BioAmber Inc.
Form 10-K
March 15, 2016

UNITED STATES

SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 10-K

(Mark One)

x ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the fiscal year ended December 31, 2015

OR

o 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: 001-35905

BioAmber Inc.

(Exact name of registrant as specified in its charter)

Delaware	20-1579162
(State or other jurisdiction of incorporation)	(I.R.S. Employer Identification No.)
1250 Rene Levesque West, Suite 4310 Montreal, Quebec, Canada H3B 4W8	H3B 4W8
(Address of principal executive offices)	(Zip Code)

(514) 844-8000

(Registrant's telephone number, including area code)

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

Title of Each Class	Name of Exchange on Which Registered
Common Stock, par value $0.01 per share	New York Stock Exchange

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 o No x

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 o No x

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 x No o

Indicate by check mark whether the registrant has submitted electronically and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes x No o

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. o

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

Large accelerated filer ¨	Accelerated filer x
Non-accelerated filer ¨ (Do not check if a smaller reporting company)	Smaller reporting company ¨

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

The aggregate market value of common stock held by non-affiliates of the registrant based on the closing price of the registrant's common stock as reported on the New York Stock Exchange on June 30, 2015, was $205 million. As of March 15, 2016, there were 28,781,753 shares of the registrant's common stock, par value $0.01 per share, outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's definitive Proxy Statement relating to its 2016 Annual Meeting of Stockholders are incorporated by reference into Part III of this Annual Report on Form 10-K where indicated. Such Proxy Statement will be filed with the U.S. Securities and Exchange Commission within 120 days after the end of the fiscal year to which this report relates.

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SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K contains "forward-looking statements" that involve risks and uncertainties, as well as assumptions that, if they never materialize or prove incorrect, could cause our results to differ materially from those expressed or implied by such forward-looking statements. The statements contained in this Annual Report on Form 10-K that are not purely historical are forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended, or Securities Act, and Section 21E of the Securities Exchange Act of 1934, as amended, or Exchange Act. Such forward-looking statements include any expectation of earnings, revenue or other financial items; any statements of the plans, strategies and objectives of management for future operations; factors that may affect our operating results; statements related to adding employees; statements related to future capital expenditures; statements related to future economic conditions or performance; statements as to industry trends and other matters that do not relate strictly to historical facts or statements of assumptions underlying any of the foregoing. Forward-looking statements are often identified by the use of words such as, but not limited to, "anticipate," "believe," "can," "continue," "could," "estimate," "expect," "intend," "may," "will," "plan," "project," "seek," "should," "target," "will," "would," and similar expressions or variations intended to identify forward-looking statements. These statements are based on the beliefs and assumptions of our management based on information currently available to management. Such forward-looking statements are subject to risks, uncertainties and other important factors that could cause actual results and the timing of certain events to differ materially from future results expressed or implied by such forward-looking statements. Factors that could cause or contribute to such differences include, but are not limited to, those identified below, and those discussed in the section titled "Risk Factors" included in Item 1A of Part I of this Annual Report on Form 10-K, and the risks discussed in our other Securities and Exchange Commission, or SEC, filings. Furthermore, such forward-looking statements speak only as of the date of this report. Except as required by law, we undertake no obligation to update any forward-looking statements to reflect events or circumstances after the date of such statements. Forward-looking statements in this Annual Report on Form 10-K may include statements about:

- the expected funding sources of our future planned manufacturing facilities and the expected timing of the completion of construction and the start of commercial operations at each of these facilities;
- our joint venture with Mitsui & Co. Ltd., or Mitsui;
- our offtake agreements with Vinmar International Ltd., or Vinmar, related to bio-based 1,4-butanediol, which we refer to as 1,4 BDO or BDO, tetrahydrofuran, which we refer to as THF, and bio-based succinic acid, and with PTTMCC Biochem Company Limited, or PTTMCC Biochem, for bio-succinic acid;
- the expected market applications for our products and the sizes of these addressable markets;
- our ability to gain market acceptance for bio-succinic acid, its derivatives including 1,4 BDO and THF and other building block chemicals;
- our ability to ramp up commercial sales and execute on our commercial expansion plan, including the timing and volume of our future production and sales;
- the expected cost-competitiveness and relative performance attributes of our bio-succinic acid and the products derived from it;

- our ability to cost-effectively produce and commercialize bio-succinic acid, its derivatives and other building block chemicals;

- customer qualification, approval and acceptance of our products;

- our ability to maintain and advance strategic partnerships and collaborations and the expected benefits and accessible markets related to those partnerships and collaborations;

- the impact of our off-take agreements on our business with our customers, our distributors and our current and future equity partners;

- our ability to economically obtain feedstock and other inputs;

- the achievement of advances in our technology platform;

- our ability to obtain and maintain intellectual property protection for our products and processes and not infringe on others rights;

- government regulatory and industry certification approvals for our facilities and products;

- government policymaking and incentives relating to bio-chemicals; and

- our ability to maintain an effective system of internal controls, remediate our existing material weakness and prevent future material weaknesses or significant deficiencies from occurring;

PART I

Item 1.Business

Overview

We are an industrial biotechnology company producing sustainable chemicals. Our proprietary technology platform combines industrial biotechnology and chemical catalysis to convert renewable feedstocks into sustainable chemicals that are cost-competitive replacements for petroleum-derived chemicals, which are used in a wide variety of everyday products including plastics, resins, paints, food additives and personal care products. We currently sell our first product, bio-succinic acid, to customers in a variety of chemical markets. We produce bio-succinic acid at our facility in Sarnia, Ontario, pursuant to a joint venture agreement with Mitsui.. Prior to the completion of our Sarnia facility, we produced our bio-succinic acid in a large-scale demonstration facility in Pomacle, France.

Succinic acid can be used to manufacture a wide variety of products used every day, including plastics, food additives and personal care products, and can also be used as a building block for a number of derivative chemicals. Today, petroleum-derived succinic acid is not used in many potential applications because of its relatively high production costs and selling price. We believe that our low-cost production capability and our development of next-generation bio-succinic derived products including 1,4 BDO, which is used to produce polyesters, plastics, spandex and other products, will provide us with access to a more than $10 billion market opportunity. Combining these opportunities with other building block chemicals we are developing, such as adipic acid which is used in the production of nylons, we believe that our total addressable market is in excess of $30 billion.

We believe we can produce bio-succinic acid that is cost-competitive with succinic acid produced from oil priced as low as $30.00 per barrel, based on management’s estimates of production costs at our facility in Sarnia, Ontario and an assumed corn price of $4.00 per bushel. While we can provide no assurance that we will be able to secure corn at $4.00 per bushel given the fluctuations in corn prices, we believe this assumption is reasonable given the historic price of corn and management’s expectations as to their ability to manage the cost of corn and other inputs for our facility in Sarnia, Ontario. Over the past five years, the price of corn ranged from a low of $2.82 per bushel to a high of $8.44 per bushel. As of March 7, 2016, the spot price was $3.49 per bushel and the six-month forward price was $3.64 per bushel. We estimate that a $1.00 increase or decrease in the per bushel price of corn would result in just a $0.024 per pound change in the variable cost of our bio-succinic acid. We expect the productivity of our yeast and on-going process improvements to further reduce our production costs. Our ability to compete on cost is not dependent on government subsidies or tariffs.

