed at these companies, these employees, directors and consultants may have been exposed to or involved in research and technology similar to the areas of research and technology in which we are engaged. Though we have not received such a complaint, we may be subject to allegations that we, our directors, employees or consultants have inadvertently or otherwise used, misappropriated or disclosed alleged trade secrets or confidential or proprietary information of those companies. Litigation may be necessary to defend against such allegations and the outcome of any such litigation would be uncertain.

Under some of our research agreements, our partners share joint rights in certain intellectual property we develop. Such provisions may limit our ability to gain commercial benefit from some of the intellectual property we develop and may lead to costly or time-consuming disputes with parties with whom we have commercial relationships over rights to certain innovations.

If any other party has filed patent applications or obtained patents that claim inventions also claimed by us, we may have to participate in interference, derivation or other proceedings declared by the USPTO to determine priority of invention and, thus, the right to the patents for these inventions in the U.S. These proceedings could result in substantial cost to us even if the outcome is favorable. Even if successful, such a proceeding may result in the loss of certain claims. Even successful outcomes of such proceedings could result in significant legal fees and other expenses, diversion of management time and efforts and disruption in our business. Uncertainties resulting from initiation and continuation of any patent or related litigation could harm our ability to compete.

If our biocatalysts, or the genes that code for our biocatalysts, are stolen, misappropriated or reverse engineered, others could use these biocatalysts or genes to produce competing products.

Third parties, including our contract manufacturers, customers and those involved in shipping our biocatalysts, may have custody or control of our biocatalysts. If our biocatalysts, or the genes that code for our biocatalysts, were stolen, misappropriated or reverse engineered, they could be used by other parties who may be able to reproduce these biocatalysts for their own commercial gain. If this were to occur, it would be difficult for us to discover or challenge this type of use, especially in countries with limited intellectual property protection.

During the ordinary course of business, we may become subject to lawsuits or indemnity claims, which could materially and adversely affect our business and results of operations.

From time to time, we may in the ordinary course of business be named as a defendant in lawsuits, claims and other legal proceedings. These actions may seek, among other things, compensation for alleged personal injury, worker’s compensation, employment discrimination, breach of contract, property damages, civil penalties and other losses of injunctive or declaratory relief. In the event that such actions or indemnities are ultimately resolved unfavorably at amounts exceeding our accrued liability, or at material amounts, the outcome could materially and adversely affect our reputation, business and results of operations. In addition, payments of significant amounts, even if reserved, could adversely affect our liquidity position.

We may not be able to enforce our intellectual property rights throughout the world.

The laws of some foreign countries do not protect intellectual property rights to the same extent as federal and state laws in the U.S. Many companies have encountered significant problems in protecting and enforcing intellectual property rights in certain foreign jurisdictions, and, particularly as we move forward in our partnerships with Praj and future international partners, we may face new and increased risks and challenges in protecting and enforcing our intellectual property rights abroad. The legal systems of certain countries, particularly certain developing countries, do not favor the enforcement of patents and other intellectual property protection, particularly those relating to bioindustrial technologies. This could make it difficult for us to stop the infringement of our patents or misappropriation of our other intellectual property rights. Proceedings to enforce our patents and other proprietary rights in foreign jurisdictions could result in substantial costs and divert our efforts and attention from other aspects of our business. Accordingly, our efforts to enforce our intellectual property rights in such countries may be inadequate to obtain a significant commercial advantage from the intellectual property that we develop.

Confidentiality agreements with employees and others may not adequately prevent disclosures of trade secrets and other proprietary information.

We rely in part on trade secret protection to protect our confidential and proprietary information and processes. However, trade secrets are difficult to protect. We have taken measures to protect our trade secrets and proprietary information, but these measures may not be effective. We require new employees and consultants to execute confidentiality agreements upon the commencement of an employment or consulting arrangement with us. These agreements generally require that all confidential information developed by the individual or made known to the individual by us during the course of the individual's relationship with us be kept confidential and not disclosed to third parties. These agreements also generally provide that know-how and inventions conceived by the individual in the course of rendering services to us shall be our exclusive property. Nevertheless, these agreements may not be enforceable, our proprietary information may be disclosed, third parties could reverse engineer our biocatalysts and others may independently develop substantially equivalent proprietary information and techniques or otherwise gain access to our trade secrets. Costly and time-consuming litigation could be necessary to enforce and determine the scope of our proprietary rights, and failure to obtain or maintain trade secret protection could adversely affect our competitive business position. In addition, an unauthorized breach in our information technology systems may expose our trade secrets and other proprietary information to unauthorized parties.

We have received funding from U.S. government agencies, which could negatively affect our intellectual property rights.

Some of our research has been funded by grants from U.S. government agencies. When new technologies are developed with U.S. government funding, the government obtains certain rights in any resulting patents and technical data, generally including, at a minimum, a nonexclusive license authorizing the government to use the invention or technical data for noncommercial purposes. U.S. government funding must be disclosed in any resulting patent applications, and our rights in such inventions will normally be subject to government license rights, periodic progress reporting, foreign manufacturing restrictions and march-in rights. March-in rights refer to the right of the U.S. government, under certain limited circumstances, to require us to grant a license to technology developed under a government grant to a responsible applicant or, if we refuse, to grant such a license itself. March-in rights can be triggered if the government determines that we have failed to work sufficiently towards achieving practical application of a technology or if action is necessary to alleviate health or safety needs, to meet requirements of federal regulations or to give preference to U.S. industry. If we breach the terms of our grants, the government may gain rights to the intellectual property developed in our related research. The government's rights in our intellectual property may lessen its commercial value, which could adversely affect our performance.

Risks Related to Legal and Regulatory

Any decline in the value of carbon credits associated with our products could have a material adverse effect on our results of operations, cash flow and financial condition.

The sale of our products is often dependent on the value of carbon credits under the RFS Program, LCFS and other similar regulatory regimes. The value of these credits fluctuates based on market forces outside of our control. There is a risk that the supply of low-carbon alternative fuels outstrips demand, resulting in the value of carbon credits declining. Any such declines could mean that the economic benefits from our efforts to de-carbonize the Luverne Facility might not be realized. Any decline in the value of carbon credits associated with our products could have a material adverse effect on our results of operations, cash flow and financial condition.

The U.S. renewable fuels industry is highly dependent upon certain federal and state legislation and regulation and any changes in legislation or regulation could have a material adverse effect on our results of operations, cash flows and financial condition.

The EPA has implemented the RFS Program pursuant to the Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007. The RFS Program sets annual quotas for the quantity of renewable fuels that must be blended into motor fuels consumed in the U.S. The domestic market for renewable fuels is significantly impacted by federal mandates under the RFS Program for volumes of renewable fuels required to be blended with gasoline. Future demand for renewable fuels will be largely dependent upon incentives to blend renewable fuels into motor fuels, including the price of renewable fuels relative to the price of gasoline, the relative octane value of the renewable fuel, constraints in the ability of vehicles to use higher renewable fuel blends, the RFS Program and other applicable environmental requirements. Any significant increase in production capacity above the RFS Program minimum requirements may have an adverse impact on renewable fuel prices.

We may face substantial delays in obtaining regulatory approvals for use of our isobutanol and renewable hydrocarbon products in the fuels and chemicals markets, which could substantially hinder our ability to commercialize our products.

Large-scale commercialization of our isobutanol may require approvals from state and federal agencies. Before we can sell isobutanol as a fuel or as a gasoline blendstock directly to large petroleum refiners, we must receive EPA fuel certification. On June 12, 2018, the EPA announced that it approved the registration of isobutanol as a fuel additive for blending into gasoline at levels up to 16 volume percent for on-road automotive use. There can be no assurances that the EPA registration of isobutanol as a fuel additive for blending into gasoline at levels up to 16 volume percent will not be revoked or changed. Further, EPA approval of 16 volume percent blends does not mitigate other rules that may exist that have to be overcome for main market adoption (rather than a specialty market) regarding blending of isobutanol in gasoline. For example, the Product Transfer Documents for Blendstock for Oxygenate Blending in common blending tanks served by multiple suppliers need to be labeled to accept isobutanol.

Additionally, California requires that fuels meet both its fuel certification requirements and a separate state low-carbon fuel standard. Any delay in receiving approval will slow or prevent the commercialization of our low-carbon isobutanol, renewable hydrocarbon products or ethanol for fuel markets, which could have a material adverse effect on our business, financial condition and results of operations.

With respect to the chemicals markets, we plan to focus on isobutanol production and sell to companies that can convert our isobutanol into other chemicals, such as isobutylene. However, should we later decide to produce these other chemicals ourselves, we may face similar requirements for EPA and other regulatory approvals. Approval, if ever granted, could be delayed for substantial amounts of time, which could significantly harm the development of our business and prevent the achievement of our goals.

Our isobutanol fermentation process utilizes a genetically modified organism which, when used in an industrial process, is considered a new chemical under the TSCA. The TSCA requires us to comply with the EPA's Microbial Commercial Activity Notice process to operate plants producing isobutanol using our biocatalysts. The TSCA's new chemicals submission policies may change and additional government regulations may be enacted that could prevent or delay regulatory approval of our isobutanol production.

There are various third-party certification organizations, such as ASTM International and Underwriters' Laboratories, Inc., involved in standard-setting regarding the transportation, dispensing and use of liquid fuel in the U.S. and abroad. These organizations may change the current standards and additional requirements may be enacted that could prevent or delay approval of our products. The process of seeking required approvals and the continuing need for compliance with applicable standards may require the expenditure of substantial resources, and there is no guarantee that we will satisfy these standards in a timely manner, if ever.

In addition, to Retrofit or otherwise modify ethanol facilities and operate the Retrofitted and modified plants to produce isobutanol, we will need to obtain and comply with a number of permit requirements. As a condition to granting necessary permits, regulators may make demands that could increase our Retrofit, modification or operations costs, and permit conditions could also restrict or limit the extent of our operations, which could delay or prevent our commercial production of isobutanol. We cannot guarantee that we will be able to meet all regulatory requirements or obtain and comply with all necessary permits to complete any ethanol plant Retrofits, and failure to satisfy these requirements in a timely manner, or at all, could have a substantial negative effect on our performance.

Jet fuels must meet various statutory and regulatory requirements before they may be used in commercial aviation, including regulations of the Federal Aviation Administration ("FAA") and specifications determined by ASTM International. Currently, our ATJ meets the FAA regulations and the ASTM International specifications. However, changes to applicable regulations and specifications in the future could have a material adverse effect on our business if such changes result in our ATJ not being eligible for use in commercial aviation.

Our isobutanol and renewable hydrocarbon products may encounter physical or regulatory issues, which could limit its usefulness as a gasoline blendstock.

In the gasoline blendstock market, isobutanol can be used in conjunction with, or as a substitute for, ethanol and other widely used fuel oxygenates, and we believe our isobutanol is physically compatible with typical gasoline engines. However, there is a risk that under actual engine conditions, isobutanol will face significant limitations, making it unsuitable for use in high percentage gasoline blends. Additionally, current regulations limit gasoline blends to low percentages of isobutanol, and also limit combination isobutanol-ethanol blends. On June 12, 2018, the EPA announced that it approved the registration of isobutanol as a fuel additive for blending into gasoline at levels up to 16 volume percent for on-road automotive use. There can be no assurances that the EPA registration of isobutanol as a fuel additive for blending into gasoline at levels up to 16 volume percent will not be revoked or changed. Government agencies may maintain or even increase the restrictions on isobutanol gasoline blends. As we believe that the potential to use isobutanol in higher percentage blends than is feasible for ethanol will be an important factor in successfully marketing isobutanol to refiners, a low blend wall could significantly limit commercialization of isobutanol as a gasoline blendstock.

We may be required to obtain additional regulatory approvals for use of our iDGs as animal feed, which could delay our ability to sell iDGs increasing our net cost of production and harming our operating results.

Our Luverne Facility and many of the ethanol plants that we might Retrofit use dry-milled corn as a feedstock. We plan to sell, as animal feed, the iDGs left as a co-product of fermenting isobutanol from dry-milled corn. We believe that this will enable us to offset a significant portion of the expense of purchasing corn for fermentation. We are currently approved to sell iDGs as animal feed through the self-assessed GRAS process of the FDA via third party scientific review. In order to improve the value of our iDGs, we are working with The Association of American Feed Control Officials ("AAFCO") to establish a formal definition for our iDGs as well as clearance for the materials into animal feed. We believe obtaining AAFCO approval will increase the value of our iDGs by offering customers of our iDGs further assurance of the safety of our iDGs. If we make certain changes in our biocatalyst whereby we can no longer rely on our GRAS process, we would be required to obtain FDA approval for marketing our iDGs. While we believe we can rely on the GRAS process as we update our biocatalysts to increase isobutanol production, for further customer assurance, we also intend to pursue approval upon a completed biocatalyst from the Center for Veterinary Medicine of the FDA. FDA testing and approval can take a significant amount of time, and there is no guarantee that we will ever receive such approval. While we have sold initial quantities of our iDGs from the Luverne Facility, if FDA or AAFCO approval is delayed or never obtained, or if we are unable to secure market acceptance for our iDGs, our net cost of production will increase, which may hurt our operating results.

Reductions or changes to existing regulations and policies may present technical, regulatory and economic barriers, all of which may significantly reduce demand for biofuels or our ability to supply isobutanol.

The market for biofuels is heavily influenced by foreign, federal, state and local government laws, regulations and policies. Changes in these laws, regulations and policies or how these laws, regulations and policies are implemented and enforced could cause the demand for biofuels to decline and deter investment in the research and development of biofuels.

Concerns associated with biofuels, including land usage, national security interests and food crop usage, continue to receive legislative, industry and public attention. This attention could result in future legislation, regulation and/or administrative action that could adversely affect our business. Any inability to address these requirements and any regulatory or policy changes could have a material adverse effect on our business, financial condition and results of operations.

Additionally, like the ethanol facilities that we Retrofit, our isobutanol and renewable hydrocarbon plants will emit GHG. Any changes in state or federal emissions regulations, including the passage of cap-and-trade legislation or a carbon tax, could limit our production of isobutanol, renewable hydrocarbon products and iDGs and increase our operating costs, which could have a material adverse effect on our business, financial condition and results of operations. The results of U.S. elections could lead to changes in federal or state laws and regulations that could have a material adverse effect on our business, prospects, financial condition and results of operations.

We use hazardous materials in our business and we must comply with environmental laws and regulations. Any claims relating to improper handling, storage or disposal of these materials or noncompliance with applicable laws and regulations could be time consuming and costly and could adversely affect our business and results of operations.

Our research and development processes involve the use of hazardous materials, including chemical, radioactive and biological materials. Our operations also produce hazardous waste. We cannot eliminate entirely the risk of accidental contamination or discharge and any resultant injury from these materials. Federal, state and local laws and regulations govern the use, manufacture, storage, handling and disposal of, and human exposure to, these materials. We may be sued for any injury or contamination that results from our use or the use by third parties of these materials, and our liability may exceed our total assets. Although we believe that our activities conform in all material respects with environmental laws, there can be no assurance that violations of environmental, health and safety laws will not occur in the future as a result of human error, accident, equipment failure or other causes. Compliance with applicable environmental laws and regulations may be expensive, and the failure to comply with past, present, or future laws could result in the imposition of fines, third-party property damage, product liability and personal injury claims, investigation and remediation costs, the suspension of production or a cessation of operations, and our liability may exceed our total assets. Liability under environmental laws can be joint and several and without regard to comparative fault. Environmental laws could become more stringent over time, imposing greater compliance costs and increasing risks and penalties associated with violations, which could impair our research, development or production efforts and harm our business.

Our expanded international activities may increase our exposure to potential liability under anti-corruption, trade protection, tax and other laws and regulations.

In the course of our relationships with Praj and future international partners, we may become subject to certain foreign tax, environmental and health and safety regulations that did not previously apply to us or our products. Such regulations may be unclear, not consistently applied and subject to sudden change. Implementation of compliance policies could result in additional operating costs, and our failure to comply with such laws, even inadvertently, could result in significant fines and/or penalties.

Additionally, the Foreign Corrupt Practices Act and other anti-corruption laws and regulations (“Anti-Corruption Laws”) prohibit corrupt payments by our employees, vendors or agents. Even with implementation of policies, training and internal controls designed to reduce the risk of corrupt payments, our employees, vendors or agents may violate our policies. Our international partnerships may significantly increase our exposure to potential liability. Our failure to comply with Anti-Corruption Laws could result in significant fines and penalties, criminal sanctions against us, our officers or our employees, prohibitions on the conduct of our business, and damage to our reputation.

Risks Related to Owning Our Securities

The market price of our common stock may be adversely affected by the future issuance and sale of additional shares of our common stock or by our announcement that such issuances and sales may occur.

We cannot predict the size of future issuances or sales of shares of our common stock in connection with future acquisitions or capital raising activities, or the effect, if any, that such issuances or sales may have on the market price of our common stock. The issuance and sale of substantial amounts of shares of our common stock, or the announcement that such issuances and sales may occur, could adversely affect the market price of our common stock.

We may not be permitted by the agreements governing our indebtedness, including our secured indebtedness with Whitebox, to repurchase our warrants, and we may not have the ability to do so.

Under certain circumstances, if a “fundamental transaction” or “extraordinary transaction” (as such terms are defined in our various warrants) occurs, holders of our warrants may require us to repurchase, for cash, the remaining unexercised portion of such warrants for an amount of cash equal to the value of the warrant as determined in accordance with the Black-Scholes option pricing model and the terms of our warrants. Our ability to repurchase our warrants depends on our ability to generate cash flow in the future. To some extent, this is subject to general economic, financial, competitive, legislative and regulatory factors and other factors that are beyond our control. We cannot assure you that we will maintain sufficient cash reserves or that our business will generate cash flow from operations at levels sufficient to permit us to repurchase our warrants. In addition, any such repurchase of our warrants may result in a default under the agreements governing our indebtedness, including our secured indebtedness with Whitebox, unless we are able to obtain such lender’s consent prior to the taking of such action. If we were unable to obtain such consent, compliance with the terms of our warrants would trigger an event of default under such agreements.

Future issuances of our common stock or instruments convertible or exercisable into our common stock, including in connection with conversions of our 2020/21 Notes or exercises of warrants, may materially and adversely affect the price of our common stock and cause dilution to our existing stockholders.

Historically, we have raised capital by issuing common stock and warrants in underwritten public offerings because no other reasonable sources of capital were available. These underwritten public offerings of common stock and warrants have materially and adversely affected the prevailing market prices of our common stock and caused significant dilution to our stockholders. We have also historically raised capital or refinanced outstanding debt through the issuance of convertible notes.

We may need to raise capital through these public offerings of common stock, warrants and convertible debt in the future.

We may obtain additional funds through public or private debt or equity financings in the near future, subject to certain limitations in the agreements governing our indebtedness, including the 2020/21 Notes. If we issue additional shares of common stock or instruments convertible into common stock, it may materially and adversely affect the price of our common stock. In addition, the conversion of some or all of the 2020/21 Notes and/or the exercise of some or all of the warrants may dilute the ownership interests of our stockholders, and any sales in the public market of any of our common stock issuable upon such conversion or exercise could adversely affect prevailing market prices of our common stock. Additionally, under the terms of certain warrants in the event that a warrant is exercised at a time when we do not have an effective registration statement covering the underlying shares of common stock on file with the SEC, such warrant may be net exercised, which will dilute the

ownership interests of existing stockholders without any corresponding benefit to the Company of a cash payment for the exercise price of such warrant.

As of December 31, 2019, we had approximately $14.1 million in outstanding 2020 Notes. On January 10, 2020, we and the holders exchanged all of the outstanding principal amount of the 2020 Notes for our newly-created 2020/21 Notes in aggregate principal amount of approximately $14.4 million. Any conversion of the outstanding 2020/21 Notes (including any interest that is paid in kind) into shares of our common stock could depress the trading price of our common stock. In addition, subject to certain restrictions, we have the option to issue common stock to any converting holder in lieu of making any required make-whole payment in cash. If we elect to issue our common stock for such payment, it will be at the same conversion rate that is applicable to conversions of the principal amount of the 2020/21 Notes. If we elect to issue additional shares of our common stock for such payments, this may cause significant additional dilution to our existing stockholders.

Our stock price may be volatile, and your investment in our securities could suffer a decline in value.

The market price of shares of our common stock has experienced significant price and volume fluctuations. We cannot predict whether the price of our common stock will rise or fall. A variety of factors may have a significant effect on our stock price, including:

- actual or anticipated fluctuations in our liquidity, financial condition and operating results;
- the position of our cash and cash equivalents;
- actual or anticipated changes in our growth rate relative to our competitors;
- actual or anticipated fluctuations in our competitors' operating results or changes in their growth rate;
- announcements of technological innovations by us, our partners or our competitors;
- announcements by us, our partners or our competitors of significant acquisitions, strategic partnerships, joint ventures or capital commitments;
- the entry into, modification or termination of licensing arrangements, marketing arrangements, and/or research, development, commercialization, supply, off-take or distribution arrangements;
- our ability to consistently produce commercial quantities of isobutanol, renewable hydrocarbon products and ethanol at the Luverne Facility, the planned Expanded Facility and the ramp up production to nameplate capacity;
- our ability to repay our indebtedness when it becomes due;
- our ability to refinance, restructure or convert our current and future indebtedness;
- additions or losses of customers or partners;
- our ability to obtain certain regulatory approvals for the use of our isobutanol and ethanol in various fuels and chemicals markets;
- commodity prices, including oil, ethanol and corn prices;
- additions or departures of key management or scientific personnel;
- competition from existing products or new products that may emerge;
- issuance of new or updated research reports by securities or industry analysts;
- fluctuations in the valuation of companies perceived by investors to be comparable to us;
- litigation involving us, our general industry or both;
- disputes or other developments related to proprietary rights, including patents, litigation matters and our ability to obtain patent protection for our technologies;
- announcements or expectations of additional financing efforts or the pursuit of strategic alternatives;

- changes in existing laws, regulations and policies applicable to our business and products, including the RFS Program, and the adoption of or failure to adopt carbon emissions regulation;
- sales of our common stock or equity-linked securities, such as warrants, by us or our stockholders;
- share price and volume fluctuations attributable to inconsistent trading volume levels of our shares;
- general market conditions in our industry; and
- general economic and market conditions.