We are working to rapidly expand our accessible markets and product portfolio. We have entered into strategic relationships with several leading companies, such as our multi-year agreements with PTTMCC Biochem for bio-succinic acid and Vinmar for bio-succinic acid, 1,4 BDO and THF. We have also entered into agreements with other companies for the supply of bio-succinic acid.

We have also entered into technology partnerships to lower our production costs, expand our product portfolio and enhance our biochemical production platform. For example, we entered into a technology partnership with Cargill, Inc., or Cargill, through which we exclusively license a proprietary yeast organism for use in our fermentation process to produce our products. We refer to the yeast organism that we have licensed from Cargill as “our yeast.” We have also established other technology licenses and collaborations, including with Johnson Matthey Davy Technologies, or Davy, and Celexion, LLC, or Celexion.

Our business strategy is to leverage the value of our technology by building and operating production facilities around the world. However, depending on our access to capital and third-party demand for our technology, we may also enter into technology licenses on an opportunistic basis.

We have entered into a joint venture agreement with Mitsui & Co. Ltd. for our facility in Sarnia, Ontario, which has a nameplate capacity of 30,000 metric tons of bio-succinic acid per year. We started commercial scale production at our Sarnia facility in October 2015 and ramp-up to full production capacity is expected by 2017. We terminated production at the large-scale demonstration facility in Pomacle, France at the end of 2014. Our joint venture with Mitsui also contemplates the potential construction and operation of an additional facility, which we expect to occur over the next three to five years.

On January 22, 2014, we entered into a 15 year offtake contract for bio-based 1,4 BDO with Vinmar, a privately held marketing, distribution, and project development company headquartered in Houston, Texas. Under the terms of the master offtake agreement, Vinmar has committed to purchase 100% of the bio-based 1,4 BDO and THF produced in our next plant, a 100,000 metric ton per

year capacity plant that we plan to build in North America and commission in late 2018. Vinmar also plans to invest in the facility alongside us. While this agreement is binding, our inability to finance and construct this BDO and THF plant would relieve Vinmar of its obligation to purchase BDO and THF under the terms of the offtake agreement. We signed a second offtake agreement on July 3, 2014 with Vinmar to supply 10,000 metric tons of bio-succinic acid per year for 15 years from the Sarnia plant. A second agreement includes Vinmar off-taking 50,000 metric tons of the 70,000 metric tons of bio-succinic acid that we plan to produce in our next plant for 15 years. Vinmar has also committed to off-take 150,000 metric tons of the production from a third bio-succinic acid plant with 200,000 metric tons of annual capacity that we plan to begin building in 2019 and commission in 2021.

We are committed to managing our economic, social, environmental and ethical performance through continued sustainable business practices. We have completed a life cycle analysis for our facility in Sarnia that indicates that no carbon dioxide equivalent (greenhouse gases) will be emitted per kilogram of our bio-succinic acid produced, making our process carbon neutral. This is significantly less carbon emission intensive than the current petrochemical process for making succinic acid, in which 7.1 kilograms of carbon dioxide equivalent are emitted per kilogram of succinic acid produced. This represents a 100% reduction in greenhouse gases for our bio-succinic acid process, relative to the current petrochemical process for making succinic acid. The life cycle analysis also indicates that our facility in Sarnia will consume 64% less energy than the current petrochemical process.

We were incorporated in the State of Delaware in October 2008 as DNP Green Technology, Inc. and were established as the result of a spin-off of certain assets from Diversified Natural Products, Inc. In September 2010, we acquired the 50% interest in our joint venture Bioamber S.A.S. that we did not already own, after which, Bioamber S.A.S. became wholly owned by us. Concurrent with this acquisition, the Company changed its name from DNP Green Technology, Inc. to BioAmber Inc. and changed its fiscal year end from June 30 to December 31. Bioamber S.A.S. was wholly owned by the Company until its liquidation in December 2014.

Our Industry

The global chemical industry is a $2.5 trillion market, according to a 2015 report by Roland Berger Strategy Consultants. Chemicals are utilized in a broad range of end-use markets, including heavy industry, mining, construction, consumer goods, textiles and healthcare. While there is significant ongoing process innovation and technological development in the broader chemicals industry, producers are still heavily reliant on petroleum-derived feedstocks. The following table lists five of the key chemical classes from two carbon, or C2, to six carbon, or C6, that are primarily being produced from fossil fuels today along with examples of derivative compounds and end-use applications.

	C2	C3	C4	C5 and greater
	Ethylene	Propylene	n-Butane Butadiene	Benzene/Toluene/Xylene
Derivatives	•Ethylene glycol	•Acrylic	•Maleic anhydride	•Adipic acid
	•Polyethylene	•Polypropylene	•Succinic Acid	•Caprolactam
	•PVC		•1,4 BDO and THF	•Caprolactone
	•Vinyl			•Cyclohexane
				•Hexamethylenediamine (HMDA)

				•Hexanediol
Applications	•Anti-freeze	•Automotive components	•Adhesives	•Carpet fiber
	•Building materials	•Coatings	•Elastomers	•Clothing
	•Foam packaging	•Packaging	•Footwear	•Nylon
	•Plastic bags	•Plastic parts	•Synthetic rubber	•Thread, ropes and netting
	•Plastic films	•Textiles and fibers	•Tires	

Reliance on Petrochemicals

While the global chemical industry provides many value-added products to industrial and consumer end-markets, it is facing an increasing number of challenges as a result of its significant reliance on petroleum as its primary feedstock for the following reasons:

- A Finite, Non-Renewable Resource as its Primary Input. Chemical companies are heavily dependent on oil, a finite, non-renewable resource that is in growing demand, particularly from developing economies such as India and China.

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Recent supply growth has been limited. Given the demand pressures on such a critical input, the purchasers of chemical have shown growing interest in finding cost-effective, renewable alternatives.

- Hydrocarbon Feedstock Price Volatility. Crude oil prices have experienced significant price volatility over time. For example, during the last five years, the market price per barrel of West Texas Intermediate crude oil ranged from a low of $26.21 to a high of $112.93 and was $37.90 on March 7, 2016. As a result, we believe chemical companies are looking for more stable solutions.
- Potential for Margins Pressure at Existing Petrochemical Facilities. Given the price volatility around crude oil, chemical companies are increasingly concerned about rapid raw material price increases driven by supply shortages in basic petrochemical inputs that could negatively impact their profit margins. Due to the nature of contracts with their customers, chemical companies often cannot pass-through rising raw materials costs to their customers quickly.
- Reduced Supply of C4 Chemicals. In certain geographies including North America, there has been a shift away from naphtha cracking to natural gas liquid cracking as a means of producing ethylene. As such, there is significantly less crude C4 fraction produced, which is a principal source of supply for C4 chemicals. Consequently, the shift to natural gas cracking has led to a drop in the supply of crude C4, a primary feedstock for C4 chemicals. This has led to increased volatility in the prices of C4 derived chemicals, including butadiene, maleic anhydride and 1,4 BDO. While the significant reduction in global oil prices over the past 18 months has led to an increase in naphtha cracking in Europe and, to a lesser extent, the United States, which moderately reversed the shift from naptha cracking in favor of natural gas cracking, we believe this shift is temporary and will continue only for as long as oil prices remain low.
- Increasing Governmental Regulation. Increasing government regulation and climate change initiatives are driving up the cost of using high carbon emitting processes, such as chemical production via petrochemicals. The third phase of the European Union’s Emission Trading System when implemented is expected to more broadly cover petrochemical production activities, potentially increasing costs at European petrochemical plants. In addition to regulation of carbon emitting processes, the use of petrochemicals in certain products, such as plasticizers containing phthalates, are subject to increasing regulatory pressure.
- Customer Demand for Renewable and Sustainable Products. Consumers are increasingly choosing renewable alternatives to products when available. As consumers become more aware of the environmental footprint of petroleum-derived products, they may shy away from less sustainable products in favor of readily available, non-petrochemical based alternatives, especially if these products are priced competitively. We believe that there is demand among certain players in the chemical industry for sustainable alternatives in order to differentiate themselves from their competitors.

Biochemical Alternatives

We believe there is significant and growing demand for a low-cost and sustainable alternative to using petroleum for chemical production. Multiple biochemical processes have been developed to address this demand, primarily using microorganisms that can convert sugars derived from renewable feedstocks into various chemical building blocks including:

- Bio-succinic acid: A biologically produced, chemically identical replacement for petroleum-derived succinic acid that can be utilized to produce derivative products such as bio-based 1,4 BDO, and can substitute petrochemicals such as maleic anhydride, phthalic acid and adipic acid in a number of applications. Target end-uses for bio-succinic acid include plasticizers, polyurethanes, personal care products, resins and coatings, de-icing solutions, lubricants and food additives.
- Bio-adipic acid: A biologically produced, chemically identical replacement for adipic acid. Target end-uses for bio-adipic acid include nylon fibers, resins, plasticizers, solvents and adhesives.

Bio-succinic acid and bio-adipic acid are often referred to as “building block” chemicals because they can be converted into intermediate chemicals that are then used in the production of a wide array of consumer end-products.

Bio-succinic acid is produced from renewable sugars in a carbon dioxide-sequestering process, which results in higher theoretical yields than other bio-based chemicals, as shown in the table below.

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Chemical	Theoretical Yield	Kg Sugar Needed to Produce a Kg of Product
Bio-succinic acid	112%	0.9
Lactic acid	100%	1.0
Bio-based 1,4 BDO via succinic acid	85%	1.2
1,3 Propanediol	63%	1.6
Adipic acid	58%	1.7
1,4 BDO via direct fermentation	54%	1.9
Ethanol	51%	2.0
Iso-Butanol	41%	2.4
Farnesene	29%	3.5

Bio-adipic acid is also produced from renewable sugars in a process that does not consume carbon dioxide, but is free of nitrous oxide emissions, which are a significant drawback of the petrochemical process. We produce bio-based succinic acid and we intend to produce bio-based 1,4 BDO via succinic acid and are also developing a bio-based route to adipic acid.

Despite their inherent benefits, there has not been a critical mass of bio-based chemical manufacturing facilities operating at sufficient scale to prove out the cost and quality necessary to compete with their petrochemical equivalents. We believe that if manufacturers of bio-based chemicals can produce at reduced costs compared to their petrochemical equivalents, the market for the bio-based chemicals could be significantly larger than it is today. The high cost of producing succinic acid from petroleum feedstock has limited its use. We believe there is a significant opportunity for bio-based chemical manufacturers who can reliably deliver product at scale, with the required specifications of potential customers and at a competitive cost.

Our Strengths

Our business benefits from a number of competitive strengths, including:

Proprietary Technology Platform that Addresses a Large Market Opportunity

Our proprietary technology platform integrates industrial biotechnology, and chemical catalysis to produce bio-based chemicals as cost-competitive, chemically identical replacements for petroleum-derived equivalents. We own or have exclusive rights to specific microorganisms, chemical catalysis technology and a scalable and flexible purification process that, when combined and optimized, convert renewable feedstocks into platform chemicals. We believe the strength of our platform, our intellectual property portfolio and our licensing agreements with Cargill, Celexion and Davy will allow us to extend our chemical production beyond our current product, bio-succinic acid, to large markets including bio-based 1,4 BDO and bio-based adipic acid. We believe our bio-based chemicals can serve as “drop-in” replacements for existing petroleum-based chemicals in these markets. Together, these chemicals address what we believe to be an approximately $30 billion market opportunity.

Selling Commercial Product Today

We are the first company selling bio-succinic acid in commercial quantities. Our customers utilize our product as a cost-competitive, sustainable alternative to the petroleum-based specialty chemicals they currently use in polymers, food additives and flavorings, bath salts, polyurethanes, pharmaceutical and other applications. Our ability to supply large scale quantities of bio-succinic acid allows our customers to develop new applications and initiate

commercialization of their products.

Cost-Competitive Economics at Large Scale

Our experience operating the large-scale demonstration facility in Pomacle, France for five years prior to commencing operations in our Sarnia plant helped us to refine our process to make bio-succinic acid cost-competitively without subsidies. We expect to produce bio-succinic acid that is cost-competitive with succinic acid produced from oil priced as low as $30.00 per barrel, based on management's estimate of production costs at our facility in Sarnia, Ontario and an assumed corn price of $4.00 per bushel. Through extensive research and development efforts relating to our bio-succinic acid production process, including pilot plant phase, process efficiency enhancements and scaling up our process to our current scale, we have been able to thoroughly address the operational complexities in our process. We believe that our experience operating at the large demonstration scale in France provided us with know-how to more efficiently operate our Sarnia facility.

Limited Exposure to the Availability and Price of Sugar

Our process requires less sugar than other renewable products. We require approximately 50% less sugar to produce a pound of bio-succinic acid than is needed to produce a pound of ethanol (0.15 gallons), and even less sugar than is needed to produce a pound of several other bio-based chemicals. This makes our process less vulnerable to price increases in sugar, relative to other bio-based processes. This efficient use of sugar translates into reduced consumption. To produce $1 billion worth of bio-succinic acid and $1 billion worth of bio-based 1,4 BDO at current prices, we would require approximately 1.5 million metric tons of sugar. Even if the entire $2 billion worth of bio-succinic acid and bio-based 1,4 BDO were produced in North America, it would require only 0.7% of the sugar produced in existing corn wet mills. Given this modest demand and our ability to source sugar from a variety of sources, rapid growth in our production capacity would not likely have a material impact on the sugar markets from which we plan to source.

Established, Diverse Customer Base

Our leadership in bio-succinic acid technology, our product quality and the economics of our process are validated by the contracts we have signed with customers in a variety of end-markets. We have entered into two offtake agreements for the Sarnia plant for the sale of 160,000 metric tons of bio-succinic acid over the next 15 years. We have also entered into supply agreements for the sale of approximately 28,000 metric tons of bio-succinic acid and its derivatives until the end of 2017. These supply agreements typically obligate our customers, subject to certain conditions, to purchase 75% to 100% of their succinic acid needs from us, contingent on our ability to meet their price and other requirements. There are no penalties in the event these customers do not purchase or we do not supply them with bio-succinic acid in the projected purchase volumes indicated in the agreements.