Furthermore, the stock markets have experienced extreme price and volume fluctuations that have affected and continue to affect the market prices of equity securities of many companies. These fluctuations often have been unrelated or disproportionate to the operating performance of those companies. These broad market and industry fluctuations, as well as general economic, political and market conditions such as recessions, interest rate changes or international currency fluctuations, may negatively impact the market price of shares of our common stock, regardless of our operating performance, and cause the value of your investment to decline.

In addition, significant amounts of short selling, or the perception that a significant amount of short sales could occur, could depress the market price of our common stock and could cause material changes to the volume of our common stock traded on Nasdaq. “Short selling” is the sale of a security that the seller does not own, including a sale that is completed by the seller's delivery of a “borrowed” security (i.e. the short seller's promise to deliver the security).

Additionally, in the past, companies that have experienced volatility in the market price of their stock have been subject to securities class action litigation or other derivative shareholder lawsuits. We may be the target of this type of litigation in the future. Securities litigation against us could result in substantial costs and divert our management’s attention from other business concerns, which could seriously harm our business regardless of the outcome.

The price of our common stock could also be affected by possible sales of common stock by investors who view our 2020/21 Notes or warrants as a more attractive means of equity participation in us and by hedging or engaging in arbitrage activity involving our common stock. The hedging or arbitrage could, in turn, affect the trading prices of our warrants, if any trading market becomes established, or any common stock that holders receive upon exercise of such warrants.

Sales of a substantial number of shares of our common stock or securities linked to our common stock, such as our 2020/21 Notes and warrants (should an established market for such securities then exist), in the public market could occur at any time. These sales, or the perception in the market that such sales may occur, could reduce the market price of our common stock.

In addition, certain holders of our outstanding common stock (including shares of our common stock issuable upon the conversion of certain 2020/21 Notes or upon exercise of certain outstanding warrants) have rights, subject to certain conditions, to require us to file registration statements covering their shares and to include their shares in registration statements that we may file for ourselves or other stockholders.

Our quarterly operating results may fluctuate in the future. As a result, we may fail to meet or exceed the expectations of investment research analysts or investors, which could cause our stock price to decline.

Our financial condition and operating results have varied significantly in the past and may continue to fluctuate from quarter to quarter and year to year in the future due to a variety of factors, many of which are beyond our control. Factors relating to our business that may contribute to these fluctuations are described in this Report and other reports that we have filed with the SEC. Accordingly, the results of any prior quarterly or annual periods should not be relied upon as indications of our future operating performance.

The indebtedness under our 2020/21 Notes is secured by substantially all of our assets. As a result of these security interests, such assets would only be available to satisfy claims of our general creditors or to holders of our equity securities if we were to become insolvent to the extent the value of such assets exceeded the amount of our indebtedness and other obligations.

Indebtedness under our 2020/21 Notes is secured by a first lien on substantially all of our assets. Accordingly, if an event of default were to occur under our credit facilities, holders of our 2020/21 Notes would have a priority right to our assets, to the exclusion of our general creditors, in the event of our bankruptcy, insolvency, liquidation, or reorganization. In that event, our assets would first be used to repay in full all indebtedness and other obligations secured by them, resulting in all or a portion of our assets being unavailable to satisfy the claims of our unsecured indebtedness. Only after satisfying the claims of our unsecured creditors and our subsidiaries’ unsecured creditors would any amount be available for distribution to holders of our equity securities.

The terms of the agreements governing our indebtedness, including the indenture governing our 2020/21 Notes, may restrict our ability to engage in certain transactions.

The terms of the agreements governing our indebtedness, including the indenture governing the 2020/21 Notes, may prohibit us from engaging in certain actions, including disposing of certain assets, granting or otherwise allowing the imposition of a lien against certain assets, incurring certain kinds of additional indebtedness, acquiring or merging with other entities, or making dividends and other restricted payments unless we receive the prior approval of the requisite holders of the 2020/21 Notes. If we are unable to obtain such approval, we could be prohibited from engaging in transactions which could be beneficial to our business and our stockholders or could be forced to repay such indebtedness in full.

The indenture governing the 2020/21 Notes may prohibit us from engaging in certain mergers or acquisitions and if a fundamental change occurs prior to the maturity date of the 2020/21 Notes, holders of the 2020/21 Notes will have the right, at their option, to require us to repurchase all or a portion of their 2020/21 Notes and to pay the holders of the 2020/21 Notes a make-whole payment equal to 14% of the aggregate amount being purchased. In addition, if a fundamental transaction occurs, holders of some of our warrants will have the right, at their option, to require us to repurchase the unexercised portion of such warrants either (i) for common stock in accordance with the terms of the applicable warrant or (ii) for an amount in cash equal to the value

of such warrants, as determined in accordance with the Black-Scholes option pricing model and the terms of such warrants. These and other provisions could prevent or deter a third party from acquiring us, even where the acquisition could be beneficial to you.

The conversion price of the 2020/21 Notes can fluctuate under certain circumstances which, if triggered, can result in potentially material further dilution to our stockholders.

The conversion price of the 2020/21 Notes can fluctuate in certain circumstances, including in the event that there is a dividend or distribution paid on shares of our common stock, in the event of a contractual conversion under certain circumstances or a conversion following a notice of redemption or a subdivision, combination or reclassification of our common stock. In such instances, the conversion price of the 2020/21 Notes can fluctuate materially lower than the current conversion price of $2.442 per share or 0.4095 shares per $1.00 of principal.

These provisions could result in substantial dilution to investors in our common stock.

The interest rate of the 2020/21 Notes can fluctuate under certain circumstances which, if triggered, can result in potentially material further dilution to our stockholders.

The interest rate of the 2020/21 Notes can fluctuate in certain circumstances, including in the event of a default of our obligations under the indenture governing the 2020/21 Notes or the registration rights agreements, if any, entered into in connection with such notes. In addition, the interest on the 2020/21 Notes may be payable in-kind. As we may pay a portion of the interest on the 2020/21 Notes in kind, by either increasing the principal amount of the outstanding 2020/21 Notes or issuing additional 2020/21 Notes, any increase to the interest rate applicable to the 2020/21 Notes could result in additional dilution to investors in our common stock.

We may not have the ability to pay interest on the 2020/21 Notes, repurchase or redeem the 2020/21 Notes, if applicable, or repay the 2020/21 Notes at maturity.

If we elect to redeem the 2020/21 Notes prior to their maturity on December 31, 2020, or April 21, 2021 if the maturity date is automatically extended under certain circumstances, the redemption price of any 2020/21 Notes redeemed by us will be paid for in cash. Our ability to pay the interest on the 2020/21 Notes, to repurchase or redeem the 2020/21 Notes, to refinance our indebtedness and to fund working capital needs and planned capital expenditures depends on our ability to generate cash flow in the future. To some extent, this is subject to general economic, financial, competitive, legislative and regulatory factors and other factors that are beyond our control. We cannot assure you that we will maintain sufficient cash reserves or that our business will generate cash flow from operations at levels sufficient to permit us to pay the interest on the 2020/21 Notes, to repurchase or redeem the 2020/21 Notes, to pay any cash amounts that may become due upon conversion of the 2020/21 Notes or repay the 2020/21 Notes at maturity, or that our cash needs will not increase. In addition, any such repurchase or redemption of the 2020/21 Notes, even if such action would be in our best interests, may result in a default under the agreements governing our indebtedness unless we are able to obtain the applicable lender’s consent prior to the taking of such action.

Our failure to repurchase tendered 2020/21 Notes at a time when the repurchase is required by the indenture governing the 2020/21 Notes would constitute a default under such notes and would permit holders of such notes to accelerate our obligations under the 2020/21 Notes. Such default may also lead to a default under the agreements governing any of our current and future indebtedness. If the repayment of the related indebtedness were to be accelerated after any applicable notice or grace periods, we may not have sufficient funds to repay such indebtedness and repurchase the 2020/21 Notes or make cash payments upon conversions thereof.

If we are unable to generate sufficient cash flow from operations in the future to service our indebtedness and meet our other needs, we may have to refinance all or a portion of our indebtedness, obtain additional funds through public or private debt or equity financings, reduce expenditures or sell assets that we deem necessary to our business. Our ability to take some or all of these actions will be subject to certain limitations in the agreements governing our indebtedness, including the 2020/21 Notes, and we cannot assure you that any of these measures would be possible or that any additional financing could be obtained on favorable terms, or at all. The inability to obtain additional financing on commercially reasonable terms could have a material adverse effect on our financial condition, which could cause the value of your investment to decline. Additionally, if we were to conduct a public or private offering of securities, any new offering would be likely to dilute our stockholders’ equity ownership.

If a fundamental change (as defined in the indenture governing the 2020/21 Notes) occurs, holders of the 2020/21 Notes may require us to repurchase, for cash, all or a portion of their 2020 Notes. In such circumstance we would be required to offer to repurchase the 2020/21 Notes at 100% of principal plus accrued and unpaid interest to, but not including, the repurchase date. We would also be required to pay the holders of the 2020/21 Notes a fundamental change make-whole payment equal to the aggregate amount of interest that would have otherwise been payable on such notes to, but not including, the maturity date of such notes.

Raising additional capital may cause dilution to our existing stockholders, restrict our operations or require us to relinquish rights to our technologies.

We may, subject to certain limitations in the agreements governing our indebtedness, including our secured indebtedness with Whitebox, seek additional capital through a combination of public and private equity offerings, debt financings, strategic partnerships and licensing arrangements. To the extent that we raise additional capital through the sale or issuance of equity, warrants or convertible debt securities, the ownership interest of our existing shareholders will be diluted, and the terms of such securities may include liquidation or other preferences that adversely affect your rights as a stockholder. If we raise capital through debt financing, it may involve agreements that include covenants further limiting or restricting our ability to take certain actions, such as incurring additional debt, making capital expenditures or declaring dividends. If we raise additional funds through strategic partnerships or licensing agreements with third parties, we may have to relinquish valuable rights to our technologies or grant licenses on terms that are not favorable to us. If we are unable to raise additional funds when needed, we may be required to delay, limit, reduce or terminate our development and commercialization efforts.

Our ability to raise capital is limited by the Securities Act and SEC rules and regulations.

Under current SEC rules and regulations, because the aggregate market value of our common stock held by non-affiliates, or public float, was less than $75 million (calculated as set forth in Form S-3 and SEC rules and regulations) at the time of filing of this Report, the amount we can raise through primary public offerings of our securities in any twelve-month period using a registration statement on Form S- 3 will be limited to one-third of our public float. Alternative means of raising capital through sales of our securities, including through the use of a “long form” registration statement on a Form S-1 or in private placements of equity or debt securities, may be more costly and time-consuming and more difficult to market to potential investors, which may have a material adverse effect on our ability to raise capital, our liquidity position and strategy.

The issuance of share-based payment awards under our stock incentive plan may cause dilution to our existing stockholders and may affect the market price of our common stock.

We have used, and in the future we may continue to use, stock options, stock grants and other equity-based incentives, either pursuant to 2010 Stock Incentive Plan (as amended and restated, the "2010 Plan"), or outside of the 2010 Plan, to provide motivation and compensation to our directors, officers, employees and key independent consultants. The award of any such incentives will result in an immediate and potentially substantial dilution to our existing shareholders and could result in a decline in the value of our stock price.

As of December 31, 2019, there were 561 shares subject to outstanding options that are or will become eligible for sale in the public market to the extent permitted by any applicable vesting requirements and Rules 144 and 1,000 under the Securities Act. The exercise of these options and the sale of the underlying shares of common stock and the sale of stock issued pursuant to stock grants may have an adverse effect upon the price of our common stock, which in turn may have an adverse effect upon the trading price of our warrants.

As of December 31, 2019, there were 1,785,829 shares of common stock available for future grant under our 2010 Plan and 190 shares of common stock reserved for issuance under our Employee Stock Purchase Plan. These shares can be freely sold in the public market upon issuance and once vested.

We may pay vendors in stock as consideration for their services, which may result in additional costs and may cause dilution to our existing stockholders.

In order for us to preserve our cash resources, we may in the future pay vendors, including technology partners, in shares, warrants or options to purchase shares of our common stock rather than cash. Payments for services in stock may materially and adversely affect our stockholders by diluting the value of outstanding shares of our common stock. In addition, in situations where we agree to register the shares issued to a vendor, this will generally cause us to incur additional expenses associated with such registration.

Except as set forth in the applicable warrant, holders of our warrants have no rights as common stockholders until such holders exercise their warrants and acquire our common stock.

Until holders of our warrants acquire shares of our common stock upon exercise of their warrants, they have no rights with respect to the shares of our common stock underlying such warrants, except for those rights set forth in the applicable warrant. Upon exercise of such warrants, such holders of our warrants will be entitled to exercise the rights of a common stockholder only as to matters for which the record date occurs after the exercise date.

The exercise prices for our warrants will not be adjusted for all dilutive events.

The exercise prices of certain warrants are subject to adjustment for certain events, including the issuance of stock dividends on our common stock and, in certain instances, the issuance of our common stock at a price per share less than the exercise price of such warrants. However, the exercise prices will not be adjusted for other events, including the issuance of certain rights, options or warrants, distributions of capital stock, indebtedness or assets and cash dividends. Accordingly, an event that adversely affects the value of the warrants may occur, and that event may not result in an adjustment to the exercise prices.

We do not anticipate paying cash dividends, and accordingly, stockholders must rely on stock appreciation for any return on their investment.

We have never paid cash dividends on our common stock and we do not expect to pay cash dividends on our common stock at any time in the foreseeable future. The future payment of dividends directly depends upon our future earnings, capital requirements, financial requirements and other factors that our board of directors will consider. As a result, only appreciation of the price of our common stock, which may never occur, will provide a return to stockholders. Investors seeking cash dividends should not invest in our common stock.

If securities or industry analysts do not publish research or reports about our business, or publish negative reports about our business, our stock price and trading volume could decline. The trading market for our common stock will be influenced by the research and reports that securities or industry analysts publish about us or our business.

We do not have any control over securities or industry analysts. If one or more of the analysts who cover us downgrade our common stock or change their opinion of our common stock, our common stock price would likely decline which in turn would likely cause a decline in the value of our warrants and 2020/21 Notes. If one or more of these analysts cease coverage of us or fail to regularly publish reports on us, we could lose visibility in the financial markets, which could cause our common stock price and the price of our warrants and 2020/21 Notes to decline or the trading volume of such securities to decline.

We are subject to anti-takeover provisions in our amended and restated certificate of incorporation, our amended and restated bylaws and under Delaware law that could delay or prevent an acquisition of the Company, even if the acquisition would be beneficial to our stockholders.

Provisions in our amended and restated certificate of incorporation and our amended and restated bylaws may delay or prevent an acquisition of the Company. Among other things, our amended and restated certificate of incorporation and amended and restated bylaws provide for a board of directors that is divided into three classes with staggered three-year terms, provide that all stockholder action must be effected at a duly called meeting of the stockholders and not by a consent in writing, and further provide that only our board of directors may call a special meeting of the stockholders. These provisions may also frustrate or prevent any attempts by our stockholders to replace or remove our current management by making it more difficult for stockholders to replace members of our board of directors, who are responsible for appointing the members of our management team. Furthermore, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the Delaware General Corporation Law, which prohibits, with some exceptions, stockholders owning in excess of 15% of our outstanding voting stock from merging or combining with us. Finally, our charter documents establish advance notice requirements for nominations for election to our board of directors and for proposing matters that can be acted upon at stockholder meetings. Although we believe these provisions together provide an opportunity to receive higher bids by requiring potential acquirers to negotiate with our board of directors, they would apply even if an offer to acquire the Company may be considered beneficial by some stockholders.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

Our corporate headquarters and research and development laboratories, included in our Gevo, Inc, segment, are located in Englewood, Colorado. Our lease terminates in July 2021. The leased space is approximately 19,241 square feet. We believe that the facility will be adequate for our needs for the immediate future and that, should it be needed, additional space can be leased to accommodate any future growth.

We own and operate an isobutanol and ethanol production facility located in Luverne, Minnesota on approximately 55 acres of land, which contains approximately 50,000 square feet of building space. The production facility was originally constructed in 1998. The land and buildings are subject to a mortgage lien and security interest to secure the obligations under our 2020/21 Notes.

Item 3. Legal Proceedings

From time to time, we have been and may again become involved in legal proceedings arising in the ordinary course of our business. We are not presently a party to any litigation that we believe to be material and we are not aware of any pending or threatened litigation against us that we believe could have a material adverse effect on our business, operating results, financial condition or cash flows.

Item 4. Mine Safety Disclosures

Not Applicable.

PART II

Item 5. Market for Registrant’s Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities Market for Common Stock

The Company's common stock is listed and traded on the Nasdaq Capital Market under the symbol "GEVO".

Holders of Record

As of February 29, 2020, there were approximately 32 holders of record of our common stock. We believe that the number of beneficial owners is substantially greater than the number of record holders because a large portion of our common stock is held of record through brokerage firms in “street name.”

Dividends

No cash dividends have been paid on our common stock to date, nor do we anticipate paying dividends in the foreseeable future. Any future determination to declare cash dividends on our common stock will be made at the discretion of our Board of Directors, subject to compliance and limitations under our debt arrangements.

Recent Sales of Unregistered Securities; Use of Proceeds from Registered Securities

None.

Purchases of Equity Securities by the Issuer

None.

Performance Graph

We are a smaller reporting company as defined by Rule 12b-2 of the Exchange Act and are not required to provide information under this item.

Item 6. Selected Financial Data

We are a smaller reporting company as defined by Rule 12b-2 of the Exchange Act and are not required to provide information under this item.

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations

Company Overview

We are commercializing the next generation of jet fuel, gasoline and diesel fuel with the potential to achieve zero carbon emissions and address the market need of reducing GHG emissions with sustainable alternatives. We use low-carbon renewable resource-based carbohydrates as raw materials (primarily from non-food corn, but also sugar cane, molasses or other cellulosic sugars) and are in an advanced state of developing renewable electricity and RNG for use in production processes. As a result, we are able to produce low-carbon fuels with substantially reduced carbon intensity (as measured by the level of GHG emissions compared to standard petroleum fossil-based fuels across their lifecycle). Our products perform as well or better than traditional fossil-based fuels in infrastructure and engines, but with substantially reduced GHG emissions. In addition to addressing the environmental problems of fossil-based carbon fuels, our technology also enables certain plastics, such as polyester, to be made with more sustainable ingredients.

Our ability to penetrate the growing low-carbon fuels market depends on the price of oil and the value of abating carbon emissions that would otherwise increase GHG emissions. We believe that our proven, patented technology that enables the use of a variety of low-carbon sustainable feedstocks to produce price-competitive, low-carbon products, such as ATJ, gasoline components like isooctane and isobutanol and diesel fuel, yields the potential to generate project and corporate returns that justify the build-out of a multi-billion-dollar business.

Recent Developments

In 2019, we entered into supply agreements pursuant to which we agreed to supply an aggregate of approximately 17 MGPY of ATJ, renewable isooctane and other renewable hydrocarbon products. Certain of these supply agreements are take-or-pay arrangements. The timing and volume commitment of certain of these agreements are subject to our ability to complete the Expanded Facility. In order to commence construction of and complete the Expanded Facility, we must secure third party financing. We believe we can obtain this financing in part due to the strength of the fuel supply commitments that we have in place.

Specifically, as of the date of this Report, we have entered into the following arrangements, among others:

Delta Air Lines. In December 2019, we entered into a long-term, take-or-pay fuel supply agreement with Delta pursuant to which we agreed to sell and deliver 10 MGPY of ATJ to Delta, subject to certain conditions and exceptions. We expect to supply the ATJ to Delta upon completion of the Expanded Facility, which we expect to occur by 2023.

Scandinavian Airlines System. In October 2019, we entered into a long-term, take-or-pay fuel supply agreement with SAS pursuant to which we agreed to sell and deliver ATJ to SAS, subject to certain conditions and exceptions. We expect to supply the ATJ under the agreement with SAS from the Expanded Facility,
which we expect to occur by 2023.

Air Total. In August 2019, we entered into a take-or-pay renewable ATJ purchase and sale agreement with Air Total pursuant to which we agreed to supply ATJ to Air Total under a three-year offtake agreement. Air Total will initially purchase certain minimal quantities of ATJ produced at the South Hampton Facility, and we expect to sell Air Total increasing amounts of ATJ upon the completion of two expansion projects to increase ATJ production capabilities at the Luverne Facility. We expect the expansion projects to be completed in 2021 and 2022, respectively.

HCS Group GmbH. In February 2019, we entered into a take-or-pay renewable isooctane purchase and sale agreement with HCS, pursuant to which we agreed to supply renewable isooctane to HCS under a ten-year offtake agreement. HCS will initially purchase certain minimum quantities of renewable isooctane produced at the South Hampton Facility. We expect to sell HCS increasing amounts of minimum quantities of renewable isooctane each year upon the completion of two expansion projects to increase renewable isooctane production capabilities at the Luverne Facility. We expect the expansion projects to be completed in 2021 and 2022, respectively.

Financial Condition

For the year ended December 31, 2019, we incurred a consolidated net loss of $28.7 million and, as of December 31, 2019, we had an accumulated deficit of $458.0 million. Our cash and cash equivalents at December 31, 2019 totaled $16.3 million, which is primarily being used for the following: (i) operating activities of our Luverne Facility; (ii) operating activities at our corporate headquarters in Colorado, including research and development work; (iii) capital improvements primarily associated with the Luverne Facility; (iv) exploration of strategic alternatives and new financings; and (v) debt service obligations.

The continued operation of our business is dependent upon raising additional capital through future public and private equity offerings, debt financings or through other alternative financing arrangements. In addition, successful completion of our research and development programs and the attainment of profitable operations are dependent upon future events, including our ability to raise sufficient capital to expand our commercial production facility, completion of our development activities resulting in sales of isobutanol or isobutanol-derived products and/or technology, achieving market acceptance and demand for our products and services and attracting and retaining qualified personnel.