Global Manufacturing Expansion Plan

In 2011 we entered into a joint venture agreement with Mitsui to build and operate a commercial scale plant in Sarnia, Ontario, to produce bio-succinic acid. We commenced construction of this facility in 2013, mechanically completed the facility in the second quarter of 2015 and commenced commercial operations there in October 2015. This facility was designed to have an initial nameplate capacity of 30,000 metric tons of bio-succinic acid. The facility could be expanded in the future, but the likelihood, timing and size of an eventual expansion will be a function of the timing of construction of our second facility that will produce 1,4-BDO and THF in addition to succinic acid. We are unlikely to undertake two construction projects simultaneously.

Experienced Management Team with Strong Track Record

Our management team consists of experienced professionals, possessing on average over 25 years of relevant experience in scaling up, manufacturing and commercializing chemicals and bio-based products, gained at both large companies and entrepreneurial start-ups. Members of our senior management team have worked at companies including Abengoa, Bombardier, Cargill, DuPont, Dow Corning Corporation, Royal DSM N.V., Quebecor World Inc., Suncor, Sanofi and Tate & Lyle.

Our Strategy

Our goal is to be the leading provider of renewable chemicals by replacing petroleum-based chemicals with our bio-based alternatives, which we believe could revolutionize the global chemical industry.

Rapidly Expand Our Global Manufacturing Capacity

We operated a large-scale demonstration facility in Pomacle, France until December 31, 2014, and started commercial operations in the fourth quarter of 2015 at our first commercial facility in Sarnia, Ontario in cooperation with Mitsui. We plan to construct additional large-scale bio-based succinic acid facilities in multiple geographic regions employing a standardized design that facilitates expedient and capital-efficient growth. We expect to benefit from incremental cost reductions and further technological and engineering improvements at each additional facility. To further streamline production and reduce costs, we plan to integrate production and locate these facilities in proximity to required infrastructure and feedstock. We intend to retain operational control and a majority interest in these facilities and collaborate with third parties to obtain capital, construct the facilities, secure feedstock, sell future output and assist with manufacturing and market access.

Target the Large and Established 1,4 BDO Market

We intend to leverage our ability to produce high quality bio-succinic at low cost, as well as high value-added derivatives of bio-succinic, such as bio-based 1,4 BDO and THF, which is used in the production of polyesters, plastics, spandex and other products.

We have licensed technology from Davy, which we believe will enable us to produce bio-based 1,4 BDO and THF at a cost that is competitive with alternative processes, with equivalent purity. In January 2014, we announced our intention to build a 100,000 metric ton per year capacity bio-based 1,4-BDO and THF plant in North America, which we plan to commission in late 2018. We have entered into a 15 year offtake contract with Vinmar in which they will guarantee 100% off-take of the bio-based 1,4 BDO and THF produced in this planned facility. We expect to benefit from Vinmar's global logistics expertise and its experience selling large volumes of BDO and THF and executing large chemical facility projects. We expect that Vinmar will invest alongside us in the planned North American facility.

Develop Next-Generation Succinic-Derived Products

We intend to leverage our proprietary technology platform and expertise in the production of bio-succinic acid to target derivatives including salts, esters, polyols and plasticizers that can be made with succinic acid.

Continue to Reduce the Cost of Our Products

Our goal is to be the low-cost producer of the bio-based chemicals we manufacture. Our bio-succinic acid production process has high yields and benefits from our proprietary, low-cost purification. We believe that at our manufacturing facility in Sarnia, Ontario, we will produce bio-succinic acid at a lower cost compared to the cost of other bio-based succinic acid processes and petroleum-derived succinic acid, according to our estimates of what the costs of the inputs are at our facility in Sarnia.

Expand Product Platform to Additional Building Block Chemicals

We are working to expand our product portfolio to C6 building block chemicals including adipic acid, hexamethylene diamine (HMDA) and caprolactam. These products are used in the production of carpeting, rugs, textile laminations, garment linings, adhesives for shoe soles and resins used in the paper products industry. We expect to use our flexible technology platform to expand our product base, starting with bio-adipic acid, by leveraging our extensive experience developing, producing and marketing bio-succinic acid. We believe our technology platform, including an exclusive license to a biochemical pathway discovered by Celexion, an exclusive license to use Cargill's proprietary yeast and our purification expertise will provide us with a cost competitive route to these chemicals.

Our Products

Our bio-based specialty chemicals can be used in multiple end-markets and applications and can serve as key building blocks for a wide variety of products used every day. The table below sets forth, for both C4 and C6 chemicals, the development stage of each of the products we currently sell or are in our pipeline and typical applications for these products. The dollar amounts set forth in the table represent management's estimates of the addressable market size for each of these products, which together represent a total addressable market in excess of $30 billion. Management's estimates of the addressable market sizes are based on industry reports from the last five years, pricing information in the industry reports and from ICIS pricing, publicly available information, and management's estimates of what portion of the total market size may be addressable through bio-succinic acid.

Market Opportunity

	C4 Platform			C6 Platform		
	Commercial	Pre-Commercialization(1)		In Development(2)		
	Bio-Succinic Acid	1,4 BDO / THF /	Polyesters made with Succinic Acid, including PBS and blends	Adipic Acid	Caprolactam	HMDA
Applications	•Plasticizers	•Elastomers	•Automotive interiors	•Carpets	•Carpets	•Carpets
	•Polyurethanes	•Engineering plastics	•Fibers and non-wovens	•Engineering plastics	•Films	•Engineering plastics
	•Personal care products	•Shoe soles	•Food packaging	•Textiles and fibers	•Textiles and fibers	•Polyurethanes
	•Resins and coatings/paints	•Spandex	•Plastic bags			•Textiles and fibers
	•De-icing and coolant solutions	•Solvents	•Plastic cups			
	•Fine chemicals		•Organic composite boards			
	•Lubricants					
	•Food additives					
	$4.0 billion	$5.5 billion	$2.0 billion	$6 billion	$10 billion	$4.5 billion

(1) "Pre-Commercialization" refers to products that have been produced at pilot scale and tested and for which the production process is in the process of being scaled up, with samples available for product testing and qualification.

(2) "In Development" refers to products that have not yet been produced at the laboratory scale in adequate quantities to undergo testing. These are early stage research projects and no samples are expected to be available for at least two years.

Bio-Succinic Acid

We chose to develop bio-succinic acid as our first product because it is a platform chemical that can be used in a broad range of markets, from high value niche applications such as personal care products and food additives, to large volume applications such as plasticizers, polyurethanes, resins and coatings. Bio-succinic acid is also unique in terms of the limited quantity of sugar that is needed for its production. In 2004, the DOE published a report on "Top Value-Added Chemicals from Biomass," identifying the top opportunities for the production of chemicals from biomass. The study prioritized twelve chemicals, from a group of over 300 possible building blocks that could be most effectively manufactured from sugars. Bio-succinic acid was recognized as one of the renewable building block chemicals with the greatest technical feasibility and commercial potential.