We expect to incur future net losses as we continue to fund the development and commercialization of our products and product candidates. We have primarily relied on raising capital to fund our operations and debt service obligations by issuing common stock and warrants in underwritten public offerings. Those issuances have caused significant dilution to our existing stockholders. While we have sought, and will continue to seek, other, less dilutive forms of financing to fund our operations and debt service obligations, there is no assurance that we will be successful in doing so.

Our transition to profitability is dependent upon, among other things, the successful development and commercialization of our products and product candidates, the achievement of a level of revenues adequate to support our cost structure and securing sufficient financing for the expansion of the Luverne Facility or a facility at another suitable location. We may never achieve profitability or generate positive cash flows, and unless and until we do, we will continue to need to raise additional cash. We intend to fund future operations through additional private and/or public offerings of debt or equity securities. In addition, we may seek additional capital through arrangements with strategic partners or from other sources, may seek to restructure our debt and we will continue to address our cost structure. Notwithstanding, there can be no assurance that we will be able to raise additional funds or achieve or sustain profitability or positive cash flows from operations.

Results of Operations

The following discussion of our financial condition and results of operations should be read in conjunction with our Consolidated Financial Statements and the notes to those Consolidated Financial Statements appearing in this Report. This discussion contains forward-looking statements that involve significant risks and uncertainties. As a result of many factors, such as those set forth under “Risk Factors” in Part I, Item 1A of this Report, our actual results may differ materially from those anticipated in these forward-looking statements.

This section of this Report discusses year-to-year comparisons between 2019 and 2018, as well as other discussions of 2019 and 2018 items. We have omitted discussion of the year ended December 31, 2017 (the earliest of the three years covered by our Consolidated Financial Statements presented in this Report) as permitted by the SEC’s recent amendments to Regulation S-K. The complete Management’s Discussion and Analysis of Financial Condition and Results of Operations for year-to-year comparisons between 2018 and 2017 and other discussions of 2017 items can be found within Part II, Item 7, to our Annual Report on Form 10-K filed with the SEC on March 28, 2019, which is available free of charge on the SEC's website at www.sec.gov and our corporate website at www.gevo.com.

Comparison of the years ended December 31, 2019 and 2018

	Years Ended December 31,		
	2019	2018	Change
Revenue and cost of goods sold		(in thousands)	
Ethanol sales and related products, net	$ 22,115	$ 31,641	$ (9,526)
Hydrocarbon revenue	2,338	1,197	1,141
Grant and other revenue	34	25	9
Total revenues	24,487	32,863	(8,376)
Cost of goods sold	36,733	41,568	(4,835)
Gross loss	(12,246)	(8,705)	(3,541)
Operating expenses			
Research and development expense	4,020	5,374	(1,354)
Selling, general and administrative expense	10,085	8,122	1,963
Total operating expenses	14,105	13,496	609
Loss from operations	(26,351)	(22,201)	(4,150)
Other (expense) income			
Interest expense	(2,732)	(3,237)	505
(Loss) on exchange or conversion of debt	—	(2,202)	2,202
Gain from change in fair value of 2020 Notes embedded derivative	394	2,637	(2,243)
Gain (loss) from change in fair value of derivative warrant liability	14	(2,976)	2,990
Other income (expense)	15	3	12
Total other (expense) income	(2,309)	(5,775)	3,466
Net loss	$ (28,660)	$ (27,976)	$ (684)

Revenue. During the year ended December 31, 2019, we recognized revenue of $22.1 million associated with the sale of 13.6 million gallons of ethanol, as well as isobutanol and related products, a decrease of $9.5 million from the year ended December 31, 2018. As a result of an unfavorable commodity environment during 2019, we reduced our production of ethanol and distillers grain at the Luverne Facility, which resulted in decreased sales compared with 2018.

Hydrocarbon revenues are comprised of ATJ, isooctane and isooctene sales. Hydrocarbon revenue increased $1.1 million during the year ended December 31, 2019 primarily as a result of greater shipments of finished products from our South Hampton Facility. During 2018, the South Hampton Facility doubled its available capacity.

Cost of goods sold. Our cost of goods sold decreased $4.8 million during the year ended December 31, 2019 compared to the prior year. Production was decreased compared to the prior year due to an unfavorable commodity environment, largely the result of greater corn costs as compared to national markets than the Midwest region has historically experienced. Cost of goods sold during the year ended December 31, 2019 included $30.4 million associated with the production of isobutanol, ethanol and related products and $6.3 million in depreciation expense. Cost of goods sold during the year ended December 31, 2018 included $35.3 million associated with the production of isobutanol, ethanol and related products and $6.3 million in depreciation expense.

Research and development expense. We continue to develop technologies for the production of isobutanol. Research and development expenses decreased $1.4 million during the year ended December 31, 2019 compared to the prior year, primarily due to decreased costs related to the South Hampton Facility, offset by an increase in personnel costs.

Selling, general and administrative expense. Selling, general and administrative expenses increased $2.0 million during the year ended December 31, 2019 compared to the prior year, primarily due to increases of $1.0 million in personnel costs resulting from increased hiring, $0.5 million in legal expenses in connection with the negotiation of new offtake and licensing agreements along with development of the biogas business, $0.2 million in consulting expenses and $0.2 million in travel expenses, partially offset by a $0.1 million decrease in accounting and professional fees.

Interest expense. Interest expense during the year ended December 31, 2019 was $2.7 million as compared to $3.2 million during the year ended December 31, 2018. The decrease of $0.5 million of interest expense was due to a decrease in the outstanding principal amount related to the exchange of approximately $3.2 million of our 2020 Notes for common stock during 2018.

Gain from change in fair value of 2020 Notes embedded derivative. During the year ended December 31, 2019, the estimated fair value of our previously outstanding 2020 Notes embedded derivative liability decreased to $0 resulting in a non-cash gain of $0.4 million primarily due to the decrease in the price of our common stock since the June 20, 2017 issuance date and the short time until the embedded derivatives were scheduled to expire on March 15, 2020.

Sources of Our Revenues

Our revenues are primarily derived from: (i) the sale of isobutanol, ethanol and related products; (ii) hydrocarbon sales consisting primarily of the sale of biojet fuel and isooctane derived from our isobutanol for purposes of certification and testing; and (iii) government grants and research and development programs.

Principal Components of Our Cost Structure

Cost of Goods Sold. Our cost of goods sold consists primarily of costs directly associated with ethanol production and initial operations for the production of isobutanol at the Luverne Facility such as costs for direct materials, direct labor, depreciation, other operating costs and certain plant overhead costs. Direct materials include corn feedstock, denaturant and process chemicals. Direct labor includes compensation of personnel directly involved in production operations at the Luverne Facility. Other operating costs include utilities and natural gas usage.

Research and Development. Our research and development costs consist of expenses incurred to identify, develop and test our technologies for the production of isobutanol and the development of downstream applications thereof. Research and development expenses include personnel costs (including stock-based compensation), consultants and related contract research, facility costs, supplies, depreciation and amortization expense on property, plant and equipment used in product development, license fees paid to third parties for use of their intellectual property and patent rights and other overhead expenses incurred to support our research and development programs.

Selling, General and Administrative. Selling, general and administrative expenses consist of personnel costs (including stock-based compensation), consulting and service provider expenses (including patent counsel-related costs), legal fees, marketing costs, insurance costs, occupancy-related costs, depreciation and amortization expenses on property, plant and equipment not used in our product development programs or recorded in cost of goods sold, travel and relocation expenses and hiring expenses.

Interest Expense. Our 2020 Notes have a fixed interest rate of 12%. As of December 31, 2019 and 2018, the 2020 Notes had a principal balance of $14.1 million and $13.8 million, respectively.

Liquidity and Capital Resources

Since our inception in 2005, we have devoted most of our cash resources to manufacturing ethanol, isobutanol and related products, research and development and selling, general and administrative activities related to the commercialization of isobutanol, as well as related products from renewable feedstocks. We have incurred losses since inception and expect to incur losses through at least 2021. We have financed our operations primarily with proceeds from multiple sales of equity and debt securities, borrowings under debt facilities and product sales.

The continued operation of our business is dependent upon raising additional capital through future public and private equity offerings, debt financings or through other alternative financing arrangements. In addition, successful completion of our research and development programs and the attainment of profitable operations are dependent upon future events, including our ability to raise sufficient capital to expand our commercial production facility, completion of our development activities resulting in sales of isobutanol or isobutanol-derived products and/or technology, achieving market acceptance and demand for our products and services and attracting and retaining qualified personnel.

We expect to incur future net losses as we continue to fund the development and commercialization of our products and product candidates. We have primarily relied on raising capital to fund our operations and debt service obligations by issuing common stock and warrants in underwritten public offerings. Those issuances have caused significant dilution to our existing stockholders. While we have sought, and will continue to seek, other, less dilutive forms of financing to fund our operations and debt service obligations, there is no assurance that we will be successful in doing so.

Our transition to profitability is dependent upon, among other things, the successful development and commercialization of our products and product candidates, the achievement of a level of revenues adequate to support our cost structure and securing sufficient financing for the expansion of the Luverne Facility or a Retrofit facility at another suitable location. We may never achieve profitability or generate positive cash flows, and unless and until we do, we will continue to need to raise additional cash. We intend to fund future operations through additional private and/or public offerings of debt or equity securities. In addition, we may seek additional capital through arrangements with strategic partners or from other sources, may seek to restructure our debt and we will continue to address our cost structure. Notwithstanding, there can be no assurance that we will be able to raise additional funds or achieve or sustain profitability or positive cash flows from operations.

The following table sets forth the major sources and uses of cash for each of the periods set forth below (in thousands):

	Year Ended December 31,	
	2019	2018
Net cash used in operating activities	$ (20,839)	$ (15,851)
Net cash used in investing activities	(7,457)	(2,233)
Net cash provided by financing activities	10,864	40,265

Operating Activities

Our primary uses of cash from operating activities are personnel related expenses and research and development related expenses including costs incurred under development agreements, costs of licensing of technology, legal-related costs, expenses for production of isobutanol, ethanol and related products, logistics and further processing of isobutanol and ethanol at the Luverne Facility and for the operation of our South Hampton Facility.

During the year ended December 31, 2019, net cash used for operating activities was $20.8 million compared to $15.9 million for the year ended December 31, 2018. The $4.9 million decrease in operating cash flows was due to reduced production at the Luverne Facility as a result of an unfavorable commodity environment, largely the result of greater corn costs as compared to national markets than the region has historically produced. We will continue to reduce production at the Luverne Facility if corn prices are too high to make it cost effective to operate.

During the year ended December 31, 2018, we used $15.9 million in cash for operating activities due to a net loss of $28.0 million, excluding the impact of $11.3 million in non-cash expenses and $0.8 million net cash increase associated with a decrease in working capital primarily a result of a decreases in both receivables and inventories.

Investing Activities

During the year ended December 31, 2019, we used $7.5 million in cash for investing activities, including $6.0 million related to capital expenditures at our Luverne Facility, of which $2.6 million related to the dry fractionation project and $2.2 million related to expanding our renewable hydrocarbon production capacity. We also invested $1.5 million in Juhl, which will provide electric energy to the Luverne Facility from its wind generation station located nearby, as well as the sale of all related environmental attributes, including renewable energy credits to Agri-Energy. We are installing equipment to fractionate and dry distillers grains at the Luverne Facility totaling approximately $3.0 million as of December 31, 2019. The cost of the fractionation machine and the thermal dryer have been funded with financing leases. No amounts are payable on these financing leases until the equipment is operational. The fractionation machine is expected to be operational in the first half of 2020.

We are developing an RNG project comprised of anaerobic digesters to be located at three dairy farms in northwest Iowa, plus associated gas upgrading equipment, to commence the supply of RNG to the Luverne Facility in 2021 as a part of our RNG project initiative. We expect to finance the RNG project with approximately $55 million of project finance debt and third-party equity. Gevo or an affiliate is expected to operate the RNG project, and Agri-Energy is expected to have a purchase option on approximately 50% of the RNG project's estimated annual 350,000 MMBtu of RNG production. The digesters are expected to be operational in the second half of 2020. We anticipate funding the digesters with financing leases.

We also plan to install approximately $18.0 million of manufacturing equipment at our Luverne Facility that is intended to support the development of a 1 MGPY hydrocarbon production facility and to reduce the cost of producing isobutanol. The manufacturing equipment is expected to be operational in the first half of 2021. We anticipate funding the manufacturing equipment with an operating lease.

During the year ended December 31, 2018, we used $2.2 million in cash for investing activities, all of which was related to capital expenditures at our Luverne Facility. Approximately $1.9 million of the 2018 capital expenditures related to constructing the site to house the dry fractionation project.

Financing Activities

During the year ended December 31, 2019, we generated $10.9 million in cash from financing activities, which primarily consisted of $11.6 million of net proceeds under our "at-the-market" offering program discussed below offset by $0.3 million paid on equipment and insurance financed, $0.2 million of debt and equity offering costs and $0.2 million net settlement of common stock under stock plans.

During the year ended December 31, 2018, we generated $40.3 million in cash from financing activities primarily related to $39.4 million in net proceeds from issuances of common stock and $1.3 million in proceeds from the exercise of warrants.

At-the-Market Offering Program. In February 2018, we commenced an at-the-market offering program, which allows us to sell and issue shares of our common stock from time-to-time. The at-the-market offering program was amended multiple times during 2018 to increase the available capacity under the at-the-market offering program by an aggregate of approximately $84.9 million. In August 2019, the at-the-market offering program was further amended to increase the available capacity under the at-the-market offering program by $10.7 million.

During the year ended December 31, 2019, we issued 3,965,688 shares of common stock under the at-the-market offering program for net proceeds of $11.5 million net of commissions and offering related expenses. During the year ended December 31, 2018, we issued 6,936,930 shares of common stock for net proceeds of $38.9 million, net of commissions and offering related expenses. As of December 31, 2019, we had capacity to issue up to $8.8 million of common stock under the at-the-market offering program.

During the period January 1, 2020 to February 29, 2020, we issued 425,776 shares of common stock under the at-the-market offering program for $0.9 million net proceeds of commissions and offering related expenses. As of February 29, 2019, we had capacity to issue up to $7.8 million of common stock under the at-the-market offering program.

However, pursuant to Instruction I.B.6. to Form S-3, because our market capitalization was below $75 million as of the date of this Report, we may only sell securities via Form S-3 if the aggregate market value of the securities sold by or on behalf of us during the 12-month period immediately prior to and including the date of the sale is no more than one-third of all common voting and nonvoting equity held by non-affiliates of us.

2020 Notes

On April 19, 2017, we entered into an Exchange and Purchase Agreement (the “2017 Purchase Agreement”) with WB Gevo, LTD (the “2017 Holder”) the holder of our 12.0% convertible senior secured notes due 2017 (the "2017 Notes"), which were issued under that certain Indenture dated as of June 6, 2014, by and among us, the guarantors party thereto, and Wilmington Savings Fund Society ("FSB"), as trustee and as collateral trustee (as supplemented, the “2017 Notes Indenture”), and Whitebox, in its capacity as representative of the 2017 Holder. Pursuant to the terms of the 2017 Purchase Agreement, the 2017 Holder, subject to certain conditions, including approval of the transaction by our stockholders (which was received on June 15, 2017), agreed to exchange all of the outstanding principal amount of the 2017 Notes for an equal principal amount of the 2020 Notes, plus an amount in cash equal to the accrued and unpaid interest (other than interest paid in kind) on the 2017 Notes (the “2017 Exchange”). On June 20, 2017, we completed the 2017 Exchange, terminated the 2017 Notes Indenture and cancelled the 2017 Notes.

The 2020 Notes had a maturity date of March 15, 2020 and were secured by a first lien on substantially all of our assets. The 2020 Notes had an interest rate equal to 12% per annum (with 2% potentially payable as PIK Interest (as defined and described below) at our option), payable on March 31, June 30, September 30 and December 31 of each year. To the extent that we paid any portion of the interest due on the 2020 Notes as PIK Interest, the maximum aggregate principal amount of 2020 Notes that would have been convertible into shares of our common stock increased.

Under certain circumstances, we had the option to pay a portion of the interest due on the 2020 Notes by either (a) increasing the principal amount of the 2020 Notes by the amount of interest then due or (b) issuing additional 2020 Notes with a principal amount equal to the amount of interest then due (interest paid in the manner set forth in (a) or (b) being referred to as “PIK Interest”).

Additional shares of our common stock could also have become issuable pursuant to the 2020 Notes in the event we were required to make certain make-whole payments as provided in the 2020 Notes Indenture.

The 2020 Notes were convertible into shares of our common stock, subject to certain terms and conditions. The initial conversion price of the 2020 Notes was equal to $14.72 per share of common stock, or 0.0679 shares of common stock per $1 principal amount of 2020 Notes.

2020/21 Notes

On January 10, 2020, we entered into an Exchange and Purchase Agreement (the “2020/21 Purchase Agreement”) with the guarantors party thereto, the 2017 Holder and Whitebox, in its capacity as representative of the 2017 Holder. Pursuant to the terms of the 2020/21 Purchase Agreement, the 2017 Holder, subject to certain conditions, agreed to exchange all of the outstanding principal amount of the 2020 Notes, which was approximately $14.1 million including unpaid accrued interest, for approximately $14.4 million in aggregate principal amount of our 2020/21 Notes (the “2020/21 Exchange”). Pursuant to the 2020/21 Purchase Agreement, we also granted the 2017 Holder an option to purchase up to an additional aggregate principal amount of approximately $7.1 million of 2020/21 Notes (the “2020/21 Option Notes”), at a purchase price equal to the aggregate principal amount of such 2020/21 Option Notes purchased less an original issue discount of 2.0%, having identical terms (other than with respect to the issue date and restrictions on transfer relating to compliance with applicable securities law) to the 2020/21 Notes issued, at any time during the period beginning on the date of closing of the 2020/21 Exchange and ending on the later of (a) 180 days thereafter, and (b) 30 days following the date on which Stockholder Approval (as described below) is obtained. In addition, on January 10, 2020 we completed the 2020/21 Exchange, terminated the 2017 Notes Indenture and cancelled the 2020 Notes. In addition, we entered into an Indenture by and among us, the guarantors named therein (the “2020/21 Notes Guarantors”) and FSB, as trustee and as collateral trustee (the “2020/21 Notes Indenture”), pursuant to which we issued the 2020/21 Notes.

The 2020/21 Notes will mature on December 31, 2020, provided that the maturity date will automatically be extended to April 1, 2021 if (i) approval of a stockholder proposal is obtained prior to March 20, 2020 for the issuance of shares of our common stock under the 2020/21 Notes Indenture in excess of 19.99% of the outstanding shares of our common stock on the date of the 2020/21 Notes Indenture (the "Stockholder Approval"), and (ii) the aggregate outstanding principal balance of the 2020/21 Notes (including any 2020/21 Option Notes) as of December 15, 2020 is less than $7 million. The 2020/21 Notes bear interest at a rate equal to 12% per annum (with 4% payable as PIK Interest (as defined and described below)), payable on March 31, June 30, September 30 and December 31 of each year. Under certain circumstances, we will have the option to pay a portion of the interest due on the 2020/21 Notes by either (a) increasing the principal amount of the 2020/21 Notes by the amount of interest then due or (b) issuing additional 2020/21 Notes with a principal amount equal to the amount of interest then due (interest paid in the manner set forth in (a) or (b) being referred to as "PIK Interest"). In the event we pay any portion of the interest due on the 2020/21 Notes as PIK Interest, the maximum aggregate principal amount of 2020/21 Notes that could be convertible into shares of our common stock will be increased.

The 2020/21 Notes are convertible into shares of our common stock voluntarily by the 2017 Holder at the conversion price, subject to certain terms and conditions. The initial conversion price of the 2020/21 Notes is equal to $2.442 per share of our common stock (the "2020/21 Notes Conversion Price"), or 0.4095 shares of our common stock per $1 principal amount of 2020/21 Notes. We and the 2017 Holder may also mutually agree on other conversions of the 2020/21 Notes into shares of our common stock on a monthly basis (a "Contractual Conversion") pursuant to the terms of the 2020/21 Notes Indenture. The 2020/21 Notes Conversion Price in a Contractual Conversion will be reduced to the lesser of the then-applicable 2020/21 Notes Conversion Price or a 10% discount to the average of the daily volume weighted average price of our common stock for the three forward trading days prior to the date of the Contractual Conversion.

Each 2017 Holder has agreed not to convert its 2020/21 Notes into shares of our common stock to the extent that, after giving effect to such conversion, the number of shares of our common stock beneficially owned by such 2017 Holder and its affiliates would exceed 4.99% of our common stock outstanding at the time of such conversion (the "4.99% Ownership Limitation"); provided that a 2017 Holder may, at its option and upon 61 days' prior notice to us, increase such threshold to 9.99% (the "9.99% Ownership Limitation"). If a conversion of 2020/21 Notes by the 2017 Holder would exceed the 4.99% Ownership Limitation or the 9.99% Ownership Limitation, as applicable, the 2020/21 Purchase Agreement contains a provision granting the 2017 Holder a fully funded prepaid warrant for such common stock with a term of nine months, subject to a six-month extension, which it can draw down from time to time.

The 2020/21 Notes may be redeemed in whole or in part, at our option, for cash at any time after the Stockholder Approval is obtained and upon 120 days' notice to the 2017 Holder. Following a notice of redemption of the 2020/21 Notes by us, the 2017 Holder may elect to convert the 2020/21 Notes into shares of our common stock at the same conversion price as applicable to a Contractual Conversion.

The 2020/21 Notes do not contain any anti-dilution adjustments for future equity issuances that are below the 2020/21 Notes Conversion Price, and adjustments to the 2020/21 Conversion Price will only generally be made in the event that there is a dividend or distribution paid on shares of our common stock, a subdivision, combination or reclassification of our common stock, or at the discretion of our Board of Directors in limited circumstances and subject to certain conditions.

The 2020/21 Notes are secured by a lien on substantially all of our assets and the 2020/21 Notes Guarantors, including intellectual property and real property, and are guaranteed by our existing subsidiaries.

Under certain circumstances, we may file one or more registration statements on Form S-3 or amend filings in order to register shares of common stock for sale or resale, as necessary in connection with the 2020/21 Notes.

Notes Payable - Other

During the fourth quarter 2019, we purchased equipment and financed part of our insurance obligation. The equipment notes pay interest between 3.9% - 4.0%, have total monthly payments of $0.01 million and mature at various date from August 2020 to December 2024. The equipment loans are secured by the related equipment.

2022 Notes

In July 2012, we issued and sold $45.0 million in aggregate principal amount of 7.5% convertible senior notes due July 2022 (the "2022 Notes"), for net proceeds of $40.9 million, after accounting for $2.7 million and $1.4 million of cash discounts and issue costs, respectively. In the first quarter of 2018, we issued an aggregate of 39,016 shares of our common stock in exchange for the redemption of the then remaining $0.5 million in outstanding 2022 Notes. As a result of this exchange, all obligations under the 2022 Notes were fully satisfied.

See Note 9, *Debt*, to our Consolidated Financial Statements included herein for further discussion of the Notes Payable.

Contractual Obligations and Commitments

We are a smaller reporting company as defined by Rule 12b-2 of the Exchange Act and are not required to provide information under this item.

Off-Balance Sheet Arrangements

As of December 31, 2019, we did not have any off-balance sheet arrangements or relationships with unconsolidated entities, such as entities often referred to as structured finance or special purpose entities, established for the purpose of facilitating off-balance sheet arrangements or other contractually narrow or limited purposes.

Critical Accounting Estimates

Our Consolidated Financial Statements are based on the application of U.S. GAAP, which requires us to make estimates and assumptions about future events that affect the amounts reported in our Consolidated Financial Statements and the accompanying notes. Future events and their effects cannot be determined with certainty; therefore, the determination of estimates requires the exercise of judgment. Actual results could differ from those estimates, and any such differences may be material to our Consolidated Financial Statements. We believe the estimates set forth below may involve a higher degree of judgment and complexity in their application than our other accounting estimates and represent the critical accounting estimates used in the preparation of our Consolidated Financial Statements. We believe our judgments related to these accounting estimates are appropriate. However, if different assumptions or conditions were to prevail, the results could be materially different from the amounts recorded.

Critical Accounting Policies

While our significant accounting policies are more fully described in Note 2 to our Consolidated Financial Statements included in this Report, we believe that the following accounting policies are the most critical to aid you in fully understanding and evaluating our reported financial results and reflect the more significant judgments and estimates that we use in the preparation of our Consolidated Financial Statements.

Accounting for Senior Secured Debt, Convertible Notes, Notes Payable - Other and Embedded Derivative

2020 Notes

See "Liquidity and Capital Resources—2020 Notes" above and Note 9, Debt, to our Consolidated Financial Statements included herein for further discussion of the 2020 Notes.

2020/21 Notes

See "Liquidity and Capital Resources—2020/21 Notes" above and Note 9, Debt, to our Consolidated Financial Statements included herein for further discussion of the 2020/21 Notes.

Notes Payable—Other

See "Liquidity and Capital Resources—Notes Payable - Other" above and Note 9, Debt, to our Consolidated Financial Statements included herein for further discussion of the Notes Payable - Other.

2022 Notes and Embedded Derivative

See “—Liquidity and Capital Resources—2022 Notes.”

We had concluded that the embedded derivatives within the 2020 Notes required separation from the host instrument and was re-valued each reporting period, with changes in the fair value of the embedded derivative recognized as a component of our Consolidated Statements of Operations.

The valuation of the embedded derivative related to the 2020/21 Notes is in process and is expected to be completed by March 31, 2020. Any changes in the fair value of the embedded derivative will be recognized as a component of our Consolidated Statements of Operations.

In January 2018, we entered into a private exchange agreement with a holder of the 2022 Notes to exchange the remaining $0.5 million of outstanding principal amount of the 2022 Notes for an aggregate of 39,016 shares of common stock. Upon completion of this exchange, the 2022 Notes were satisfied in their entirety and there are no remaining obligations under the 2022 Notes, including any remaining obligations under the 2022 Notes embedded derivative. Accordingly, the fair value of the 2022 Notes embedded derivative was zero as of December 31, 2019 and 2018.

Impairment of Property, Plant and Equipment

Our property, plant and equipment consist primarily of assets associated with the acquisition and upgrade of the Luverne Facility. We assess impairment of property, plant and equipment for recoverability when events or changes in circumstances indicate that their carrying amount may not be recoverable. Circumstances applicable to our current stage of operations which could trigger a review include, but are not limited to: (i) significant decreases in the market price of the asset; (ii) significant adverse changes in the business climate or legal or regulatory factors; (iii) accumulation of costs significantly in excess of the amount originally expected for the acquisition or construction of the asset; and (iv) expectations that the asset will more likely than not be sold or disposed of significantly before the end of its estimated useful life. The carrying amount of a long-lived asset is considered to be impaired if it exceeds the sum of the undiscounted cash flows expected to result from the use and eventual disposition of the asset.

We evaluated our long-lived assets for impairment as of December 31, 2019. This evaluation included comparing the carrying amount our long-lived assets to the undiscounted future cash flows of our consolidated net assets as this represents the lowest level of identifiable cash flows. Significant assumptions included in the estimated undiscounted future cash flows include, among others, estimates of the:

- sales price of isobutanol, hydrocarbons, ethanol and by-products such as dried distillers grains;
- purchase price of corn;
- production levels of isobutanol;
- capital and operating costs to produce isobutanol; and
- estimated useful life of the primary asset.

Factors which can impact these assumptions include, but are not limited to:

- effectiveness of our technology to produce isobutanol at targeted margins;
- demand for isobutanol, hydrocarbon, ethanol and oil prices; and
- harvest levels of corn.

Based upon our evaluation at December 31, 2019, we concluded that the estimated undiscounted future cash flows from the Luverne Facility exceeded the carrying value of the Luverne Facility and, as such, these assets were not impaired. Although our cash flow forecasts are based on assumptions that are consistent with our planned use of the assets, these estimates required significant exercise of judgment and are subject to change in future reporting periods as facts and circumstances change. Additionally, we may make changes to our business plan that could result in changes to the expected cash flows. As a result, it is possible that a long-lived asset may be impaired in future reporting periods.

Revenue Recognition

Revenue Recognition. We record revenue from the sale of hydrocarbon products, ethanol and related products, including the sale of corn inventory. We recognize revenue when all of the following criteria are satisfied: (i) we have identified a contract with a customer; (ii) we have identified the performance obligations of the customer; (iii) we have determined the transaction price; (iv) we have allocated the transaction price to the identified performance obligations in the contract with the customer; and (v) we have satisfied each individual performance obligation with the contract with a customer.

Hydrocarbon and ethanol related products are generally shipped free on board shipping point. Collectability of revenue is reasonably assured based on historical evidence of collectability with our customers. In accordance with our agreements for the marketing and sale of ethanol and related products, commissions due to marketers were deducted from the gross sales price at the time payment was remitted. Ethanol and related products sales were recorded net of commissions and shipping and handling costs.

Revenue related to government research grants and cooperative agreements is recognized in the period during which the related costs are incurred, provided that the conditions under the awards have been met and only perfunctory obligations are outstanding. Revenues related to the lease agreements are recognized on a straight-line basis over the term of the contract.

For the years ended December 31, 2019 and 2018, Eco-Energy, accounted for approximately 71% and 72% of our consolidated revenue, respectively. For the years ended December 31, 2019 and 2018, Purina accounted for approximately 17% and 21% of our consolidated revenue, respectively. All are customers of our Gevo Development/Agri-Energy segment. Given the production capacity compared to the overall size of the North American market and the fungible demand for our products, we do not believe that a decline in a specific customer's purchases would have a material adverse long-term effect upon our financial results.

Stock-Based Compensation

Our stock-based compensation expense includes expenses associated with share-based awards granted to employees and board members and expenses associated with our employee stock purchase plan (“ESPP”). The estimated fair value of stock options and ESPP awards is determined on the date of grant and recorded to expense over the requisite service period, generally the vesting period. We estimate the fair value of stock option awards using the Black-Scholes option-pricing model which requires judgments to be made, including estimating: (i) the expected life of an award; (ii) stock price volatility; and (iii) prior to our initial public offering in February 2011, the fair value of our common stock.

The Black-Scholes option-pricing model calculates the estimated fair value of stock options using the following inputs: (i) expected stock option life; (ii) expected volatility; (iii) risk-free interest rate; (iv) expected dividend yield rate; (v) exercise price; and (vi) closing price of our common stock on the date of grant.

Due to our limited history of grant activity, we use the “simplified method” permitted by the SEC to estimate the expected stock option life as the arithmetic average of the total contractual term of the option and its vesting period. We calculate the estimated volatility rate based on selected comparable public companies, due to a lack of historical information regarding the volatility of our stock price. We will continue to analyze the historical stock price volatility assumption as more historical data for our common stock becomes available. The risk-free interest rate assumption is based on the U.S. Treasury yield curve in effect on the date of grant for instruments with a term similar to the expected life of the related option. No dividends are expected to be paid.

The estimated fair value of a stock option using the Black-Scholes option-pricing model is impacted significantly by changes in a company’s stock price. For example, all other assumptions being equal, the estimated fair value of a stock option will increase as the closing price of a company’s stock increases and will decrease as the closing price of a company’s stock decreases. Prior to the closing of our initial public offering, we were a private company and, as such, we were required to estimate the fair value of our common stock. In the absence of a public trading market, we determined a reasonable estimate of the then-current fair value of our common stock for purposes of granting stock-based compensation based on multiple criteria. We determined the fair value of our common stock utilizing methodologies, approaches and assumptions consistent with the American Institute of Certified Public Accountants Practice Aid, “Valuation of Privately-Held-Company Equity Securities Issued as Compensation.” After the closing of our initial public offering in February 2011, the fair value of our common stock is no longer an estimate as it is based upon the closing price of our stock on the date of grant.

Recent Accounting Pronouncements

See Note 2 in Item 8. “Financial Statements and Supplemental Data,” of this Report, for a discussion of recent accounting pronouncements.

Item 7A. Quantitative and Qualitative Disclosures about Market Risk

We are a smaller reporting company as defined by Rule 12b-2 of the Exchange Act and are not required to provide information under this item.

Item 8. Financial Statements and Supplementary Data

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REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Board of Directors and Stockholders
Gevo, Inc.

Opinion on the financial statements

We have audited the accompanying consolidated balance sheets of Gevo, Inc. (a Delaware corporation) and subsidiaries (the "Company") as of December 31, 2019 and 2018, the related consolidated statements of operations, changes in shareholders' equity, and cash flows for each of the two years in the period ended December 31, 2019, and the related notes (collectively referred to as the "financial statements"). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2019 and 2018, and the results of its operations and its cash flows for each of the two years in the period ended December 31, 2019, in conformity with accounting principles generally accepted in the United States of America.

Change in accounting principle

As discussed in Note 2 to the consolidated financial statements, the Company changed its method of accounting for leases in 2019 due to the adoption of Accounting Standard Codification Topic 842, *Leases*.

Going concern uncertainty

The accompanying consolidated financial statements have been prepared assuming that the Company will continue as a going concern. As discussed in Note 1 to the consolidated financial statements, the Company has suffered recurring losses from operations and incurred a net loss of $29 million during the year ended December 31, 2019. As of December 31, 2019 and the date of this report, the Company's existing working capital is not sufficient to meet the cash requirements to fund operations through March 17, 2021 without additional sources of debt or equity. These conditions, along with other matters as set forth in Note 1, raise substantial doubt about the Company's ability to continue as a going concern. Management's plans in regard to these matters are also described in Note 1. As described in Note 9 to the consolidated financial statements, these matters may also potentially affect the Company's rights and obligations under certain debt agreements. The consolidated financial statements do not include any adjustments that might result from the outcome of this uncertainty.

Basis for opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) ("PCAOB") and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audits we are required to obtain an understanding of internal control over financial reporting but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ GRANT THORNTON LLP

We have served as the Company's auditor since 2015.

Denver, Colorado
March 17, 2020

GEVO, INC.
CONSOLIDATED BALANCE SHEETS
(In thousands, except share and per share amounts)

	December 31, 2019	December 31, 2018
Assets		
Current assets:		
Cash and cash equivalents	$ 16,302	$ 33,734
Accounts receivable	1,135	526
Inventories	3,201	3,166
Prepaid expenses and other current assets	3,590	1,284
Total current assets	24,228	38,710
Property, plant and equipment, net	66,696	67,462
Investment in Juhl	1,500	—
Deposits and other assets	935	863
Total assets	$ 93,359	$ 107,035
Liabilities		
Current liabilities:		
Accounts payable and accrued liabilities	$ 5,678	$ 4,896
2020 Notes (current), net	13,900	—
2020 Notes embedded derivative liability	—	394
Notes payable - other (current)	516	—
Total current liabilities	20,094	5,290
2020 Notes (long-term), net	—	12,554
Notes payable - other (long-term)	233	—
Other long-term liabilities	528	404
Total liabilities	20,855	18,248
Commitments and Contingencies (See Note 14)		
Stockholders' Equity		
Common stock, $0.01 par value per share; 250,000,000 authorized; 14,083,232 and 8,640,583 shares issued and outstanding at December 31, 2019 and 2018, respectively. (See Note 2)	141	86
Additional paid-in capital	530,349	518,027
Accumulated deficit	(457,986)	(429,326)
Total stockholders' equity	72,504	88,787
Total liabilities and stockholders' equity	$ 93,359	$ 107,035

See the accompanying Notes to the Consolidated Financial Statements.

GEVO, INC.
CONSOLIDATED STATEMENTS OF OPERATIONS
(In thousands, except share and per share amounts)

	Year Ended December 31,	
	2019	**2018**
Revenue and cost of goods sold		
Ethanol sales and related products, net	$ 22,115	$ 31,641
Hydrocarbon revenue	2,338	1,197
Grant and other revenue	34	25
Total revenues	24,487	32,863
Cost of goods sold	36,733	41,568
Gross loss	(12,246)	(8,705)
Operating expenses		
Research and development expense	4,020	5,374
Selling, general and administrative expense	10,085	8,122
Total operating expenses	14,105	13,496
Loss from operations	(26,351)	(22,201)
Other (expense) income		
Interest expense	(2,732)	(3,237)
(Loss) on exchange or conversion of debt	—	(2,202)
Gain from change in fair value of 2020 Notes embedded derivative	394	2,637
Gain (loss) from change in fair value of derivative warrant liability	14	(2,976)
Other income (expense)	15	3
Total other (expense) income	(2,309)	(5,775)
Net loss	$ (28,660)	$ (27,976)
Net loss per share - basic and diluted	$ (2.35)	$ (5.74)
Weighted-average number of common shares outstanding - basic and diluted	12,177,906	4,876,897

See the accompanying Notes to the Consolidated Financial Statements.

GEVO, INC.
CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(In thousands, except share amounts)

	Common Stock		Paid-In Capital	Accumulated Deficit	Stockholders' Equity
	Shares	Amount			
Balance, December 31, 2017	1,090,553	$ 11	$ 464,870	$ (401,350)	$ 63,531
Shares issued upon reverse stock split	12,261	—	—	—	—
Issuance of common stock under stock plans, net of taxes	119	—	—	—	—
Issuance of common stock, net of issue costs & warrants	6,936,930	69	38,877	—	38,946
Non-cash stock-based compensation	—	—	571	—	571
Issuance of common stock upon exercise of warrants	300,911	3	6,165	—	6,168
Issuance of common stock upon exchange of debt	299,809	3	7,544	—	7,547
Net loss	—	—	—	(27,976)	(27,976)
Balance, December 31, 2018	8,640,583	86	518,027	(429,326)	88,787
Issuance of common stock, net of issue costs	3,965,688	40	11,317	—	11,357
Non-cash stock-based compensation	—	—	1,221	—	1,221
Issuance of common stock under stock plans, net of taxes	1,476,961	15	(216)	—	(201)
Net loss	—	—	—	(28,660)	(28,660)
Balance, December 31, 2019	14,083,232	$ 141	$ 530,349	$ (457,986)	$ 72,504

See the accompanying Notes to the Consolidated Financial Statements.

GEVO, INC.
CONSOLIDATED STATEMENTS OF CASH FLOWS
(In thousands)

	Year Ended December 31,	
	2019	**2018**
Operating Activities		
Net loss	$ (28,660)	$ (27,976)
Adjustments to reconcile net loss to net cash used in operating activities:		
(Gain) loss from the change in fair value of derivative warrant liability	(14)	2,976
(Gain) from the change in fair value of the embedded derivative to the 2020 Notes	(394)	(2,637)
Loss on sale of property, plant and equipment	4	—
Loss on exchange or conversion of debt	—	2,202
Stock-based compensation	1,349	683
Depreciation and amortization	6,656	6,520
Non-cash lease expense	48	—
Non-cash interest expense	1,346	1,706
Other non-cash expenses	—	6
Changes in operating assets and liabilities:		
Accounts receivable	(609)	528
Inventories	(35)	1,196
Prepaid expenses and other current assets, deposits and other assets	(1,824)	(630)
Accounts payable, accrued expenses and long-term liabilities	1,294	(425)
Net cash used in operating activities	(20,839)	(15,851)
Investing Activities		
Acquisitions of property, plant and equipment	(5,989)	(2,233)
Proceeds from sale of property, plant and equipment	32	—
Investment in Juhl	(1,500)	—
Net cash used in investing activities	(7,457)	(2,233)
Financing Activities		
Payments on secured debt	(292)	—
Debt and equity offering costs	(232)	(392)
Proceeds from issuance of common stock and common stock warrants	11,589	39,394
Proceeds from the exercise of warrants	—	1,263
Net settlement of common stock under stock plans	(201)	—
Net cash provided by financing activities	10,864	40,265
Net (decrease) increase in cash and cash equivalents	(17,432)	22,181
Cash and cash equivalents	33,734	11,553
Beginning of year		
	$ 16,302	$ 33,734
End of year		

See the accompanying Notes to the Consolidated Financial Statements.

GEVO, INC.
CONSOLIDATED STATEMENTS OF CASH FLOWS—(Continued)
(In thousands)

Supplemental disclosures of cash and non-cash investing and financing transactions	Year Ended December 31, 2019	2018
Cash paid for interest	$ 1,391	$ 1,945
Non-cash purchase of property, plant and equipment	368	919
Equipment and insurance financed with notes payable	1,041	—
Conversion and exchanges of convertible debt for common stock	—	3,701
Fair value of 2020 Notes embedded derivative upon exchange	—	2,193
Fair value of warrants at issuance and upon exercise, net	—	4,905

See the accompanying Notes to the Consolidated Financial Statements.

GEVO, INC.
Notes to Consolidated Financial Statements

1. Nature of Business and Financial Condition

Nature of Business. Gevo, Inc. (“Gevo” or the “Company,” which, unless otherwise indicated, refers to Gevo, Inc. and its subsidiaries) are commercializing the next generation of jet fuel, gasoline and diesel fuel with the potential to achieve zero carbon emissions and address the market need of reducing greenhouse gas (“GHG”) emissions with sustainable alternatives. The Company uses low-carbon renewable resource-based carbohydrates as raw materials (primarily from non-food corn, but also sugar cane, molasses or other cellulosic sugars) and is in an advanced state of developing renewable electricity and renewable natural gas (“RNG”) for use in production processes. As a result, Gevo is able to produce low-carbon fuels with substantially reduced carbon intensity (as measured by the level of GHG emissions compared to standard petroleum fossil-based fuels across their lifecycle). The Company’s products perform as well or better than traditional fossil-based fuels in infrastructure and engines, but with substantially reduced GHG emissions. In addition to addressing the environmental problems of fossil-based carbon fuels, the Company’s technology also enables certain plastics, such as polyester, to be made with more sustainable ingredients.

Gevo’s ability to penetrate the growing low-carbon fuels market depends on the price of oil and the value of abating carbon emissions that would otherwise increase GHG emissions. The Company believes that its proven, patented technology that enables the use of a variety of low-carbon sustainable feedstocks to produce price-competitive, low-carbon products, such as alcohol-to-jet fuel (“ATJ”), gasoline components like isooctane and isobutanol and diesel fuel, yields the potential to generate project and corporate returns that would justify the build-out of a multi-billion-dollar business.

Ultimately, the Company believes that the attainment of profitable operations is dependent upon future events, including (i) completing certain capital improvements at Company’s production facility located in Luverne, Minnesota (the "Luverne Facility") to increase the production capacity of renewable jet fuel and isooctane and other related products that can be made from isobutanol; (ii) completing the Company's development activities resulting in commercial production and sales of renewable hydrocarbon products and low-carbon ethanol; (iii) obtaining adequate financing to complete the Company's development activities, including the build out of renewable hydrocarbon capacity; (iv) gaining market acceptance and demand for the Company's products and services; (v) attracting and retaining qualified personnel; and (vi) achieving a level of revenues adequate to support the Company's cost structure.

Financial Condition. For the years ended December 31, 2019 and 2018, the Company incurred a consolidated net loss of $28.7 million and $28.0 million, respectively, and had an accumulated deficit of $458.0 million as of December 31, 2019. The Company’s cash and cash equivalents as of December 31, 2019 totaled $16.3 million and are expected to be used for the following purposes: (i) operating activities of the Luverne Facility; (ii) operating activities at the Company’s corporate headquarters in Colorado, including research and development work; (iii) capital improvements primarily associated with the Luverne Facility; (iv) exploration of strategic alternatives and new financings; and (v) debt service obligations.

The Company expects to incur future net losses as it continues to fund the development and commercialization of its product candidates. To date, the Company has financed its operations primarily with proceeds from multiple sales of equity and debt securities, borrowings under debt facilities and product sales. The Company’s transition to profitability is dependent upon, among other things, the successful development and commercialization of its product candidates and the achievement of a level of revenues adequate to support the Company’s cost structure. The Company may never achieve profitability or positive cash flows, and unless and until it does, the Company will continue to need to raise additional cash. Management intends to fund future operations through additional private and/or public offerings of debt or equity securities. In addition, the Company may seek additional capital through arrangements with strategic partners or from other sources, it may seek to restructure its debt and it will continue to address its cost structure. Notwithstanding, there can be no assurance that the Company will be able to raise additional funds or achieve or sustain profitability or positive cash flows from operations.