We have identified three main market opportunities for our bio-succinic acid platform:

- First, we intend to replace petroleum-based succinic acid in applications where it is currently in use, such as food additives and fine chemicals, where the “natural” aspect of bio-based succinic acid adds value to these applications and drives greater market demand.
- Second, we intend to expand into new applications for succinic acid, such as phthalate-free plasticizers, silicone replacements and bioplastics such as PBS, using application development and technical support to demonstrate performance advantages as well as health and environmental benefits of products made with bio-succinic acid compared to the petrochemicals currently being used for these applications.
- Third, we intend to convert bio-succinic acid to bio-based 1,4 BDO and THF, which are large volume, existing markets accessible to our “drop-in” bio-based alternatives. These chemical intermediates are used to produce polyesters, plastics, spandex and other products.

Historically, the high cost of producing succinic acid from petroleum feedstock limited its use to a narrow range of applications such as pharmaceuticals and food ingredients. A study published in August 2012 by Roland Berger, a consulting firm, estimated the market for petroleum-based succinic acid at approximately 51,000 metric tons per year, representing a market size of approximately $350 million. However, market research firms and consultants have predicted that manufacturing bio-succinic acid will make succinic acid economically feasible for use in greater volumes across a spectrum of new applications. Roland Berger projects that the succinic

acid market will grow at a compounded annual growth rate of between 25% and 30% through 2020, when the global market size is expected to be between 500,000 and 700,000 metric tons.

We have entered into two offtake agreements for the Sarnia plant for the sale of 162,000 metric tons of bio-succinic acid over the next 15 years. We have also entered into supply agreements for the sale of approximately 28,000 metric tons of bio-succinic acid and its derivatives until the end of 2017. These supply agreements obligate our customers to exclusively fulfill 75% to 100% of their needs for bio-succinic acid from us, contingent on our ability to meet their price and other requirements; however, there are no penalties in the event they do not purchase or we do not supply them with bio-succinic acid in the projected purchase volumes indicated in the agreements.

We are currently focused on the following applications for bio-succinic acid, listed in descending size of the addressable markets:

- Plasticizers. Plasticizers are organic esters that are primarily used to render polyvinyl chloride, or PVC, more flexible. PVC is widely used in multiple end-markets because it is low cost, durable and versatile. Bio-succinic acid esters can serve as replacements for the major phthalate-based plasticizers, which account for over 80% of the worldwide plasticizer market. There is increasing demand for renewable, phthalate-free plasticizers, particularly in sensitive applications such as children's toys and childcare articles. We entered into a joint development agreement with Lanxess, Inc., or Lanxess, a global leader in phthalate-free plasticizers, to develop a portfolio of bio-succinic-based phthalate-free plasticizers that can exceed the performance of general purpose plasticizers at competitive prices. Lanxess has begun to market a range of succinic acid based plasticizers, under the Uniplex brand. These succinic acid based plasticizers have been tested by Solvin, a division of Solvay and one of the world's leading producers of PVC, and they achieved positive results that collectively outperformed existing phthalate alternatives. While the global market for plasticizers exceeds $30 billion, we believe the addressable market for phthalate-free plasticizers is approximately $1.5 billion.
- Polyurethanes. Succinic acid, and to a greater extent adipic acid, are currently used in polyester polyols, which are used to make polyurethanes. Polyurethanes are used in, among other things, soles for footwear, molded foams for automotive applications like car seats and arm rests, and non-foam applications such as coatings, adhesives and sealants. Bio-succinic acid can be used to replace adipic acid in this market and is currently the only renewable alternative to adipic acid for the production of polyurethanes. Suppliers of polyester polyols are actively looking for bio-based, cost-effective substitutes for adipic acid to improve the environmental profile and reduce the cost of their products. Some of the largest producers in Western Europe and North America have tested and validated our bio-succinic acid as a replacement for adipic acid in polyester polyols. Due to our first mover advantage, low cost of production and strong relationships with key customers, we believe we will be able to capture a significant portion of the market for bio-succinic acid in polyurethanes. We believe the addressable market for polyurethanes exceeds $1 billion.
- Personal Care Products. Our initial focus in the personal care market has been the use of esters of bio-succinic acid as natural emollients and surfactants. Emollients are used in lotions, liquid soaps and cleansers to improve and moisturize skin, while surfactants are used in soaps, body washes and shampoos to allow easier spreading. We believe there is a significant opportunity for bio-based alternatives as consumers are increasingly demanding renewable products and ingredients in the personal care products they use including the replacement of silicone based ingredients in shampoos and other products. We believe the addressable market for succinic acid and succinate esters in the personal care industry is approximately $500 million.
- Resins and Coatings. Bio-succinic acid can be used to replace adipic acid in polyester coating resins, powder coatings, unsaturated polyester resins, or UPR, and polyester polyols used in urethane surface coatings. Bio-succinic acid can also replace, or be used in conjunction with phthalic anhydride in UPR and alkyd resins. Bio-succinic acid offers performance equivalent to petroleum-based raw materials, as well as environmental advantages and cost-effectiveness. We believe the addressable market for resins and coatings exceeds $600 million.
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Food Additives. Succinic acid is currently used for its multiple functions in food applications; as an acidulant, to increase the tartness or acidity of food, as a pH regulator for food ingredients, and as a flavoring agent. The unique ‘umami’ flavor of succinic acid gives a salty, soy-like taste to food and is used in the production of soy sauce, miso, sake and synthetic liquors in Asia. Outside of Asia, succinic acid is primarily used in the baking industry. Succinic acid can also be used to replace malic acid, which provides a bitter salty taste similar to succinic acid, and adipic acid that is used as a flavor in fruit drinks and as a gelling aid for gelatin desserts. Initially, we are targeting existing succinic acid applications, but we believe our bio-succinic acid will rapidly expand succinic acid’s portion of the overall flavors and food ingredients market as a natural alternative. We believe the addressable market for food additives is approximately $200 million.

- Lubricants. Adipate esters are widely used in the lubricants market as base oils or as additives to form industrial lubricants and metal-working fluids. Bio-succinic acid is capable of replacing adipate esters and producing sustainable succinate esters that meet the demand for more environmentally friendly, non-toxic lubricants. We are working with third parties to assess our bio-succinate esters and accelerate market penetration. To date, our bio-succinate esters have performed well in product testing, showing improved flowability in cold temperatures and better prevention of oxidation, rust and corrosion. We believe the addressable market for lubricants exceeds $100 million.
- Fine Chemicals. Succinic acid is used today in a variety of high value added applications including dyes, inks, and toners. Succinic acid is also used in pharmaceutical applications. Derivatives of succinic acid such as succinimides can provide multiple functions in pharma applications, such as a pH buffer, an antibacterial or chelating agent, a coatings/sizing agent, or as a stabilizer for other ingredients. We believe the addressable market for fine chemical applications exceeds $100 million.
- De-icing Solutions. Chlorides are the most commonly used de-icer for roadways. Potassium salts are typical non-chloride de-icers used for roadways as well as airport runways and other surfaces. We have developed a patented bio-succinic acid-based de-icer formulation for use on airport runways. Our bio-based product is significantly less corrosive than potassium acetate and potassium formate. We are also developing bio-succinic acid based products as wetting agents for chlorides in the larger roadway market, which can reduce the corrosiveness of the chlorides applied.
- Other Markets. Other applications of bio-succinic acid that are currently being developed and tested by potential customers and partners include anti-freeze solutions, coolants solvents, water treatment chemicals, effervescence agents such as laundry tablets and bath salts, artificial leather products and foams made with recycled polyethylene terephthalate (PET).