Existing working capital was not sufficient to meet the cash requirements to fund planned operations through the period that is one year after the date the Company’s audited 2019 year-end financial statements were issued. These conditions raise substantial doubt about the Company’s ability to continue as a going concern. The Company’s inability to continue as a going concern may potentially affect the Company’s rights and obligations under its senior secured debt and issued and outstanding convertible notes. The accompanying financial statements have been prepared assuming that the Company will continue as a going concern and do not include adjustments that might result from the outcome of this uncertainty. This basis of accounting contemplates the recovery of the Company’s assets and the satisfaction of liabilities in the normal course of business.

GEVO, INC.
Notes to Consolidated Financial Statements (Continued)

At-the-Market Offering Program. In February 2018, the Company commenced an at-the-market offering program, which allows it to sell and issue shares of its common stock from time-to-time. The at-the-market offering program was amended multiple times during 2018 to increase the available capacity under the at-the-market offering program by an aggregate of approximately $84.9 million. In August 2019, the at-the-market offering was further amended to increase the available capacity under the at-the-market offering program by $10.7 million.

During the year ended December 31, 2019, the Company issued 3,965,688 shares of common stock under the at-the-market offering program for gross proceeds of $11.5 million, net of commissions and other offering related expenses. As of December 31, 2019, the Company has remaining capacity to issue up to approximately $8.8 million of common stock under the at-the-market offering program.

From January 1, 2020 to February 29, 2020, the Company issued 425,766 shares of common stock under the at-the-market offering program for gross proceeds of $0.9 million, net of commissions and other offering related expenses. As of February 29, 2019, we had capacity to issue up to $7.8 million of common stock under the at-the-market offering program.

During the year ended December 31, 2018, the Company issued 6,936,930 shares of common stock under the at-the-market offering program for net proceeds of $38.9 million, net of commissions and offering related expenses.

Reverse Stock Split. On June 1, 2018, the Company effected a reverse stock split of the outstanding shares of its common stock by a ratio of one-for-twenty (the "Reverse Stock Split"), and its common stock began trading on the Nasdaq Capital Market on a Reverse Stock Split-basis on June 4, 2018.

2. Summary of Significant Accounting Policies

Principles of Consolidation. The Consolidated Financial Statements of Gevo include the accounts of its wholly-owned subsidiaries. All intercompany balances and transactions have been eliminated in consolidation.

Basis of Presentation. The Consolidated Financial Statements of the Company (which include the accounts of its wholly-owned subsidiaries Gevo Development, LLC and Agri-Energy, LLC) have been prepared pursuant to the rules and regulations of the U.S. Securities and Exchange Commission (the “SEC”) and accounting principles generally accepted in the U.S. ("GAAP") for complete financial statements. These statements reflect all normal and recurring adjustments which, in the opinion of management, are necessary to present fairly the financial position, results of operations and cash flows of the Company at December 31, 2019.

Use of Estimates. The preparation of financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ materially from those estimates.

Reclassifications. Certain prior year amounts have been reclassified to conform to the current year presentation. These reclassifications did not affect total revenues, costs and expenses, net income or stockholders’ equity.

Concentrations of Credit Risk. The Company’s financial instruments that are exposed to concentrations of credit risk consist of cash and cash equivalents in excess of the federally insured limits. The Company’s cash and cash equivalents are deposited with high credit-quality financial institutions and are primarily in demand deposit accounts.

Cash and Cash Equivalents. The Company maintains its cash and cash equivalents in highly liquid interest-bearing money market accounts or non-interest bearing demand accounts. The Company considers all highly liquid investments purchased with a maturity of three months or less at the date of acquisition to be cash equivalents.

Accounts Receivable. The Company records receivables for products shipped and services provided but for which payment has not yet been received. As of December 31, 2019 and 2018, no allowance for doubtful accounts has been recorded, based upon the expected full collection of the accounts receivable. As of December 31, 2019, three customers, Eco-Energy, LLC ("Eco-Energy"), Purina Animal Nutrition, LLC (“Purina”), formerly Land O'Lakes Purina Feed, LLC, and HCS Group GmbH ("HCS") comprised 57%, 13% and 15% of the Company's outstanding trade accounts receivable, respectively. As of December 31, 2018, two customers, Eco-Energy and Purina, comprised 66% and 27% of the Company's outstanding trade accounts receivable, respectively.

GEVO, INC.
Notes to Consolidated Financial Statements (Continued)

Inventories. Inventory is recorded at net realizable value. Cost of goods sold is determined by average cost method. Isobutanol and ethanol inventory cost consists of the applicable share of raw material, direct labor and manufacturing overhead costs. Spare Parts inventory consists of the parts required to maintain and operate the Company's Luverne Facility and is recorded at cost.

Derivative Instruments. The Company evaluates its contracts for potential derivatives which Gevo, Inc. uses to raise capital. See Note 7 for a description of the Company's accounting for embedded derivatives.

Warrants. The Company has warrants outstanding as of December 31, 2019 representing 54,989 shares of Gevo's common stock, which expire at various dates through February 17, 2022. The exercise prices of the warrants range from $3.80 to $220.00 as of December 31, 2019. Based on the terms of the warrant agreements, the Company has determined that all warrants issued since 2013 qualify as derivatives and, as such, are included in "*Accounts Payable and Accrued Liabilities"* on the Consolidated Balance Sheets and recorded at fair value each reporting period. The decrease (increase) in the estimated fair value of the warrants outstanding as of December 31, 2019 and 2018 represents an unrealized gain (loss) which has been recorded as a gain (loss) from the change in fair value of derivative warrant liability in the Consolidated Statements of Operations.

During the year ended December 31, 2018, common stock was issued as a result of exercise of warrants as described below:

	Common Stock Issued		Proceeds
Series A Warrants	251	$	1,054
Series K Warrants	300,660		1,262,712
	300,911	$	1,263,766

Property, Plant and Equipment. Property, plant and equipment are recorded at cost less accumulated depreciation and amortization. Depreciation and amortization are computed using the straight-line method over the assets' estimated useful lives. Leasehold improvements are amortized over the term of the lease agreement or the service lives of the improvements, whichever is shorter. Assets under construction are depreciated when they are placed into service. Maintenance and repairs are charged to expense as incurred and expenditures for major improvements are capitalized.

Impairment of Property, Plant and Equipment. The Company's property, plant and equipment consist primarily of assets associated with the acquisition and upgrade of the Luverne Facility. The Company assesses impairment of property, plant and equipment for recoverability when events or changes in circumstances indicate that their carrying amount may not be recoverable. Circumstances which could trigger a review include, but are not limited to: significant decreases in the market price of the asset; significant adverse changes in the business climate, or legal or regulatory factors; accumulation of costs significantly in excess of the amount originally expected for the acquisition or construction of the asset; or expectations that the asset will more likely than not be sold or disposed of significantly before the end of its estimated useful life. The carrying amount of a long-lived asset is considered to be impaired if it exceeds the sum of the undiscounted cash flows expected to result from the use and eventual disposition of the assets.

The Company evaluated its Luverne Facility for impairment as of December 31, 2019 and 2018. These evaluations included comparing the carrying amount of the acquisition and upgrade of the Luverne Facility to the estimated undiscounted future cash flows at the Luverne Facility as this represents the lowest level of identifiable cash flows. Significant assumptions included in the estimated undiscounted future cash flows include, among others, estimates of the:

- sales price of isobutanol, hydrocarbons, ethanol and by-products such as dried distillers grains;
- purchase price of corn;
- production levels of isobutanol;
- capital and operating costs to produce isobutanol; and
- estimated useful life of the primary asset.

Factors which can impact these assumptions include, but are not limited to:

- effectiveness of the Company's technology to produce isobutanol at targeted margins;
- demand for isobutanol and oil prices; and
- harvest levels of corn.

GEVO, INC.
Notes to Consolidated Financial Statements (Continued)

Based upon the Company's evaluation at December 31, 2019 and 2018, the Company concluded that the estimated undiscounted future cash flows from the Luverne Facility exceeded the carrying value and, as such, these assets were not impaired. Although the Company's cash flow forecasts are based on assumptions that are consistent with its planned use of the assets, these estimates required significant exercise of judgment and are subject to change in future reporting periods as facts and circumstances change. Additionally, the Company may make changes to its business plan that could result in changes to the expected cash flows. As a result, it is possible that a long-lived asset may be impaired in future reporting periods.

Investment in Juhl. In September 2019, Agri-Energy purchased 1.5 million shares of Series A preferred stock of Juhl Clean Energy Assets, Inc. ("Juhl") for a purchase price of $1.00 per share in connection with the development of wind electrical energy generating facility project near the Luverne Facility. An affiliate of Juhl will construct, own and operate the wind project, and Agri-Energy will purchase the electricity directly from the City of Luverne. The investment in Juhl is accounted for under the cost method.

Debt Issue Costs. Debt issue costs are costs incurred in connection with the Company's debt financings that have been capitalized and are being amortized over the stated maturity period or estimated life of the related debt using the effective interest method.

Revenue Recognition. The Company records revenue from the sale of ethanol and related products, hydrocarbon products and funding from government grants and cooperative agreements. The Company recognizes revenue when all of the following criteria are satisfied: (i) it has identified a contract with a customer; (ii) it has identified the performance obligations of the customer; (iii) it has determined the transaction price; (iv) it has allocated the transaction price to the identified performance obligations in the contract with the customer; and (v) it has satisfied each individual performance obligation with the contract with a customer.

Ethanol and related products as well as hydrocarbon products are generally shipped free-on-board shipping point. Collectability of revenue is reasonably assured based on historical evidence of collectability between the Company and its customers. In accordance with the Company's agreements for the marketing and sale of ethanol and related products, commissions due to marketers are deducted from the gross sales price at the time payment was remitted. Ethanol and related products sales are recorded net of commissions and shipping and handling costs. Sales and other taxes that the Company collects concurrent with revenue-producing activities are excluded from revenue.

Revenue related to government research grants and cooperative agreements is recognized in the period during which the related costs are incurred, provided that the conditions under the awards have been met and only perfunctory obligations are outstanding. Revenues related to lease agreements are recognized on a straight-line basis over the term of the contract.

For the years ended December 31, 2019 and 2018, Eco-Energy accounted for approximately 71% and 72% of the Company's consolidated revenue, respectively. Purina represented approximately 17% and 21% of the Company's consolidated revenue for the years ended December 31, 2019 and 2018, respectively. All are customers of the Company's Gevo Development/Agri-Energy segment (see Note 16). Given the production capacity compared to the overall size of the North American market and the fungible demand for the Company's products, the Company does not believe that a decline in a specific customer's purchases would have a material adverse long-term effect upon the Company's financial results.

Cost of Goods Sold. Cost of goods sold includes costs incurred in conjunction with the operations for the production of isobutanol at the Luverne Facility and costs directly associated with the ethanol and related products production process such as costs for direct materials, direct labor and certain plant overhead costs. Costs associated with the operations for the production of isobutanol includes costs for direct materials, direct labor, plant utilities, including natural gas and plant depreciation. Direct materials consist of dextrose for initial production of isobutanol, corn feedstock, denaturant and process chemicals. Direct labor includes compensation of personnel directly involved in production operations at the Luverne Facility. Costs of direct materials for the production of ethanol and related products consist of corn feedstock, denaturant and process chemicals. Direct labor includes compensation of personnel directly involved in the operation of the Luverne Facility. Plant overhead costs primarily consist of plant utilities and plant depreciation. Cost of goods sold is mainly affected by the cost of corn and natural gas. Corn is the most significant raw material cost. The Company purchases natural gas to power steam generation in the production process and to dry the distillers grains, a by-product of ethanol and related products production.

Patents. All costs related to filing and pursuing patent applications are expensed as incurred as recoverability of such expenditures is uncertain. Patent-related legal expenses incurred are recorded as selling, general and administrative expense.

GEVO, INC.
Notes to Consolidated Financial Statements (Continued)

Research and Development. Research and development costs are expensed as incurred and are recorded as research and development expense in the Consolidated Statements of Operations. The Company's research and development costs consist of expenses incurred to identify, develop, and test its technologies for the production of isobutanol and the development of downstream applications thereof. Research and development expense includes personnel costs, consultants and related contract research, facility costs, supplies, depreciation on property, plant and equipment used in development, license fees and milestone payments paid to third parties for use of their intellectual property and patent rights and other direct and allocated expenses incurred to support the Company's overall research and development programs.

Income Taxes. Deferred tax assets and liabilities are recognized based on the difference between the carrying amounts of assets and liabilities in the financial statements and their respective tax bases. Deferred tax assets and liabilities are measured using currently enacted tax rates in effect in the years in which those temporary differences are expected to reverse. Deferred tax assets should be reduced by a valuation allowance if, based on the weight of available evidence, it is more likely than not that some portion or all of the deferred tax assets will not be realized.

Stock-Based Compensation. The Company's stock-based compensation expense includes expenses associated with share-based awards granted to employees and board members, and expenses associated with awards under its employee stock purchase plan ("ESPP"). Stock-based compensation expense for all share-based payment awards granted is based on the grant date fair value. The grant date fair value for stock option awards is estimated using the Black-Scholes option pricing model and the grant date fair value for restricted stock awards is based upon the closing price of the Company's common stock on the date of grant. The Company recognizes compensation costs for share-based payment awards granted to employees net of estimated forfeitures and recognizes stock-based compensation expense for only those awards expected to vest on a straight-line basis over the requisite service period of the award, which is currently the vesting term of up to four years. For performance based restricted stock awards, the Company recognizes expense over the requisite service period.

Net Loss Per Share. Basic net loss per share is computed by dividing the net loss attributable to Gevo's common stockholders for the period by the weighted-average number of common shares outstanding during the period. Diluted earnings per share ("EPS") includes the dilutive effect of common stock equivalents and is computed using the weighted-average number of common stock and common stock equivalents outstanding during the reporting period. Diluted EPS for the years ending December 31, 2019 and 2018 excluded common stock equivalents because the effect of their inclusion would be anti-dilutive or would decrease the reported loss per share.

The following table sets forth securities that could potentially dilute the calculation of diluted earnings per share:

	Year Ended December 31,	
	2019	**2018**
Warrants to purchase common stock - liability classified	54,989	55,963
Warrants to purchase common stock - equity classified	—	6
Convertible 2020 Notes	974,139	1,071,674
Outstanding options to purchase common stock	1,561	2,311
Stock appreciation rights	127,225	132,566
Unvested restricted common stock	—	290,300
Total	1,157,914	1,552,820

GEVO, INC.
Notes to Consolidated Financial Statements (Continued)

Recent Accounting Pronouncements

Financial Instruments - Credit Losses. Measurement of Credit Losses on Financial Instruments. In June 2016, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") No. 2016-13, *Financial Instruments - Credit Losses Measurement of Credits Losses on Financial Instruments* (“ASU 2016-13”), which replaces accounting for credit losses for most financial assets, including trade accounts receivable, and certain other instruments that are not measured at fair value through income. ASU 2016-13 replaces the current “incurred loss” model, in which losses are recognized when a loss is incurred as of the date of the balance sheet, to an “expected credit loss” model, which includes a broader range of information to estimate expected credit losses over the lifetime of the financial asset. ASU 2016-13 is effective for fiscal years beginning after December 15, 2022. It is expected that the adoption of this standard will primarily apply to the valuation of the Company’s trade accounts receivables. The Company sells primarily to a small quantity of large customers with significant balance sheets and those financial assets are often settled within one-to-two weeks after the completion of the corresponding sales transaction. The Company does not anticipate that the adoption of this standard will have a material impact on the Company’s Consolidated Financial Statements.

Adoption of New Accounting Pronouncements

Leases. In February 2016, the FASB issued ASU No. 2016-02, *Leases* (“ASU 2016-02”). ASU 2016-02 requires most contracts which convey over a period of time the right to use or control the use of an asset to be recognized on a company’s financial statements. The objective is to increase transparency and comparability among organizations by recognizing lease assets and lease liabilities on the balance sheet and disclosing key information about leasing arrangements. ASU 2016-02 was effective for fiscal years beginning after December 15, 2018. The standard required using the modified retrospective transition method and applying ASU 2016-02 either at the (i) latter of the earliest comparative period presented in the financial statements or commencement date of the lease, or (ii) beginning of the period of adoption. The Company adopted the standard effective January 1, 2019 with no retrospective adjustment to prior periods presented in the financial statements. There was no impact to the opening balance of retained earnings as of January 1, 2019 as a result of the adoption of this standard.

As a result of adopting ASU 2016-02, the Company recognized $1.2 million in right-to-use assets and related lease liabilities at January 1, 2019. The Company elected both (i) the short-term lease scope exception for leases with original terms of twelve months or less and (ii) the package of practical expedients, which included the ability to classify leases as operating, for those leases existing prior to January 1, 2019 that were previously classified as operating under Accounting Standards Codification ("ASC") 840, *Leases*, the superseded accounting standard for the accounting for leases.

3. Revenues from Contracts with Customers and Other Revenues

The Company's current and historical revenues have consisted of the following: (a) ethanol sales and related products revenue, net; (b) hydrocarbon revenue; and (c) grant and other revenue, which has historically consisted primarily of revenues from governmental and cooperative research grants.

Ethanol sales and related products revenues, net. Ethanol sales and related products revenues, net are sold to customers on a free-on-board, shipping point basis. Each transaction occurs independent of any other sale, and once sold, there are no future obligations on the part of the Company to provide post-sale support or promises to deliver future goods or services.

Hydrocarbon revenue. Hydrocarbon revenues include sales of ATJ, isooctene and isooctane and are sold mostly on a free-on-board, shipping point basis. Each transaction occurs independent of any other sale, and once sold, there are no future obligations on the part of the Company to provide post-sale support or promises to deliver future goods or services.

Grant and other revenues. Grant revenues have historically consisted of governmental and cooperative research grants. Other revenues have historically included occasional short-term (less than one-year) consulting services and leases of certain storage facilities located at the Luverne Facility.

GEVO, INC.
Notes to Consolidated Financial Statements (Continued)

The following table sets forth the components of the Company's revenues between those generated from contracts with customers and those generated from arrangements that do not constitute a contract with a customer (in thousands):

	Year Ended December 31, 2019		
Major Goods/Service Line	**Revenues from Contracts with Customers**	**Other Revenues**	**Total**
Ethanol sales and related products, net	$ 22,115	$ —	$ 22,115
Hydrocarbon revenue	2,338	—	2,338
Grant and other revenue	—	34	34
	$ 24,453	$ 34	$ 24,487
Timing of Revenue Recognition			
Goods transferred at a point in time	$ 24,453	$ —	$ 24,453
Services transferred over time	—	34	34
	$ 24,453	$ 34	$ 24,487

	Year Ended December 31, 2018		
Major Goods/Service Line	**Revenues from Contracts with Customers**	**Other Revenues**	**Total**
Ethanol sales and related products, net	$ 31,641	$ —	$ 31,641
Hydrocarbon revenue	1,197	—	1,197
Grant and other revenue	25	—	25
	$ 32,863	$ —	$ 32,863
Timing of Revenue Recognition			
Goods transferred at a point in time	$ 32,838	$ —	$ 32,838
Services transferred over time	25	—	25
	$ 32,863	$ —	$ 32,863

Goods transferred at a point-in-time. For the years ended December 31, 2019 and 2018, there were no contracts with customers for which consideration was variable or for which there were multiple performance obligations for any given contract. Accordingly, the entire transaction price is allocated to the goods transferred. As of December 31, 2019 and 2018, there were no remaining unfulfilled or partially fulfilled performance obligations.

All goods transferred are tested to ensure product sold satisfies contractual product specifications prior to transfer. The customer obtains control of the goods when title and risk of loss for the goods has transferred, which in most cases is "*free-on-board, shipping point*". All material contracts have payment terms of between one to three months and there are no return or refund rights.

Services transferred over time. For the years ended December 31, 2019 and 2018, there were no contracts for which consideration was variable or for which there were multiple performance obligation for any given contract. Accordingly, the entire transaction price is allocated to the individual service performance obligation. As of December 31, 2019 and 2018, respectively, there were no material unfulfilled or partially fulfilled performance obligations.

For the years ended December 2019 and 2018, revenues were recognized ratably over time, as the performance obligation was satisfied and benefit to the customer was transferred on a ratable basis over time.

Contract Assets and Trade Receivables. As of December 31, 2019 and 2018, there were no contract assets or liabilities as all customer amounts owed to the Company are unconditional and the Company does not receive payment in advance for its products. Accordingly, amounts owed by customers are classified as account receivables on the Company's Consolidated Balance Sheets. In addition, due to the nature of the Company's contracts, there are no costs incurred or to be paid in the future that qualify for asset recognition as a cost to fulfill or obtain a contract. The Company did not incur any impairment losses on any receivables as all amounts owed were paid or current as of December 31, 2019 or 2018.

4. Leases, Right-to-Use Assets and Related Liabilities

The Company enters into various arrangements which constitute a lease as defined by ASC 842, *Leases*, as part of its ongoing business activities and operations. Leases represent a contract or part of a contract that conveys the right to control the use of identified property, plant or equipment (an identified asset) for a period of time in exchange for consideration. Such contracts result in both (a) right-to-use assets, which represent the Company's right to use an underlying asset for the term of the contract; and (b) a corresponding lease liability which represents the Company's obligation to make the lease payments arising from the contract, measured on a discounted basis.

The contracts for the Company are comprised of facility, equipment and transportation leases necessary to conduct the Company's day-to-day operations for which the Company maintains control of right-to-use assets and incurs the related liabilities.

The Company elected to adopt both the (a) short-term lease exemption for those leases with initial terms of twelve months or less; and (b) the practical expedient to not separate lease components from non-lease components, if applicable. Leases which qualify for the short-term scope exception consist of certain residential rents for executive apartments, certain of the Company's railcar leases and other equipment leases. There were no leases containing variable lease payments and none of the Company's leases contained extension or termination options which were necessary in determining the value of the right-to-use asset and related liabilities. The Company assumed a 12.0% discount rate, which is consistent with the stated rate on the Company's 2020 Notes and represents the best approximation of the rate implicit in the Company's leases.

The Company identified three lease agreements that qualify as "operating" based on the terms and conditions at the commencement date for each lease. These include the lease for the Company's office and research facility in Englewood, Colorado, with a term expiring in July 2021, a lease of plant equipment with a term expiring in January 2021 used by Agri-Energy at the Luverne Facility and a lease of transportation equipment with a term expiring in June 2020 used by Agri-Energy at the Luverne Facility. All other leases qualified for the short-term scope exemption. This consists of a corporate apartment in Colorado and leases of transportation equipment located at both the Luverne Facility and the South Hampton Facility with original lease terms of less than twelve months.

Upon adoption of ASC 842, *Leases*, which was effective January 1, 2019, the Company recognized a total of $1.2 million of right-to-use assets and related lease liabilities. Within the Consolidated Balance Sheet at December 31, 2019, $0.6 million of right-to-use assets with a remaining term exceeding twelve months are included in *"Deposits and other assets"*. For the related lease liabilities, $0.4 million are included in *"Accounts payable and accrued liabilities"* for the current portion and $0.3 million are included in *"Other long-term liabilities"* for the non-current portion.

The Company recognizes rent expense on its operating leases on a straight-line basis.

There are two contractual agreements related to equipment improvements at the Luverne Facility that were not recognized as of December 31, 2019 as a result of operating contingencies which must be satisfied before the Company is obligated under the terms of the contract. The total estimated fair value of unrecognized right-to-use assets and related lease liabilities relating to these contracts was approximately $3.0 million as of December 31, 2019.

The following table presents the (a) costs by lease category and (b) other quantitative information relating to the Company's leases for the year ended December 31, 2019:

Lease Cost		
Operating lease cost	$	1,554
Short-term lease cost		66
Variable lease expense (1)		119
Total lease cost	$	1,739
(1) Represents amounts incurred in excess of minimum payments for common area maintenance and present value discounts.		
Other Information		
Cash paid for the measurement of lease liabilities		
Operating cash flows from operating leases	$	1,554
Right-to-use assets obtained in exchange for new operating lease liabilities	$	280
Weighted-average remaining lease term, operating leases (months)		21.0
Weighted-average discount rate - operating leases		12%

The table below shows the future minimum payments under non-cancelable operating leases at December 31, 2019 (in thousands):

Year Ending December 31,		
2020	$	684
2021		336
2022 and thereafter		—
Total		1,020
Less: Amounts representing present value discounts		(80)
Total lease liabilities	$	940

5. Inventories

The following table sets forth the components of the Company's inventory balances (in thousands):

	December 31,	
	2019	2018
Raw materials		
Corn	$ 267	$ 29
Enzymes and other inputs	184	204
Finished goods		
Jet Fuels, Isooctane and Isooctene	571	394
Isobutanol	135	549
Ethanol	93	182
Distillers grains	54	54
Work in process		
Agri-Energy	254	214
Gevo	122	89
Spare parts	1,521	1,451
Total inventories	$ 3,201	$ 3,166

Work in process inventory includes unfinished jet fuel, isooctane and isooctene inventory.

6. Property, Plant and Equipment

The following table sets forth the Company's property, plant and equipment by classification (in thousands):

	Useful Life (in years)	December 31,	
		2019	2018
Luverne retrofit asset	20	$ 70,820	$ 70,842
Plant machinery and equipment	10	17,413	16,285
Site improvements	10	7,054	7,055
Lab equipment, furniture and fixtures and vehicles	5	6,393	6,574
Demonstration plant	2	3,597	3,597
Buildings	10	2,543	2,543
Leasehold improvements, pilot plant, land and support equipment	2 to 5	2,523	2,542
Computer, office equipment and software	3 to 6	2,034	2,335
Construction in progress	—	7,710	3,478
		120,087	115,251
Less accumulated depreciation and amortization		(53,391)	(47,789)
Property, plant and equipment, net		$ 66,696	$ 67,462

The Company recorded depreciation and amortization expense related to property, plant and equipment as follows (in thousands):

	Year Ended December 31,	
	2019	2018
Cost of goods sold	$ 6,282	$ 6,250
Operating expenses	210	267
Total depreciation and amortization	$ 6,492	$ 6,517

7. Embedded Derivatives

2020 Notes Embedded Derivative

In June 2017, the Company issued its 12% convertible senior secured notes due 2020 (the "2020 Notes") in exchange for its 12.0% convertible senior secured notes due 2017 (the "2017 Notes"). The 2020 Notes contain the following embedded derivatives: (i) a Make-Whole Payment (as defined in the indenture governing the 2020 Notes (the "2020 Notes Indenture")) upon either conversion or redemption; (ii) right to redeem the outstanding principal upon a Fundamental Change (as defined in the 2020 Notes Indenture); (iii) issuer rights to convert into a limited number of shares in any given three-month period commencing nine months from the issuance date and dependent on the stock price exceeding 150% of the then in-effect conversion price over a ten-business day period; and (iv) holder rights to convert into either shares of the Company's common stock or pre-funded warrants upon the election of the holders of the 2020 Notes.

Embedded derivatives are separated from the host contract and the 2020 Notes and carried at fair value when: (a) the embedded derivative possesses economic characteristics that are not clearly and closely related to the economic characteristics of the host contract; and (b) a separate, stand-alone instrument with the same terms would qualify as a derivative instrument. The Company has concluded that certain embedded derivatives within the 2020 Notes meet these criteria and, as such, must be valued separate and apart from the 2020 Notes as one embedded derivative and recorded at fair value each reporting period.

The Company used a binomial lattice model in order to estimate the fair value of the embedded derivative in the 2020 Notes. A binomial lattice model generates two probable outcomes, whether up or down, arising at each point in time, starting from the date of valuation until the maturity date. A lattice was initially used to determine if the 2020 Notes would be converted by the holder, called by the issuer, or held at each decision point. Within the lattice model, the following assumptions are made: (i) the 2020 Notes will be converted by the holder if the conversion value plus the holder's Make-Whole Payment is greater than the holding value; or (ii) the 2020 Notes will be called by the issuer if (a) the stock price exceeds 150% of the then in-effect conversion price over a ten-business day period and (b) if the holding value is greater than the conversion value plus the Make-Whole Payment at the time.

Using this lattice model, the Company valued the embedded derivative using a "with-and-without method", where the value of the 2020 Notes including the embedded derivative is defined as the "with", and the value of the 2020 Notes excluding the embedded derivative is defined as the "without". This method estimates the value of the embedded derivative by comparing the difference in the values between the 2020 Notes with the embedded derivative and the value of the 2020 Notes without the embedded derivative. The lattice model requires the following inputs: (i) price of Gevo common stock; (ii) Conversion Rate (as defined in the 2020 Notes Indenture); (iii) Conversion Price (as defined in the 2020 Notes Indenture); (iv) maturity date; (v) risk-free interest rate; (vi) estimated stock volatility; and (vii) estimated credit spread for the Company.

GEVO, INC.
Notes to Consolidated Financial Statements (Continued)

As of December 31, 2019 and 2018, the estimated fair value of the embedded derivatives was $0 and $0.4 million, respectively. The Company recorded a $0.4 million and $2.6 million gain to reflect the change in fair value of the embedded derivative in the Consolidated Statements of Operations for the years ended December 31, 2019 and 2018, respectively. The Company recorded the estimated fair value of the embedded derivative as a component of current liabilities in the Consolidated Balance Sheet.

The following table sets forth the inputs to the lattice model that were used to value the embedded derivatives:

	December 31, 2019	December 31, 2018
Stock price	$ 2.31	$ 1.96
Conversion Rate	$ 67.95	$ 67.95
Conversion Price	$ 14.72	$ 14.72
Maturity date	March 15, 2020	March 15, 2020
Risk-free interest rate	1.52%	2.57%
Estimated stock volatility	60%	150%
Estimated credit spread	27%	31%

Changes in certain inputs into the lattice model can have a significant impact on changes in the estimated fair value of the embedded featured within the 2020 Notes. For example, the estimated fair value will generally decrease with: (1) a decline in the stock price; (2) decreases in the estimated stock volatility; and (3) a decrease in the estimated credit spread.

GEVO, INC.
Notes to Consolidated Financial Statements (Continued)

8. Accounts Payable and Accrued Liabilities

The following table sets forth the components of the Company's accounts payable and accrued liabilities in the Consolidated Balance Sheets (in thousands):

	December 31,	
	2019	2018
Accrued production fees	$ 1,946	$ 1,648
Accounts payable - trade	1,474	1,944
Accrued utilities and supplies	645	344
Other accrued liabilities	1,613	960
Total accounts payable and accrued liabilities	$ 5,678	$ 4,896

9. Debt

2020 Notes

The following table sets forth information pertaining to the 2020 Notes which is included in the Company's Consolidated Balance Sheets (in thousands):

	Principal Amount of 2020 Notes	Debt Discount	Debt Issue Costs	Total 2020 Notes	2020 Notes Embedded Derivative	Total 2020 Notes and 2020 Notes Embedded Derivative
Balance - December 31, 2017	$ 16,657	$ (2,501)	$ (665)	$ 13,491	$ 5,224	$ 18,715
Amortization of debt discount	—	1,094	—	1,094	—	1,094
Amortization of debt issue costs	—	—	309	309	—	309
Paid-in-kind interest	304	—	—	304	—	304
Change in fair value of 2020 Notes embedded derivative	—	—	—	—	(2,637)	(2,637)
Conversion of 2020 Notes into common stock	(3,186)	428	114	(2,644)	(2,193)	(4,837)
Balance - December 31, 2018	13,775	(979)	(242)	12,554	394	12,948
Amortization of debt discount	—	856	—	856	—	856
Amortization of debt issue costs	—	—	212	212	—	212
Paid-in-kind interest	278	—	—	278	—	278
Change in fair value of 2020 Notes embedded derivative	—	—	—	—	(394)	(394)
Balance - December 31, 2019	$ 14,053	$ (123)	$ (30)	$ 13,900	$ —	$ 13,900

On April 19, 2017, the Company entered into an Exchange and Purchase Agreement (the "2017 Purchase Agreement") with WB Gevo, LTD (the "2017 Holder") the holder of the Company's 12.0% convertible senior secured notes due 2017 (the "2017 Notes"), which were issued under that certain Indenture dated as of June 6, 2014, by and among the Company, the guarantors party thereto, and Wilmington Savings Fund Society ("FSB"), as trustee and as collateral trustee (as supplemented, the "2017 Notes Indenture"), and Whitebox Advisors LLC ("Whitebox"), in its capacity as representative of the 2017 Holder. Pursuant to the terms of the 2017 Purchase Agreement, the 2017 Holder, subject to certain conditions, including approval of the transaction by the Company's stockholders (which was received on June 15, 2017), agreed to exchange all of the outstanding principal amount of the 2017 Notes for an equal principal amount of the 2020 Notes, plus an amount in cash equal to the accrued and unpaid interest (other than interest paid in kind) on the 2017 Notes (the "2017 Exchange"). On June 20, 2017, the Company completed the 2017 Exchange, terminated the 2017 Notes Indenture and cancelled the 2017 Notes.

The 2020 Notes had a maturity date of March 15, 2020 and were secured by a first lien on substantially all of our assets. The 2020 Notes had an interest rate equal to 12% per annum (with 2% potentially payable as PIK Interest (as defined and described below) at our option), payable on March 31, June 30, September 30 and December 31 of each year. To the extent that the Company paid any portion of the interest due on the 2020 Notes as PIK Interest, the maximum aggregate principal amount of 2020 Notes that would have been convertible into shares of the Company's common stock increased.

Under certain circumstances, the Company had the option to pay a portion of the interest due on the 2020 Notes by either (a) increasing the principal amount of the 2020 Notes by the amount of interest then due or (b) issuing additional 2020 Notes with a principal amount equal to the amount of interest

then due (interest paid in the manner set forth in (a) or (b) being referred to as “PIK Interest”).

Additional shares of the Company's common stock could also have become issuable pursuant to the 2020 Notes in the event the Company was required to make certain make-whole payments as provided in the 2020 Notes Indenture.

The 2020 Notes were convertible into shares of the Company's common stock, subject to certain terms and conditions. The initial conversion price of the 2020 Notes was equal to $14.72 per share of common stock, or 0.0679 shares of common stock per $1 principal amount of 2020 Notes.

GEVO, INC.
Notes to Consolidated Financial Statements (Continued)

2020/21 Notes

On January 10, 2020, the Company entered into an Exchange and Purchase Agreement (the “2020/21 Purchase Agreement”) with the guarantors party thereto, the 2017 Holder and Whitebox Advisors LLC ("Whitebox"), in its capacity as representative of the 2017 Holder. Pursuant to the terms of the 2020/21 Purchase Agreement, the 2017 Holder, subject to certain conditions, agreed to exchange all of the outstanding principal amount of the 2020 Notes, which was approximately $14.1 million including unpaid accrued interest, for approximately $14.4 million in aggregate principal amount of the Company's newly created 12.0% Convertible Senior Notes due 2020/21 (the "2020/21 Notes") (the “2020/21 Exchange”). Pursuant to the 2020/21 Purchase Agreement, the Company also granted the 2017 Holder an option to purchase up to an additional aggregate principal amount of approximately $7.1 million of 2020/21 Notes (the “2020/21 Option Notes”), at a purchase price equal to the aggregate principal amount of such 2020/21 Option Notes purchased less an original issue discount of 2.0%, having identical terms (other than with respect to the issue date and restrictions on transfer relating to compliance with applicable securities law) to the 2020/21 Notes issued, at any time during the period beginning on the date of closing of the 2020/21 Exchange and ending on the later of (a) 180 days thereafter, and (b) 30 days following the date on which Stockholder Approval (as described below) is obtained. In addition, on January 10, 2020, the Company completed the 2020/21 Exchange, terminated the 2017 Notes Indenture and cancelled the 2020 Notes. In addition, the Company entered into an Indenture by and among the Company, the guarantors named therein (the “2020/21 Notes Guarantors”) and FSB, as trustee and as collateral trustee (the “2020/21 Notes Indenture”), pursuant to which the Company issued the 2020/21 Notes.

The 2020/21 Notes will mature on December 31, 2020, provided that the maturity date will automatically be extended to April 1, 2021 if (i) approval of a stockholder proposal is obtained prior to March 20, 2020 for the issuance of shares of the Company’s common stock under the 2020/21 Notes Indenture in excess of 19.99% of the outstanding shares of the Company’s common stock on the date of the 2020/21 Notes Indenture (the “Stockholder Approval”), and (ii) the aggregate outstanding principal balance of the 2020/21 Notes (including any 2020/21 Option Notes) as of December 15, 2020 is less than $7 million. The 2020/21 Notes bear interest at a rate equal to 12% per annum (with 4% payable as PIK Interest (as defined and described below)), payable on March 31, June 30, September 30 and December 31 of each year. Under certain circumstances, the Company will have the option to pay a portion of the interest due on the 2020/21 Notes by either (a) increasing the principal amount of the 2020/21 Notes by the amount of interest then due or (b) issuing additional 2020/21 Notes with a principal amount equal to the amount of interest then due (interest paid in the manner set forth in (a) or (b) being referred to as “PIK Interest”). In the event the Company pays any portion of the interest due on the 2020/21 Notes as PIK Interest, the maximum aggregate principal amount of 2020/21 Notes that could be convertible into shares of the Company’s common stock will be increased.

The 2020/21 Notes are convertible into shares of the Company’s common stock voluntarily by the 2017 Holder at the conversion price, subject to certain terms and conditions. The initial conversion price of the 2020/21 Notes is equal to $2.442 per share of the Company’s common stock (the “2020/21 Notes Conversion Price”), or 0.4095 shares of the Company’s common stock per $1 principal amount of 2020/21 Notes. The Company and the 2017 Holder may also mutually agree on other conversions of the 2020/21 Notes into shares of the Company’s common stock on a monthly basis (a “Contractual Conversion”) pursuant to the terms of the 2020/21 Notes Indenture. The 2020/21 Notes Conversion Price in a Contractual Conversion will be reduced to the lesser of the then-applicable 2020/21 Notes Conversion Price or a 10% discount to the average of the daily volume weighted average price of the Company’s common stock for the three forward trading days prior to the date of the Contractual Conversion.

Each 2017 Holder has agreed not to convert its 2020/21 Notes into shares of the Company’s common stock to the extent that, after giving effect to such conversion, the number of shares of the Company’s common stock beneficially owned by such 2017 Holder and its affiliates would exceed 4.99% of the Company’s common stock outstanding at the time of such conversion (the “4.99% Ownership Limitation”); provided that a 2017 Holder may, at its option and upon 61 days’ prior notice to the Company, increase such threshold to 9.99% (the “9.99% Ownership Limitation”). If a conversion of 2020/21 Notes by a 2017 Holder would exceed the 4.99% Ownership Limitation or the 9.99% Ownership Limitation, as applicable, the 2020/21 Purchase Agreement contains a provision granting the 2017 Holder a fully funded prepaid warrant for such common stock with a term of nine months, subject to a six-month extension, which it can draw down from time to time.

The 2020/21 Notes may be redeemed in whole or in part, at the Company’s option, for cash at any time after the Stockholder Approval is obtained and upon 120 days’ notice to the 2017 Holder. Following a notice of redemption of the 2020/21 Notes by the Company, the 2017 Holder may elect to convert the 2020/21 Notes into shares of the Company’s common stock at the same conversion price as applicable to a Contractual Conversion.

The 2020/21 Notes do not contain any anti-dilution adjustments for future equity issuances that are below the 2020/21 Notes Conversion Price, and adjustments to the 2020/21 Notes Conversion Price will only generally be made in the event that there is a dividend or distribution paid on shares of the Company’s common stock, a subdivision, combination or reclassification of the Company’s common stock, or at the discretion of the Board of Directors of the Company in limited circumstances and subject to certain conditions.

The 2020/21 Notes are secured by a lien on substantially all of the assets of the Company and the 2020/21 Notes Guarantors, including intellectual property and real property, and are guaranteed by the Company’s existing subsidiaries.

Under certain circumstances, the Company may file one or more registration statements on Form S-3 or amend filings in order to register shares of common stock for sale or resale, as necessary in connection with the 2020/21 Notes.

Notes Payable - Other

During the fourth quarter 2019, the Company purchased equipment and financed part of its insurance obligation. The equipment notes pay interest between 3.9% - 4.0%, have total monthly payments of $0.01 million and mature at various dates from August 2020 to December 2024. The equipment loans are secured by the related equipment. The balance of these notes at December 31, 2019 are as follows (in thousands):

Equipment	$ 321
Insurance	428
	749
Less current portion	(516)

Long-term portion	$ 233

Future payments for Notes Payable - Other are as follows (in thousands):

Year ending December 31,	**Amount**
2020	$ 516
2021	79
2022	60
2023	62
2024	32
	$ 749

2022 Notes

In July 2012, the Company sold $45.0 million in aggregate principal amount of its 7.5% convertible senior notes due July 2022 (the "2022 Notes") for net proceeds of $40.9 million, after accounting for $2.7 million and $1.4 million of discounts and issue costs, respectively. The 2022 Notes had an interest rate of 7.5%, which was to be paid semi-annually in arrears on January 1 and July 1 of each year. In the first quarter of 2018, the Company issued an aggregate 39,016 shares in exchange for the redemption of the remaining $0.5 million in outstanding 2022 Notes.

10. Equity Incentive Plans

2006 Omnibus Securities and Incentive Plan. During 2006, the Company established the Gevo, Inc. 2006 Omnibus Securities and Incentive Plan (the “2006 Plan”). Pursuant to the 2006 Plan, the Company granted stock awards to employees and directors of the Company. Upon adoption of the Gevo, Inc. 2010 Stock Incentive Plan (as amended and restated, the “2010 Plan”), no further grants can be made under the 2006 Plan. At December 31, 2019, there were no remaining shares available for future grants of stock awards. To the extent outstanding awards under the 2006 Plan expire, or are forfeited, cancelled, settled, or become unexercisable without the issuance of shares, the shares of common stock subject to such awards will be available for future issuance under the 2010 Plan.

2010 Stock Incentive Plan. In February 2011, the Company’s stockholders approved the Gevo, Inc. 2010 Plan. The 2010 Plan provided for the grant of non-qualified stock options, incentive stock options, stock appreciation rights, restricted stock awards, restricted stock units and other equity awards to employees and directors of the Company. On June 10, 2019, the 2010 Plan was amended and restated, which increased the number of shares of common stock reserved for issuance to 3,266,661 shares. In July 2019, the Company issued 254,500 shares of common stock in relation to restricted stock awards granted on August 9, 2018. In July 2019, the Company also issued 1,283,032 shares of common stock in relation to restricted stock awards granted on June 24, 2019 and 25,581 shares of common stock in relation to restricted stock awards granted on August 8, 2019, in each case vesting over two years, to its employees and directors. In August 2019, the Company withheld 79,790 shares of common stock to settle income taxes related to the vested restricted stock awards for certain employees. At December 31, 2019, an additional 1,785,829 shares were available for issuance upon the exercise of outstanding stock option awards or the grant of stock appreciation rights and restricted stock awards under the 2010 Plan.

Employee Stock Purchase Plan. In February 2011, the Company’s stockholders approved the Employee Stock Purchase Plan (the "ESPP"). The offering periods for the ESPP are from January 1 to June 30 and from July 1 to December 31 of each calendar year. The Company has reserved 190 shares of common stock for issuance under the ESPP, of which 190 shares as of December 31, 2019 are available for future issuance. The purchase price of the common stock under the ESPP is 85% of the lower of the fair market value of a share of common stock on the first or last day of the purchase period. There were no purchases of common stock under the ESPP during 2019.

11. Stock-Based Compensation

Stock-Based Compensation Expense. The Company records stock-based compensation expense during the requisite service period for share-based payment awards granted to employees and non-employees.

The following table sets forth the Company's stock-based compensation expense (in thousands):

	Year Ended December 31,	
	2019	2018
Stock options and ESPP awards		
Research and development	$ —	$ 21
Selling, general and administrative	—	48
Restricted stock awards		
Research and development	228	85
Selling, general and administrative	993	417
Stock appreciation rights		
Research and Development	66	61
Selling, general and administrative	62	51
Total stock-based compensation	$ 1,349	$ 683

There were no stock options granted during the years ended December 31, 2019 or 2018.