Our Product Pipeline

Derivatives of Bio-Succinic Acid

Succinic acid can be used to produce 1,4 BDO and THF. Succinic acid is also a monomer used to produce certain polyesters, including PBS. We are actively targeting these derivatives of bio-succinic acid, which offer large existing drop-in markets to broaden our addressable market and maximize the value of our technology.

1,4 Butanediol (1,4 BDO) and Tetrahydrofuran (THF)

The major uses of 1,4 BDO are in the production of THF and polybutylene terephthalate, or PBT. THF is used to produce spandex fibers and other performance polymers, resins, solvents and printing inks for plastics. PBT is an engineering-grade thermoplastic that combines excellent mechanical and electrical properties with robust chemical resistance. The automotive and electronics industries heavily rely on PBT to produce connectors, insulators, wheel covers, gearshift knobs and reinforcing beams. We believe there is also growing demand in the automotive industry to produce PBT and blends that are partially bio-based to enable automobile manufacturers to meet their sustainability goals. There is also growing demand in the apparel industry for renewable, bio-based spandex. In 2014, we licensed Davy's vapor phase hydrogenation technology to make bio-based 1,4 BDO and bio-THF from our bio-succinic acid. Davy validated our bio-succinic acid as a feedstock in its pilot plant and Davy is providing performance guarantees for its technology as part of the licensing package. We believe the addressable market for 1,4 BDO and THF exceeds $5.5 billion. Following the licensing of the Davy BDO/THF technology package, we terminated our previous license to DuPont's liquid phase hydrogenation catalysts and ended our associated catalyst development collaboration with Evonik Industries AG, or Evonik, that we had previously.

Succinic Acid Based Polyesters

Succinic acid can be reacted with different alcohols to produce polyesters. Polybutylene succinate, or PBS, is one such polyester. PBS is a biodegradable polymer made by reacting succinic acid with 1,4 BDO. The market for this biopolymer is currently limited by capacity and price, and the fact that it has traditionally been made with petroleum-derived succinic acid and 1,4 BDO. Applications range from single use in food service ware, including cutlery, cups and lids, agricultural mulching film and compostable bags. Our bio-succinic acid enables PBS to be lower cost and partially renewable, and upon commercialization, we expect our bio-based 1,4 BDO will enable PBS to be 100% bio-based. We believe that this will drive PBS market growth beyond current applications to include paper coating, food packaging, fibers and non-wovens, and durable applications including automotive interiors, consumer goods and household appliances. We are the exclusive supplier of bio-succinic acid to the joint venture between PTT Biochem Limited, or PTT, and Mitsubishi Chemical, which they use to produce partially bio-based PBS.

PBS can be used in combination with other biopolymers such as PLA, PHA and poly (3-hydroxybutyrate-co-3-hydroxyvalerate), or PHBV, and with petrochemical polymers such as polypropylene, polystyrene and polycarbonate. These combinations, known as blends, combine the properties of the polymers that are being mixed and can lead to specific properties and performance that are being sought by customers. PBS composites are compounds in which PBS is filled with fibers (such as natural fibers, glass fibers or carbon fibers) or fillers (such as wood flour or starch). Blends and composites can alter properties such as stiffness, mechanical resistance and density, and lead to more cost-effective solutions. Potential applications include automotive interiors, non-wovens (such as disposal hygiene products), construction materials, consumer goods and appliances. We believe the potential addressable market for succinic acid based polyesters, including PBS, along with polyols, polyester and composites is approximately $2 billion.

C6 Building Block Chemicals

We expect to use our flexible technology platform, including our partnership with Celexion and our exclusive rights to the Cargill yeast, to expand our product base to C6 building block chemicals, starting with bio-adipic acid, by leveraging our extensive experience developing, producing and marketing bio-succinic acid. We also plan to produce bio-based caprolactam and bio-based hexamethylenediamine.

Adipic Acid

Adipic acid is primarily used in the production of Nylon 6,6 fibers, plastics and resins. Nylon fibers are used in carpeting and rugs, nylon plastics are used in molding and extrusion applications and nylon resins are used mainly for injection molding in automotive and electrical applications, as well as for hardware, appliance and machine parts. We believe the addressable market for adipic acid exceeds $6 billion.

Caprolactam

Caprolactam is an intermediate used in the production of Nylon 6, a major engineering plastic. Nylon 6 finds significant use in film and wire and cable insulation, as well as in automotive applications like intake manifolds, previously made with aluminum ingots, replaced by plastics such as Nylon 6 in order to reduce weight and obtain flexibility of design. We believe the addressable market for caprolactam is approximately $10 billion.

Hexamethylenediamine (HMDA)

Our C6 Platform also offers a proprietary route to bio-HMDA, which is an intermediate used to produce Nylon 6,6. Nylon 6,6 polymer is principally converted into fibers, with the remainder going into Nylon 6,6 plastics used in molding and extrusion applications, primarily in automotive applications such as exterior body components, under-the-hood components, and some mechanical components. Other Nylon 6,6 resin applications include electronics, film and extrusion coatings. A major use of Nylon fibers is in carpeting and rugs. We believe the addressable market for HMDA exceeds $4.5 billion.

Our Commercial Strategy and Partnerships

Existing Markets for Succinic Acid

For the past six years we have been sampling and qualifying our bio-succinic acid among existing purchasers of succinic acid. Our initial focus was to identify customers that valued natural, bio-based succinic acid, and to sign them to long-term supply agreements. The figure below illustrates the existing markets and applications we have targeted with this product. The use of succinic acid in these markets and applications is already well-established.

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During the year ended December 31, 2015, 31% of our sales were to PTT MCC Biochem Company Ltd. During the year ended December 31, 2014, 47% our sales were to International Flavor and Fragrances, Inc., or IFF, Brenntag AG, or Brenntag and Olon Italy.

Emerging Markets for Bio-Succinic Acid

Beyond the established markets for succinic acid, we have been working with third parties in a number of applications to expand the use of bio-succinic acid. These partnerships are currently immaterial to our financial results and many of these partnerships are in the early stages—in most cases pursuant to non-binding letters of intent—so we can provide no assurances as to the timing or amount of commercial sales that may result from these partnerships, if any. We have and intend to continue to utilize collaborations in an effort to secure development expertise, intellectual property, market access and commercialization capabilities, in an effort to establish barriers to entry for our competitors and accelerate market uptake of our bio-succinic acid. The figure below illustrates the emerging markets for bio-succinic acid that we have targeted. We believe our collaboration strategy for these markets provides us with a cost-effective approach to expanding our addressable markets while capitalizing on our first-mover advantage for bio-based alternatives.

Bio-Succinic Acid Based Esters

Phthalate-Free Plasticizers. Plasticizers are softeners that are primarily used in PVC and other plastics to make these materials more flexible. Most plasticizers are phthalate-based, and phthalates have been identified as a possible health risk. We have partnered with a leader in phthalate-free plasticizers and have jointly developed bio-succinic acid-based plasticizers that are both renewable and phthalate-free. We have developed a portfolio of succinic acid based plasticizers, which our partner is now sampling to the marketplace and actively promoting. We have also been working with a leading producer of PVC, which has tested our succinic acid based plasticizers and found them to collectively outperform existing phthalate alternatives.

Silicone Replacements. Silicone replacements are used across all segments of the personal care market, including skin care, hair care (shampoos), antiperspirants and deodorants, as well as color cosmetics. In the past, attempts by third parties to develop silicon replacements have generally resulted in the need to compromise performance. We have been collaborating with a specialty ingredients company and have jointly developed bio-succinic acid based esters that are effective silicone replacements without compromising performance. We are jointly marketing these natural silicone replacements with our partner, which has begun to commercialize a range of bio-based silicone replacements to the personal care industry.

Bio-Based Lubricants. We have been collaborating with a manufacturer of lubricant formulations to develop formulations containing bio-based succinate esters to be used as a substitute for conventional petroleum-based lubricants. Pursuant to this

collaboration, we are developing a range of succinic acid based esters that are renewable and testing a range of esters for lubricant applications. The lubricant manufacturer is currently seeking to complete the development and testing of these formulations and we will jointly own the intellectual property rights related to the formulations and we expect to jointly commercialize successful formulations.

Bio-Succinic Acid Based Bioplastics

Bio-Based PBS/PLA Resins for Food Service Applications. We have partnered with a leading producer of polylactic acid (PLA), a biodegradable polyester. We have been jointly developing and bringing to market a new family of bio-based compounded PBS/PLA resins, which are initially designed for food service applications.

Bio-Based PBS for the Automotive Industry. We have been collaborating for several years with a leader in automotive interiors. The goal of the collaboration was to develop succinic acid based polyesters that could be combined with natural fibers and other proprietary ingredients into lightweight composites that could be used to make injected molded parts for automobile interiors. The automotive parts company intends to commercialize this technology and has established a partnership with Mitsubishi Chemical, whereby we will supply bio-succinic to Mitsubishi Chemical and the automotive parts company will source PBS from Mitsubishi Chemical for the subsequent manufacture of its proprietary composites.

Bio-Succinic Acid Based Salts

De-icers. We have been working with a company engaged in the development and marketing of chemical solutions, to develop an innovative bio-based airport runway de-icer, which we expect will be commercialized through our collaborator’s existing marketing channels. We have also entered into a collaborative arrangement with a company engaged in the development, production and sale of deicer formulations, to develop formulations based on our proprietary succinate salt compositions to be used as a bio-based, non-toxic and biodegradable deicers for roadway, consumer and windshield washer applications. We will supply the bio-succinic acid and jointly own with our partner the intellectual property rights related to the formulations. We intend to work together to commercialize successful formulations.

Heat Transfer Fluids. We are collaborating with a leading manufacturer and distributor of oenological products, to develop a formulation based on succinate salts to be used as a heat transfer fluid in the production of wines. Our collaborator is completing the development and testing of such formulation based on the succinate salts, and, if the development of the formulation is successful and our collaborator commercializes the formulation, we expect to enter into a supply agreement with our collaborator for a five year period governing the sales of bio-based succinic acid or the salts. We will also jointly own the intellectual property rights related to the further development made on these salts.

Other Succinic Acid Based Polyesters. In addition to our work on PBS, we have explored succinic acid in combination with other alcohols and monomers. We are evaluating the performance of these polymers in broad applications such as automotive, adhesives and packaging. These materials are complimentary to PBS and we believe the addressable market for all succinic acid based polyesters, blends and composites, is approximately $2 billion.

Existing Markets for Derivatives of Bio-Succinic Acid

In an effort to expand the addressable markets for our bio-succinic acid, we secured a technology license from Davy in 2015 that allows us to convert our bio-succinic acid into “drop-in” 1,4 BDO and THF, which together represent existing chemical markets with annual sales in excess of $5.5 billion. The figure below illustrates value-added derivatives we have been developing.

Bio-Based 1,4 BDO

Spandex. We have established a collaboration with a global leader in the manufacture and distribution of spandex fibers, and our collaborator has tested our bio-based 1,4 BDO in the production of bio-spandex. We are currently assessing opportunities for joint production of bio-based 1,4 BDO, from which our collaborator would off-take a portion of the BDO produced for its bio-spandex needs.

Polyesters including PBT. We have been collaborating with several manufacturers of PBT, a heat resistant polymer used widely in automotive and electronic applications. We expect to sell our bio-based 1,4 BDO to these companies for the subsequent manufacture of bio-based polyesters.

Butadiene. Butadiene can be made from BDO and is used in the production of synthetic rubber and we estimate that the market for butadiene is approximately $14.5 billion. However, we do not believe that in the current environment of low oil prices and relative low butadiene prices that BDO is a cost effective feedstock for making butadiene.

Our Technology

Our proprietary technology platform combines commercial scale industrial biotechnology and chemical catalysis to convert renewable feedstocks into chemicals that are cost-competitive replacements for petroleum-derived chemicals. We are developing three distinct technologies:

- the production of succinic acid through fermentation;
- the conversion of succinic acid into 1,4 BDO and THF by catalyst assisted hydrogenation reaction; and
- the production of adipic acid and other C6 chemical intermediates through fermentation and purification with or without catalytic conversion.

Succinic Acid Production

Our process is based on the fermentation of sugar using a proprietary yeast organism to produce bio-succinic acid. Following separation and purification, bio-succinic acid, in its finished form, is a white crystal that physically resembles table salt.

In 2010 we signed a license with Cargill granting us exclusive rights to their yeast platform for the production of bio-succinic acid that could offer lower capital costs and lower operating costs. Cargill had developed a proprietary yeast host that is very robust and capable of thriving in harsh fermentation conditions, including high tolerance to organic acids such as succinic acid, good tolerance to low pH, physical robustness to heat, agitation and processing, high glycolytic rates and the ability to grow in a simple medium with inexpensive nutrients. Cargill has a patent portfolio to protect its yeast platform.

We worked with Cargill for over three years to develop our yeast and reached the final development milestone in the fall of 2013. Working with Cargill, we sequentially scaled up our yeast at the 20 liter, 600 liter, 2,000 liter and 180,000 liter scale, and we observed the same performance (measured as succinic acid production over time) for our yeast at each successive size of fermenter. We validated the purification process at small-scale and at the large-scale demonstration facility in Pomacle, France.

Our yeast produces succinic acid at a low pH, so that there is very little base added during the fermentation. This results in reduced energy consumption and a simplified purification process. Yeast also gives us the ability to use larger, less complex fermenters relative to bacteria, leading to lower capital intensity. Our Sarnia plant has been designed to operate the yeast. We are continuing to make improvements to our yeast to further improve its performance and reduce the cost of production and the capital intensity of future plants.