Due to the Company's limited history of grant activity, the expected life of options granted was estimated using the "simplified method" in accordance with SEC Staff Accounting Bulletin 110, where the expected life equals the arithmetic average of the vesting term and the original contractual term of the options. The volatility factor was determined based upon management's estimate using inputs from comparable public companies. The risk-free interest rate assumption is determined based upon observed interest rates appropriate for the expected term of the Company's employee stock options. The dividend yield assumption is based on the Company's history of dividend payouts.

An annual forfeiture rate is estimated at the time of grant for all share-based payment awards, and revised, if necessary, in subsequent periods if the actual forfeiture rate differs from the Company's estimate. Forfeitures have been estimated by the Company based upon historical and expected forfeiture experience. Estimated forfeiture rates used for the periods presented were from 0% to 5%.

GEVO, INC.
Notes to Consolidated Financial Statements (Continued)

Stock Option Award Activity. Stock option activity under the Company's option plans at December 31, 2019 and changes during the year ended December 31, 2019 were as follows.

	Number of Options	Weighted-Average Exercise Price	Weighted-Average Remaining Contractual Term (years)	Aggregate Intrinsic Value
Options outstanding at December 31, 2018	2,313	$ 2,358.44	6.87	$ —
Granted	—	$ —		
Canceled or forfeited	(752)	$ 5,151.80		
Exercised	—	$ —		
Options outstanding at December 31, 2019	1,561	$ 928.79	6.56	$ —
Options exercisable at December 31, 2019	1,511	$ 1,043.47	6.53	$ —
Options vested and expected to vest at December 31, 2019	1,561	$ 928.79	6.56	$ —

The aggregate intrinsic values in the table above represent the total pretax intrinsic values (the difference between the closing price of Gevo's common stock on the last trading day of the 2019 calendar year and the exercise price, multiplied by the number of in-the-money stock option shares) that would have been received by the option holders had all in-the-money outstanding stock options been exercised on December 31, 2019.

As of December 31, 2019, there was no unrecognized compensation cost related to stock options.

There is a maximum contractual term of ten years for the share options. The Company settles stock option exercises with newly issued common shares. No tax benefits were realized by the Company in connection with these exercises as the Company maintains net operating loss carryforwards and has established a valuation allowance against the entire tax benefit.

Restricted Stock. The Company periodically grants restricted stock awards to employees and directors. The vesting period for restricted stock awards granted may be based upon a service period or based upon the attainment of performance objectives. The Company recognizes stock-based compensation over the vesting period, generally two to three years, for awards that vest based upon a service period. For performance based restricted stock awards, the Company recognizes expense over the requisite service period.

Non-vested restricted stock awards at December 31, 2019 and changes during the year ended December 31, 2019 were as follows.

	Number of Shares	Weighted-Average Grant-Date Fair Value
Non-vested at December 31, 2018	290,300	$ 3.45
Granted	1,308,613	$ 1.91
Vested	(254,500)	$ 3.45
Canceled or forfeited	(35,800)	$ 3.45
Non-vested at December 31, 2019	1,308,613	$ 1.91

The total fair value of restricted stock that vested during the years ended December 31, 2019 and 2018 was $0.7 million and $0.5 million, respectively. As of December 31, 2019, the total unrecognized compensation expense, net of estimated forfeitures, relating to restricted stock awards was $1.8 million, which is expected to be recognized over the remaining weighted-average period of approximately 1.5 years.

Stock Appreciation Rights. The Company granted 132,566 stock appreciation rights valued at an aggregate of $0.6 million on the respective dates of grant during the year ended December 31, 2018. The vesting period for stock appreciation rights granted are based upon a service period. The stock appreciation rights have the potential to be cash settled in the event there are insufficient shares available from the 2010 Plan and are therefore classified as a liability and remeasured at each reporting period based on the price of the Company's common stock.

The following table sets forth the Black-Scholes option pricing model assumptions and resulting grant date fair value for stock appreciation rights granted during the year ended December 31, 2018 (there were no grants of stock appreciation rights during the year ended December 31, 2019):

	December 31, 2018	Grant Date(1)
Risk-free interest rate	2.54%	2.84%
Expected dividend yield	—	—
Expected volatility factor	134.17%	125.03%
Expected option life (in years)	5.75	5.75
Weighted average value	$ 1.65	$ 4.53

(1) Stock appreciation rights were granted on May 2, 2018 and August 9, 2018. The values reported above are the weighted-average grant date value. The weighted-average strike price was $5.23 per share.

12. Income Taxes

There is no provision for income taxes because the Company has incurred operating losses since inception. As of December 31, 2019, the Company had federal and state net operating loss carryforwards of approximately $400.3 million and $375.7 million, respectively, which may be used to offset future taxable income. The Company also had federal research and development tax credit carryforwards and other federal tax credit carryforwards which aggregate to $3.5 million at December 31, 2019. These carryforwards expire at various times through 2039 and may be limited in their annual usage by Section 382 of the Internal Revenue Code, as amended, relating to ownership changes.

The following table sets forth the tax effects of temporary differences that give rise to significant portions of the Company's net deferred tax assets (in thousands):

	December 31,	
	2019	2018
Deferred tax assets, net:		
Net operating loss carryforwards	$ 109,813	$ 103,612
Research and other credits	3,482	3,482
Operating lease assets	(170)	—
Operating lease liabilities	199	—
Other temporary differences	4,851	3,760
Deferred tax assets	118,175	110,854
Valuation allowance	(118,175)	(110,854)
Net deferred tax assets	$ —	$ —

The Company recognizes uncertain tax positions net, against any operating losses or applicable research credits as they arise. Currently, there are no uncertain tax positions recognized at December 31, 2019. The Company has provided a full valuation allowance on its deferred tax assets at December 31, 2019 and 2018, as management believes it is more likely than not that the related deferred tax asset will not be realized. The reported amount of income tax expense differs from the amount that would result from applying domestic federal statutory tax rates to pretax losses, primarily because of changes in the valuation allowance.

The following table sets forth reconciling items from income tax computed at the statutory federal rate:

	Year Ended December 31,	
	2019	2018
Federal income tax at statutory rate	21.0%	21.0%
State income taxes, net of federal benefits	7.0%	6.2%
Impact of change in statutory tax rates	(0.2%)	(8.8%)
Permanent deductions	(0.1%)	(3.7%)
Valuation allowance	(27.7%)	(14.7%)
Effective tax rate	—%	—%

Accounting literature regarding liabilities for unrecognized tax benefits provides guidance for the recognition and measurement in financial statements of uncertain tax positions taken or expected to be taken in a tax return. The Company's evaluation was performed for the tax periods from inception to December 31, 2019. The Company is subject to examination by major tax jurisdictions for the years ended December 31, 2015 to 2019.

The Company may from time to time be assessed interest or penalties by major tax jurisdictions, although there have been no such assessments historically with any material impact to its financial results. The Company would recognize interest and penalties related to unrecognized tax benefits within the income tax expense line in the accompanying Consolidated Statements of Operations. Accrued interest and penalties would be included within the related tax liability line in the Consolidated Balance Sheets.

13. Employee Benefit Plan

The Company's employees participate in the Gevo, Inc. 401(k) Plan (the "401(k) Plan"). Subject to certain eligibility requirements, the 401(k) Plan covers substantially all employees after three months of service with quarterly entry dates. Employee contributions are deposited by the Company into the 401(k) Plan and may not exceed the maximum statutory contribution amount. The Company may make matching and/or discretionary contributions to the 401(k) Plan. The Company did not provide an employer match during the years ended December 31, 2019 or 2018.

14. Commitments and Contingencies

Legal Matters. From time to time, the Company has been and may again become involved in legal proceedings arising in the ordinary course of its business. The Company is not aware of any pending or threatened litigation against the Company that it believes could have a material adverse effect on its business, operating results, financial condition or cash flows.

Indemnifications. In the ordinary course of its business, the Company makes certain indemnities under which it may be required to make payments in relation to certain transactions. As of December 31, 2019 and 2018, the Company did not have any liabilities associated with indemnities.

In addition, the Company, as permitted under Delaware law and in accordance with its amended and restated certificate of incorporation and amended and restated bylaws, in each case, as amended to date, indemnifies its officers and directors for certain events or occurrences, subject to certain limits, while the officer or director is or was serving at the Company's request in such capacity. The duration of these indemnifications, commitments, and guarantees varies and, in certain cases, is indefinite. The maximum amount of potential future indemnification is unlimited; however, the Company has a director and officer insurance policy that may enable it to recover a portion of any future amounts paid. The Company accrues for losses for any known contingent liability, including those that may arise from indemnification provisions, when future payment is probable. No such losses have been recorded to date.

Environmental Liabilities. The Company's operations are subject to environmental laws and regulations adopted by various governmental authorities in the jurisdictions in which it operates. These laws require the Company to investigate and remediate the effects of the release or disposal of materials at its locations. Accordingly, the Company has adopted policies, practices and procedures in the areas of pollution control, occupational health and the production, handling, storage and use of hazardous materials to prevent material environmental or other damage, and to limit the financial liability which could result from such events. Environmental liabilities are recorded when the Company's liability is probable and the costs can be reasonably estimated. No environmental liabilities have been recorded as of December 31, 2019.

15. Fair Value Measurements and Fair Value of Financial Instruments

Accounting standards define fair value, outline a framework for measuring fair value, and detail the required disclosures about fair value measurements. Under these standards, fair value is defined as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date in the principal or most advantageous market. Standards establish a hierarchy in determining the fair market value of an asset or liability. The fair value hierarchy has three levels of inputs, both observable and unobservable. Standards require the utilization of the highest possible level of input to determine fair value.

Level 1 – inputs include quoted market prices in an active market for identical assets or liabilities.

Level 2 – inputs are market data, other than Level 1, that are observable either directly or indirectly. Level 2 inputs include quoted market prices for similar assets or liabilities, quoted market prices in an inactive market, and other observable information that can be corroborated by market data.

Level 3 – inputs are unobservable and corroborated by little or no market data.

These tables present the carrying value and fair value, by fair value hierarchy, of the Company's financial instruments at December 31, 2019 and 2018, respectively (in thousands). The Company believes that the fair value of its Notes Payable - Other approximated book value, which totaled $0.7 million at December 31, 2019.

		Fair Value Measurements at December 31, 2019		
	Fair Value at December 31, 2019	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Recurring				
Derivative Warrant Liability	$ 8	$ —	$ —	$ 8
Nonrecurring				
Corn and finished goods inventory	$ 940	$ 267	$ 673	$ —

		Fair Value Measurements at December 31, 2018		
	Fair Value at December 31, 2018	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Recurring				
Derivative Warrant Liability	$ 22	$ —	$ —	$ 22
2020 Notes Embedded Derivative Liability	394	—	—	394
Total Recurring Fair Value Measurements	$ 416	$ —	$ —	$ 416
Nonrecurring				
Corn and finished goods inventory	$ 1,047	$ 29	$ 1,018	$ —

	Fair Value Measurements Using Significant Unobservable Inputs (Level 3) (in thousands)	
	Derivative Warrant Liability	2020 Embedded Derivative Liability
Balance, December 31, 2018	$ 22	$ 394
Total (gains) or losses for the period included in earnings	(14)	(394)
Purchases	—	—
Balance, December 31, 2019	$ 8	$ —

There were no transfers between Level 1 and Level 2 inputs. There were no transfers in or out of Level 3 inputs. There were no issuances, purchases, sales or settlements of Level 3 inputs during the year ended December 31, 2019.

The Company believes that the fair value of its accounts receivable and accounts payable approximate its book value due to their short-term nature.

Fair Value Methodology

Inventories. The Company records its corn inventory at fair value only when the Company's cost of corn purchased exceeds the market value for corn. The Company determines the market value of corn and dry distillers grain based upon Level 1 inputs using quoted market prices. The Company records its isobutanol, hydrocarbon and ethanol inventory at market using Level 2 inputs.

2020 Notes. The Company has estimated the fair value of the 2020 Notes to be $13.5 million at June 20, 2017, the date the Company exchanged the 2017 Notes for the 2020 Notes, utilizing a binomial lattice model. The Company accounted for the 2020 Notes using the amortized cost method and reported $13.9 million and $12.6 million as of December 31, 2019 and 2018, respectively, net of debt discount and issuance costs.

2020 Notes Embedded Derivative. The Company had estimated the fair value of the embedded derivative on a stand-alone basis to be $0 at December 31, 2019 based upon Level 3 inputs. See Note 7, Embedded Derivatives, for the fair value inputs used to estimate the fair value of the 2020 Notes with and without the embedded derivative and the fair value of the embedded derivative.

While the Company believes that its valuation methods are appropriate and consistent with other market participants, it recognizes that the use of different methodologies or assumptions to determine the fair value of certain financial instruments could result in a different estimate of fair value at the reporting date.

16. Segments

The Company has determined that it has two operating segments: (i) Gevo, Inc. segment; and (ii) Gevo Development/Agri-Energy segment. The Company organizes its business segments based on the nature of the products and services offered through each of its consolidated legal entities. Transactions between segments are eliminated in consolidation.

Gevo Segment. The Gevo segment is responsible for all research and development activities related to the future production of isobutanol, including the development of the Company's proprietary biocatalysts, the production and sale of renewable jet and other fuels, the Retrofit process and the next generation of chemicals and biofuels that will be based on the Company's isobutanol technology. The Gevo segment also develops, maintains and protects its intellectual property portfolio, develops future markets for its isobutanol and provides corporate oversight services.

Gevo Development/Agri-Energy. The Gevo Development/Agri-Energy segment is currently responsible for the operation of the Luverne Facility and the production of ethanol, isobutanol and related products.

GEVO, INC.
Notes to Consolidated Financial Statements (Continued)

The Company's chief operating decision maker is provided with and reviews the financial results of each of the Company's consolidated legal entities, Gevo, Inc., Gevo Development, LLC and Agri-Energy, LLC. The Company organizes its business segments based on the nature of the products and services offered through each of its consolidated legal entities. All revenue is earned and all assets are held in the U.S.

	Year Ended December 31,	
	2019	2018
	(In thousands)	
Revenues from external customers		
Gevo	$ 2,338	$ 1,222
Gevo Development / Agri-Energy	22,149	31,641
Consolidated	$ 24,487	$ 32,863
Loss from operations		
Gevo	$ (12,360)	$ (11,552)
Gevo Development / Agri-Energy	(13,991)	(10,649)
Consolidated	$ (26,351)	$ (22,201)
Interest expense		
Gevo	$ 2,732	$ 3,237
Gevo Development / Agri-Energy	—	—
Consolidated	$ 2,732	$ 3,237
Depreciation and amortization expense		
Gevo	$ 210	$ 269
Gevo Development / Agri-Energy	6,446	6,251
Consolidated	$ 6,656	$ 6,520
Acquisitions of plant, property and equipment		
Gevo	$ 130	$ 27
Gevo Development / Agri-Energy	6,367	3,096
Consolidated	$ 6,497	$ 3,123
Revenue by geographic area		
United States	$ 22,149	$ 31,641
Other	2,338	1,222
Consolidated	$ 24,487	$ 32,863

	December 31,	
	2019	2018
Total assets		
Gevo	$ 91,861	$ 105,379
Gevo Development / Agri-Energy	143,349	140,982
Intercompany eliminations (1)	(141,851)	(139,326)
Consolidated (2)	$ 93,359	$ 107,035

(1) Includes intercompany sales of $0.4 million and $0.1 million during the years ended December 31, 2019 and 2018, respectively, for hydrocarbon sales.
(2) All other significant non-cash items relate to the activities of Gevo.

Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure

None.

Item 9A. Controls and Procedures

Evaluation of Disclosure Controls and Procedures

We maintain disclosure controls and procedures, as such term is defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act, that are designed to provide reasonable assurance that information required to be disclosed by us in the reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the SEC rules and regulations, and that such information is accumulated and communicated to our management, including our Chief Executive Officer and Principal Financial Officer, as appropriate, to allow timely decisions regarding required financial disclosures. In designing and evaluating the disclosure controls and procedures, management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving the desired control objectives, and management is required to apply its judgment in evaluating the cost-benefit relationship of possible controls and procedures.

Based on their evaluation as of December 31, 2019, our Chief Executive Officer and our Chief Financial Officer concluded that our disclosure controls and procedures were effective as of December 31, 2019.

Management's Report on Internal Control over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting, as defined in Rules 13a-15(f) and 15d-15(f) of the Exchange Act. Our internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. Our internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of our assets; (ii) provide reasonable assurance that transactions are recorded to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the Company are made only in accordance with authorizations of our management and directors; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of our assets that could have a material effect on our financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Under the supervision and with the participation of our management, including our Chief Executive Officer and our Chief Financial Officer, we conducted an evaluation of the effectiveness of our internal control over financial reporting based on the framework set forth in *Internal Control—Integrated Framework* (2013 framework) issued by the Committee of Sponsoring Organizations of the Treadway Commission. Based upon the results of the evaluation, our management concluded that our internal control over financial reporting was effective as of December 31, 2019.

Changes in Internal Control Over Financial Reporting

There were no changes in our internal control over financial reporting during the quarter ended December 31, 2019 that have materially affected, or reasonably likely to materially affect, our internal control over financial reporting.

Item 9B. Other Information

None

PART III

Item 10. Directors, Executive Officers and Corporate Governance

The information required by this item is incorporated by reference to our definitive proxy statement for the 2020 annual meeting of stockholders to be filed with the SEC within 120 days after our fiscal year ended December 31, 2019.

Item 11. Executive Compensation

The information required by this item is incorporated by reference to our definitive proxy statement for the 2020 annual meeting of stockholders to be filed with the SEC within 120 days after our fiscal year ended December 31, 2019.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters

The following provides certain information with respect to our equity compensation plans in effect as of December 31, 2019:

	Number of Securities to be Issued Upon Exercise of Outstanding Options, Warrants and Rights		Weighted-Average Exercise Price of Outstanding Options, Warrants and Rights	Number of Securities Remaining Available for Issuance Under Equity Compensation Plans (Excluding Securities Reflected in the First Column) (3)
Equity Compensation Plans Approved by Stockholders				
2010 Plan and 2006 Plan (1)	1,561(2)	$	928.79	1,785,829
Employee Stock Purchase Plan	—	$	—	190
Equity Compensation Plans Not Approved by Stockholders	—	$	—	—
Total	1,561	$	928.79	1,786,019

(1) After the adoption of our 2010 Plan in February 2011, no further grants have been, or will be, made under the 2006 Plan and, to the extent outstanding awards under the 2006 Plan are forfeited or lapse unexercised, the shares of common stock subject to such awards will be available for future issuance under the 2010 Plan.

(2) Consists only of outstanding stock options.

(3) Awards issuable under the 2010 Plan may include stock options, stock appreciation rights, restricted stock units and other stock-based awards.

Item 13. Certain Relationships and Related Transactions, and Director Independence

The information required by this item is incorporated by reference to our definitive proxy statement for the 2020 annual meeting of stockholders to be filed with the SEC within 120 days after our fiscal year ended December 31, 2019.

Item 14. Principal Accounting Fees and Services

The information required by this item is incorporated by reference to our definitive proxy statement for the 2020 annual meeting of stockholders to be filed with the SEC within 120 days after our fiscal year ended December 31, 2019.

PART IV

Item 15. Exhibits, Financial Statement Schedules

(a)(1) Financial Statements

The following Consolidated Financial Statements are included:

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Report of Independent Registered Public Accounting Firm	51
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Consolidated Statements of Operations	53
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(a)(2) Financial Statement Schedules

All financial statement schedules have been omitted because they are not applicable or are not required, or because the information required to be set forth therein is included in the Consolidated Financial Statements or notes thereto.

(a)(3) Exhibits

Exhibit No.	Description	Incorporated by Reference				Filed Herewith
		Form	File No.	Filing Date	Exhibit	
3.1	Amended and Restated Certificate of Incorporation of Gevo, Inc.	10-K	001-35073	March 29, 2011	3.1	
3.2	Certificate of Amendment to the Amended and Restated Certificate of Incorporation of Gevo, Inc.	8-K	001-35073	June 10, 2013	3.1	
3.3	Certificate of Amendment to Amended and Restated Certificate of Incorporation of Gevo, Inc.	8-K	001-35073	July 9, 2014	3.1	
3.4	Certificate of Amendment to Amended and Restated Certificate of Incorporation of Gevo, Inc.	8-K	001-35073	April 22, 2015	3.1	
3.5	Certificate of Amendment to Amended and Restated Certificate of Incorporation of Gevo, Inc.	8-K	001-35073	January 6, 2017	3.1	
3.6	Certificate of Amendment to Amended and Restated Certificate of Incorporation of Gevo, Inc.	8-K	001-35073	June 4, 2018	3.1	
3.7	Amended and Restated Bylaws of Gevo, Inc.	10-K	001-35073	March 29, 2011	3.2	
4.1	Form of the Gevo, Inc. Common Stock Certificate.	S-1	333-168792	January 19, 2011	4.1	
4.2	Fifth Amended and Restated Investors' Rights Agreement, dated March 26, 2010.	S-1	333-168792	August 12, 2010	4.2	
4.3†	Stock Issuance and Stockholder's Rights Agreement, dated July 12, 2005, by and between Gevo, Inc. and the California Institute of Technology.	S-1	333-168792	August 12, 2010	4.3	

Exhibit No.	Description	Incorporated by Reference				Filed Herewith
		Form	File No.	Filing Date	Exhibit	
4.4*	Indenture, dated January 10, 2020, by and among Gevo, Inc., the guarantors party thereto, and Wilmington Savings Fund Society, FSB, as trustee and as collateral trustee.	8-K	001-35073	January 13, 2020	4.1	
4.5	Registration Rights Agreement, dated January 10, 2020, by and among Gevo, Inc. and the investors named therein.	8-K	001-35073	January 13, 2020	4.2	
4.6	2015 Common Stock Unit Series A Warrant Agreement, dated February 3, 2015, by and between Gevo, Inc. and the American Stock Transfer & Trust Company, LLC.	8-K	001-35073	February 4, 2015	4.1	
4.7	2015 Common Stock Unit Series C Warrant Agreement, dated May 19, 2015, by and between Gevo, Inc. and the American Stock Transfer & Trust Company LLC.	8-K	001-35073	May 20, 2015	4.1	
4.8	Form of Series D Warrant to Purchase Common Stock.	8-K	001-35073	December 15, 2015	4.1	
4.9	Form of Amendment No. 1 to Series D Warrant.	8-K	001-35073	June 13, 2016	4.1	
4.10	Form of Series F Warrant to Purchase Common Stock.	8-K	001-35073	April 5, 2016	4.1	
4.11	Form of Series I Warrant to Purchase Common Stock.	8-K	001-35073	September 15, 2016	4.1	
4.12	Form of Series K Warrant to Purchase Common Stock.	8-K	001-35073	February 22, 2017	4.1	
4.13	Description of Securities.					X
10.1†	Ethanol and Isobutanol Purchase and Marketing Agreement, dated February 16, 2018, between Eco-Energy, LLC and Agri-Energy, LLC.	8-K	001-35073	February 22, 2018	10.1	
10.2†	License Agreement, dated July 12, 2005, by and between Gevo, Inc. and the California Institute of Technology.	S-1	333-168792	November 4, 2010	10.6	
10.3†	Amendment No. 4, dated October 1, 2010, to the License Agreement, by and between Gevo, Inc. and the California Institute of Technology, dated July 12, 2005.	S-1	333-168792	October 21, 2010	10.10	

Exhibit No.	Description	Incorporated by Reference				Filed Herewith
		Form	File No.	Filing Date	Exhibit	
10.4#	Gevo, Inc. 2006 Omnibus Securities and Incentive Plan.	S-1	333-168792	August 12, 2010	10.11	
10.5#	Form of Stock Option Agreement under the 2006 Omnibus Securities.	S-1	333-168792	August 12, 2010	10.13	
10.6#	Gevo, Inc. Amended and Restated 2010 Stock Incentive Plan.	8-K	001-35073	June 13, 2019	10.1	
10.7#	Form of Restricted Stock Unit Agreement under the Amended and Restated 2010 Stock Incentive Plan.	S-1	333-168792	January 19, 2011	10.15	
10.8#	Form of Restricted Shares Award Agreement under the Amended and Restated 2010 Stock Incentive Plan.	10-Q	001-35073	August 8, 2018	10.7	
10.9#	Form of Stock Option Award Agreement under the Amended and Restated 2010 Stock Incentive Plan.	10-Q	001-35073	August 8, 2018	10.6	
10.10#	Form of Stock Appreciation Rights Award Agreement under the Amended and Restated 2010 Stock Incentive Plan.	10-Q	001-35073	August 8, 2018	10.8	
10.11#	Gevo, Inc. Employee Stock Purchase Plan.	S-8	333-172771	March 11, 2011	4.7	
10.12#	Gevo, Inc. Executive Health Management Plan.	10-Q	001-35073	November 2, 2011	10.1	
10.13#	Form of Indemnification Agreement between Gevo, Inc. and its directors and officers.	S-1	333-168792	January 19, 2011	10.33	
10.14#	Employment Agreement, dated June 4, 2010, by and between Gevo, Inc. and Patrick Gruber.	S-1	333-168792	November 4, 2010	10.14	
10.15#	Amendment Agreement, dated December 21, 2011, by and between and Patrick Gruber.	8-K	001-35073	December 27, 2011	10.1	
10.16#	Second Amendment Agreement, dated February 16, 2015, by and between Gevo, Inc. and Patrick Gruber.	8-K	001-35073	February 17, 2015	10.1	
10.17#	Employment Agreement, dated June 4, 2010, by and between Gevo, Inc. and Christopher Ryan.	S-1	333-168792	November 4, 2010	10.16	

Exhibit No.	Description	Incorporated by Reference				Filed Herewith
		Form	File No.	Filing Date	Exhibit	
10.18#	Offer of Employment Letter, dated December 21,2015, by and between Gevo, Inc. and Geoffrey T. Williams, Jr.	10-Q	001-35073	May 9, 2017	10.1	
10.19#	Change of Control Agreement for Geoffrey T. Williams, Jr., dated February 18, 2016.	10-Q	001-35073	May 9, 2017	10.2	
10.20#	Offer Letter, dated July 20, 2019, by and between Gevo, Inc. and Carolyn Romero.	10-Q	001-35073	November 13, 2019	10.1	
10.21#	Offer Letter, dated November 9, 2019, by and between Gevo, Inc. and L. Lynn Smull.	8-K	001-35073	November 15, 2019	10.1	
10.22†	Lease of Space, dated September 13, 2012, between Hines REIT 345 Inverness Drive, LLC and Gevo, Inc.	10-K	001-35073	March 26, 2013	10.48	
10.23†	First Amendment to Lease, effective December 11, 2015, between Hines REIT 345 Inverness Drive, LLC.	10-K	001-35073	March 30, 2016	10.62	
10.24†	Price Risk Management, Origination and Merchandising and between Agri-Energy, LLC and FCStone Merchant Services, LLC.	10-Q	001-35073	August 7, 2015	10.3	
10.25	Grain Bin Lease Agreement, dated June 1, 2015, by and between Agri-Energy, LLC and FCStone Merchant Services LLC.	10-Q	001-35073	August 7, 2015	10.4	
10.26	Unsecured Guaranty Agreement, dated June 1, 2015, by Gevo, Inc. in favor of FCStone Merchant Services, LLC	10-Q	001-35073	August 7, 2015	10.5	
10.27†	First Amendment to Grain Bin Lease Agreement, dated December 21, 2017, Agri-Energy, LLC and FCStone Merchant Services, LLC.	10-K	001-35073	March 28, 2018	10.27	
10.28	Second Amendment to the Grain Bin Lease Agreement, dated May 1, 2018, between Agri-Energy LLC, and FCStone Merchant Services, LLC.	10-Q	001-35073	August 8, 2018	10.5	
10.29†	First Amendment to Price Risk Management, Origination and Merchandising Agreement, dated December 21, 2017, Agri-Energy, LLC and FCStone Merchant Services, LLC.	10-K	001-35073	March 28, 2018	10.28	
10.30†	Settlement Agreement and Mutual Release, dated August 22, 2015, by and among Gevo, Inc., Butamax Advanced Biofuels, LLC, E.I. du Pont de Nemours & Company and BP Biofuels North America LLC.	10-Q	001-35073	November 5, 2015	10.2	
10.31†	Patent Cross-License Agreement, dated August 22, 2015, by and between Gevo, Inc. and Butamax Advanced Biofuels LLC.	10-Q	001-35073	November 5, 2015	10.3	
10.32+	Construction License Agreement, dated April 4, 2019, by and between Gevo, Inc. and Praj Industries Ltd.	8-K	001-35073	April 9, 2019	10.1	
10.33	Joint Development Agreement, dated April 4, 2019, by and between Gevo, Inc. and Praj Industries Ltd.	8-K	001-35073	April 9, 2019	10.2	
10.34+	Development License Agreement, dated April 4, 2019, by and between Gevo, Inc. and Praj Industries Ltd.	8-K	001-35073	April 9, 2019	10.3	

Exhibit No.	Description	Incorporated by Reference				Filed Herewith
		Form	File No.	Filing Date	Exhibit	
10.35†	Renewable Isooctane Purchase and Sale Agreement, dated February 21, 2019 by and between Gevo, Inc. and HCS Group GmbH.	8-K	001-35073	February 27, 2019	10.1	
10.36†	At-The-Market Offering Agreement, dated February 13, 2018, between Gevo, Inc. and H.C. Wainwright & Co., LLC.	8-K	001-35073	February 13, 2018	1.1	
10.37	Amendment to At-The-Market Offering Agreement and Engagement Agreement, dated June 20, 2018, between Gevo, Inc. and H.C. Wainwright & Co., LLC.	8-K	001-35073	June 20, 2018	1.2	
10.38†	Amendment to At-The-Market Offering Agreement, dated June 25, 2018, between Gevo, Inc. and H.C. Wainwright & Co., LLC.	8-K	001-35073	June 25, 2018	1.3	
10.39	Amendment to At-The-Market Offering Agreement and Engagement Agreement, dated June 28, 2018, between Gevo, Inc. and H.C. Wainwright & Co., LLC.	8-K	001-35073	June 28, 2018	1.4	
10.40	Amendment to At-The-Market Offering Agreement and Engagement Agreement, dated August 15, 2019, between Gevo, Inc. and H.C. Wainwright & Co., LLC.	8-K	001-35073	August 15, 2019	1.5	
10.41+	Renewable ATJ Purchase and Sale Agreement, effective July 26, 2019, by and between Gevo, Inc. and Air Total International, S.A.	8-K	001-35073	August 13, 2019	10.1	
10.42+	Fuel Sales Agreement, dated as of December 11, 2019, by and between Gevo, Inc. and Delta Air Lines, Inc.	8-K	001-35073	December 17, 2019	10.1	
10.43*	Exchange and Purchase Agreement, dated January 10, 2020, by and among Gevo, Inc., the guarantors party thereto, the holders named in Schedule I thereto, and Whitebox Advisors LLC, in its capacity as representative of the holders.	8-K	001-35073	January 13, 2020	10.1	
21.1	List of Subsidiaries.	S-1	333-168792	October 1, 2010	21.1	
23.1	Consent of Grant Thornton LLP.					X

Exhibit No.	Description	Incorporated by Reference				Filed Herewith
		Form	File No.	Filing Date	Exhibit	
31.1	Section 302 Certification of the Principal Executive Officer.					X
31.2	Section 302 Certification of the Principal Financial Officer.					X
32.1 **	Section 906 Certifications of the Principal Executive Officer and the Principal Financial Officer.					X **
101	Interactive Data Files Pursuant to Rule 405 of Regulation S-T: (i) Consolidated Balance Sheets at December 31, 2019 and December 31, 2018, (ii) Consolidated Statements of Operations for each of the two years in the period ended December 31, 2019, (iii) Consolidated Statements of Stockholders' Equity for each of the two years in the period ended December 31, 2019, (iv) Consolidated Statements of Cash Flows for each of the two years in the period ended December 31, 2019; and (iv) Notes to the Consolidated Financial Statements.					X

† Certain portions have been omitted pursuant to a confidential treatment request. Omitted information has been filed separately with the SEC.

+ Certain portions of the exhibit have been omitted pursuant to Rule 601(b)(10) of Regulation S-K. The omitted information is (i) not material and (ii) would likely cause competitive harm to the Company if publicly disclosed.

* Certain schedules and exhibits have been omitted pursuant to Item 601(a)(5) of Regulation S-K under the Securities Exchange Act of 1934, as amended.

# Indicates a management contract or compensatory plan or arrangement.

** Furnished herewith

(b) Exhibits

See Item 15(a)(3) above.

(c) Financial Statement Schedules

See Item 15(a)(2) above.

Item 16. Form 10-K Summary

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this Report to be signed on its behalf by the undersigned, thereunto duly authorized.

GEVO, INC.

By: /s/ Carolyn M. Romero
Carolyn M. Romero, CPA
VP - Controller
Principal Accounting Officer

Date: March 17, 2020

Pursuant to the requirements of the Securities Exchange Act of 1934, this Report has been signed below by the following persons on behalf of the registrant and in the capacities and on the dates indicated:

Signatures	Title	Date
/s/ PATRICK R. GRUBER **Patrick R. Gruber, Ph.D.**	Chief Executive Officer (Principal Executive Officer) and Director	March 17, 2020
/s/ L. LYNN SMULL **L. Lynn Smull**	Chief Financial Officer (Principal Financial Officer)	March 17, 2020
/s/ CAROLYN M. ROMERO **Carolyn M. Romero, CPA**	VP - Controller (Principal Accounting Officer)	March 17, 2020
/s/ RUTH I. DREESSEN **Ruth I. Dreessen**	Chairman of the Board of Directors	March 17, 2020
/s/ GARY W. MIZE **Gary W. Mize**	Director	March 17, 2020
Johannes Minho Roth	Director	March 17, 2020
/s/ ANDREW J. MARSH **Andrew J. Marsh**	Director	March 17, 2020
/s/ WILLIAM H. BAUM **William H. Baum**	Director	March 17, 2020

Exhibit 4.13

DESCRIPTION OF SECURITIES

The following summary of the terms of the capital stock of Gevo, Inc. ("we," "our" or "us") is based upon our amended and restated certificate of incorporation and our amended and restated bylaws. The summary is not complete and is qualified by reference to our amended and restated certificate of incorporation and our amended and restated bylaws, each of which is filed as an exhibit to this Annual Report on Form 10-K and incorporated by reference herein. We encourage you to read our amended and restated certificate of incorporation, our amended and restated bylaws and the applicable provisions of the Delaware General Corporation Law (the "DGCL") for additional information.

Authorized and Outstanding Capital Stock

Our authorized capital stock consists of 250,000,000 shares of common stock, par value $0.01 per share, and 10,000,000 shares of preferred stock, par value $0.01 per share, issuable in one or more series designated by our board of directors.

Common Stock

The holders of our common stock have one vote per share. Holders of common stock are not entitled to vote cumulatively for the election of directors. Generally, all matters to be voted on by stockholders must be approved by a majority, or, in the case of election of directors, by a plurality, of the votes cast at a meeting at which a quorum is present, voting together as a single class, subject to any voting rights granted to holders of any then outstanding preferred stock. Subject to preferences that may be applicable to any then outstanding preferred stock, holders of our common stock are entitled to participate equally in dividends when and as dividends may be declared by our board of directors out of funds legally available for the payment of dividends. In the event of our voluntary or involuntary liquidation, dissolution or winding up, the prior rights of our creditors and the liquidation preference of any preferred stock then outstanding must first be satisfied. The holders of common stock will be entitled to share in the remaining assets on a pro rata basis. No shares of common stock are subject to redemption or have redemptive rights to purchase additional shares of common stock.

Our common stock is listed on the Nasdaq Capital Market under the symbol "GEVO."

Preferred Stock

Our amended and restated certificate of incorporation provides that we may issue shares of preferred stock from time to time in one or more series. Our board of directors is authorized to fix the voting rights, if any, designations, powers, preferences, qualifications, limitations and restrictions thereof, applicable to the shares of each series of preferred stock. Our board of directors may, without stockholder approval, issue preferred stock with voting and other rights that could adversely affect the voting power and other rights of the holders of our common stock, including the likelihood that such holders will receive dividend payments and payments upon liquidation, and could have anti-takeover effects, including preferred stock or rights to acquire preferred stock in connection with implementing a stockholder rights plan. The ability of our board of directors to issue preferred stock without stockholder approval could have the effect of delaying, deferring or preventing a change of control or the removal of our existing management. There are currently no shares of preferred stock outstanding.

Anti-Takeover Provisions

The DGCL, our amended and restated certificate of incorporation, and our amended and restated bylaws contain provisions that could discourage or make more difficult a change in control of us, including an acquisition of us by means of a tender offer, a proxy contest and removal of our incumbent officers and directors, without the support of our board of directors. A summary of these provisions follows.

Statutory Business Combination Provision

We are subject to Section 203 of the DGCL, which, subject to certain exceptions, prohibits a Delaware corporation from engaging in any "business combination" with an "interested stockholder" for a period of three years following the time that such stockholder became an interested stockholder, unless:

- the board of directors of the corporation approves either the business combination or the transaction that resulted in the stockholder becoming an interested stockholder, prior to the time the interested stockholder attained that status;
- upon the closing of the transaction that resulted in the stockholder becoming an interested stockholder, the interested stockholder owned at least 85% of the voting stock of the corporation outstanding at the time the transaction commenced, excluding, for purposes of determining the number of shares outstanding, those shares owned by persons who are directors and also officers and by employee stock plans in which employee participants do not have the right to determine confidentially whether shares held subject to the plan will be tendered in a tender or exchange offer; or
- at or subsequent to such time, the business combination is approved by the board of directors and authorized at an annual or special meeting of stockholders, and not by written consent, by the affirmative vote of at least 66-2/3% of the outstanding voting stock that is not owned by the interested stockholder.

With certain exceptions, an "interested stockholder" is a person or group who or which owns 15% or more of the corporation's outstanding voting stock (including any rights to acquire stock pursuant to an option, warrant, agreement, arrangement or understanding, or upon the exercise of conversion or exchange rights, and stock with respect to which the person has voting rights only), or is an affiliate or associate of the corporation and was the owner of 15% or more of such voting stock at any time within the previous three years.

In general, Section 203 defines a business combination to include:

- any merger or consolidation involving the corporation and the interested stockholder;
- any sale, transfer, pledge or other disposition of 10% or more of the assets of the corporation involving the interested stockholder;
- subject to certain exceptions, any transaction that results in the issuance or transfer by the corporation of any stock of the corporation to the interested stockholder;

- any transaction involving the corporation that has the effect of increasing the proportionate share of the stock of any class or series of the corporation beneficially owned by the interested stockholder; or

- the receipt by the interested stockholder of the benefit of any loans, advances, guarantees, pledges or other financial benefits provided by or through the corporation.

A Delaware corporation may "opt out" of this provision with an express provision in its original certificate of incorporation or an express provision in its amended and restated certificate of incorporation or bylaws resulting from a stockholders' amendment approved by at least a majority of the outstanding voting shares. However, we have not "opted out" of this provision. Section 203 could prohibit or delay mergers or other takeover or change-in-control attempts and, accordingly, may discourage attempts to acquire us.

Election and Removal of Directors

Our amended and restated certificate of incorporation provides for our board of directors to be divided into three classes, with staggered three-year terms. Only one class of directors is elected at each annual meeting of our stockholders, with the other classes continuing for the remainder of their respective three-year terms. Because our stockholders do not have cumulative voting rights, our stockholders holding a majority of the shares of common stock outstanding are able to elect all of our directors. Directors may be removed only with cause by the affirmative vote of the holders of at least a majority of the outstanding shares entitled to vote on such removal.

No Stockholder Action by Written Consent

Our amended and restated certificate of incorporation and our amended and restated bylaws provide that any action required or permitted to be taken by the holders of common stock at an annual or special meeting of stockholders must be effected at a duly called meeting and may not be taken or effected by written consent of the stockholders.

Stockholder Meetings

Under our amended and restated certificate of incorporation and our amended and restated bylaws, only our board of directors, acting pursuant to a resolution adopted by a majority of the directors then in office, may call a special meeting of the stockholders, and any business conducted at any special meeting will be limited to the purpose or purposes specified in the notice for such special meeting.

Requirements for Advance Notification of Stockholder Nominations and Proposals

In order for our stockholders to bring nominations or business before an annual meeting properly, they must comply with certain notice requirements as provided by our amended and restated bylaws. Typically, in order for such notices to be timely, they must be provided to us not earlier than the close of business on the 120th day prior to the one-year anniversary of the preceding year's annual meeting and not later than the close of business on the 90th day prior to the one-year anniversary of the preceding year's annual meeting. For such notices to be timely in the event the annual meeting is advanced more than 30 days prior to or delayed by more than 70 days after the one-year anniversary of the preceding year's annual meeting, notice must be provided to us not earlier than the close of business on the 120th day prior to such annual meeting and not later than the close of business on the later of the 90th day prior to such annual meeting or, if later, the 10th day following the day on which public announcement of the date of such meeting is first made.

Amendment of Charter Provisions

The affirmative vote of the holders of at least 66-2/3% of the voting power of all of the then-outstanding shares of our voting stock, voting together as a single class, is required to, among other things, alter, amend or repeal certain provisions of our amended and restated certificate of incorporation, including those related to the classification of our board of directors, the amendment of our bylaws and certificate of incorporation, restrictions against stockholder actions by written consent, the designated parties entitled to call a special meeting of the stockholders and the indemnification of officers and directors.

Our amended and restated bylaws may only be amended (or new bylaws adopted) by our board of directors or the affirmative vote of the holders of at least 66-2/3% of the voting power of all of the then-outstanding shares of our voting stock.

Transfer Agent and Registrar

The transfer agent and registrar for our common stock is American Stock Transfer & Trust Company. Its address is 6201 15th Avenue, Brooklyn, New York 11219 and its telephone number is (718) 921-8300.

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We have issued our report dated March 17, 2020, with respect to the consolidated financial statements of Gevo, Inc. and subsidiaries included in the Annual Report on Form 10-K for the year ended December 31, 2019. We consent to the incorporation by reference of said report in the Registration Statements of Gevo, Inc. on Form S-8 (File Nos. 333-172771, 333-195264, 333-207172, 333-212391, 333-226689 and 333-232267) and on Form S-3 (File Nos. 333-197285 and 333-226686).

/s/ Grant Thornton LLP

Denver, Colorado
March 17, 2020

Exhibit 31.1

CERTIFICATION OF PRINCIPAL EXECUTIVE OFFICER

I, Patrick R. Gruber, certify that:

1. I have reviewed this annual report on Form 10-K of Gevo, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 17, 2020

/s/ Patrick R. Gruber

Patrick R. Gruber
Chief Executive Officer
(Principal Executive Officer)

Exhibit 31.2

CERTIFICATION OF PRINCIPAL FINANCIAL OFFICER

I, Lynn Smull, certify that:

1. I have reviewed this annual report on Form 10-K of Gevo, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 17, 2020

/s/ L. Lynn Smull

L. Lynn Smull
Chief Financial Officer
(Principal Financial Officer)

Exhibit 32.1

CERTIFICATIONS

I, Patrick R. Gruber, Chief Executive Officer of Gevo, Inc. (the "Company"), and I, Lynn Smull, Chief Financial Officer of the Company, certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that:

(1) The Annual Report on Form 10-K of the Company for the year ended December 31, 2019, (the "Report") fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company for the period covered by the Report.

/s/ Patrick R. Gruber

Patrick R. Gruber
Chief Executive Officer
(Principal Executive Officer)

Date: March 17, 2020

/s/ L. Lynn Smull

L. Lynn Smull
Chief Financial Officer
(Principal Financial Officer)

Date: March 17, 2020

A signed original of this written statement required by Section 906 has been provided to the Company and will be retained by the Company and furnished to the U.S. Securities and Exchange Commission or its staff upon request.

This certification accompanies the Report to which it relates, is not deemed filed with the U.S. Securities and Exchange Commission and is not to be incorporated by reference into any filing of the Company under the Securities Act of 1933, as amended, whether made before or after the date of the Report and irrespective of any general incorporation language contained in such filing.