1,4-BDO / THF Production

We utilize catalyst technology licensed from Davy to transform our bio-succinic acid into bio-based 1,4 BDO, and bio-THF. The process involves passing bio-succinic acid and hydrogen gas into a fixed bed reactor over a heterogeneous catalyst, converting the bio-succinic acid into a mixture of bio-based 1,4 BDO and bio-THF, followed by distillation to separate, purify and recover the bio-based 1,4 BDO, and bio-THF. The relative concentrations of these three products can be modified by adjusting the reaction conditions. Our bio-succinic acid has been tested and validated in Davy’s pilot plant to assure performance.

Adipic Acid and Other C6 Intermediates

We have licensed worldwide, exclusive rights to a metabolic pathway that transforms sugar into a family of value-added products, including adipic acid, caprolactam, HMDA, caprolactone and hexanediol. The patents covering this pathway have been issued in the United States and Europe and are pending in a number of other jurisdictions. We believe this pathway has the advantage of offering a good yield on sugar, relative to alternative routes to these products, and having several products that can be derived from a common pathway.

We are currently focused on the development of adipic acid, which allows us to leverage our experience in producing and scaling up succinic acid, including our experience with our yeast. We have secured an exclusive, worldwide license from Cargill to use their proprietary low pH yeast platform to produce adipic acid.

Technology Partnerships

We have developed our succinic acid, BDO/THF and C6 platforms through open innovation—using partnerships and licenses to access the best available technologies, facilities and know-how. We have complemented these third party contributions with in-house development efforts, integrating the whole into competitive platforms. The use of open innovation has reduced the capital and operating costs of development and accelerated our development efforts. This approach to technology development contributed to our winning the 2011 ICIS Innovation Award, which recognized our use of open innovation to develop our succinic acid platform. Our principal technology partnerships are summarized below.

Cargill

In April 2010, we entered into a commercial license agreement with Cargill Inc., or Cargill, pursuant to which Cargill granted to us an exclusive, worldwide, royalty bearing license, with a limited right to sub-license, to use certain patents that cover our yeast strain to be used in our fermentation process at our Sarnia facility under construction. We agreed to pay Cargill a royalty based on net sales

of our products, but in no event less than a minimum annual royalty payment if we wish to maintain our exclusive license. If royalties based on net sales are below the minimum annual royalty payment, we may elect to pay the difference. If we elect not to pay the difference in any one year, Cargill may transform the exclusive license granted to us under the agreement to a non-exclusive, worldwide, royalty-free license. This is a long-term agreement that renews automatically, unless previously terminated.

Concurrently with the commercial license agreement, we entered into a development agreement with Cargill for a term of four years. Under the development agreement, Cargill had further developed our yeast for use in producing bio-succinic acid. We made an initial payment to Cargill and agreed to pay Cargill certain fixed amounts per year for each full-time equivalent person to perform under the agreement in accordance with a work plan. In addition, we had agreed to make certain payments to Cargill upon reaching various milestones. The first milestone was a proof of concept milestone that was reached in May 2011. The second milestone related to a performance target and was met in the second quarter of 2012. The final milestone related to completion of our yeast's development was achieved in the third quarter of 2013. The results stemming from the development work under the agreement are licensed to us pursuant to the commercial license agreement. We also have an option under the development and license agreements to further develop our yeast so that it can consume ligno-cellulosic, non-food feedstocks.

In May 2012, we secured an exclusive, worldwide, royalty-bearing license from Cargill to use certain patents that cover Cargill's yeast for the production of adipic acid. In addition to the license, we were granted the option to further develop Cargill's yeast so that it can consume ligno-cellulosic and non-food feedstocks, as well as the option to secure rights to the yeast for the production of caprolactam, HMDA, caprolactone and hexanediol. We have begun a research and development program under which Cargill has provided assistance in metabolically engineering its yeast to produce adipic acid. This is an early stage research and development program and there is no assurance of its successful development, scale-up or commercialization.

Johnson Matthey Davy Technologies

In December 2014, we entered into a license agreement with Davy. We intend to use the technology licensed from Davy in our planned 100,000 metric ton per year capacity plant that uses bio-succinic acid as the feedstock to produce 70,000 metric tons of BDO and 30,000 metric tons of THF. We also secured the right to license the Davy technology for two additional BDO/THF plants. We also entered into an engineering agreement with Davy in relation with the license agreement, under which Davy provided a complete basic engineering package for converting bio-succinic acid to bio-BDO and bio-THF, along with the provision to supply certain pieces of equipment and the catalysts needed to operate the plant. Davy will also provide on-site construction and commissioning support, and performance guarantees for the subsequent operation of the plant.

Celexion

In September 2010, we entered into a technology license agreement with Celexion. Under the agreement, we have an exclusive, worldwide, royalty bearing license to develop, make, use or sell certain C6 derivatives, including adipic acid, hexamethylene diamine and hexanediol, under patent applications in the United States and certain foreign countries held by Celexion that describe metabolically engineered host cells for producing difunctional alkanes and methods for producing difunctional alkanes. Under the agreement, we are obligated to pay Celexion a low single digit percentage royalty based on net sales of the products, or in circumstances in which we sublicense the technology, a royalty equal to a percentage of compensation received by us as a result of the sublicense. We are also obligated to make certain payments upon achieving various milestones under the agreement. The term of the agreement runs until the later of September 2025 or expiration of the last-to-expire licensed patents.

National Research Council of Canada

We have partnered with the National Research Council of Canada, the Government of Canada's premier organization for research and development, and with the INRS, a Canadian university dedicated to fundamental and applied research, to develop an organism that can consume methanol or methane for the production of bio-succinic acid. We began this work in November 2012.

Intellectual Property

Our success depends in large part upon our ability to obtain and maintain protection for our proprietary technologies and to operate without infringing the intellectual property rights of others. We primarily protect our intellectual property in Canada, the United States, Europe and certain other jurisdictions through a combination of patents and patent applications on inventions, trademark protection on our product names and trade secret protection as we deem appropriate. We also seek to ensure a competitive position through several partnerships, joint development and joint venture agreements.

We own or have rights in patents and patent applications directed to various aspects of our business. Our licensing agreement with Cargill gives us access to four existing patent families covering topics such as methods and materials for the production of organic products including organic acids using genetically-modified yeast species to fermentation process optimization. Patents resulting from these four patent families are scheduled to expire from 2019 to 2026. Our collaboration with Cargill has also generated three international patent applications licensed to us or owned by us that are directed to the production of succinic acid. Patents, if granted on these patent applications, would expire in 2031 and 2033.

With regard to the purification of bio-succinic acid and other dicarboxylic acids produced by fermentation, we own three U.S. patents, nine granted patents in Europe and other countries directed to processes for producing succinic acid, adipic acid, and other di-carboxylic acids, or their ammonium salt forms from fermentation broths. U.S. patent to this purification technology is scheduled to expire in 2031 onwards. For 1,4 BDO production, we entered into a technology license with Davy. Davy's process is designed with an esterification step prior to hydrogenolysis. This achieves greater efficiency, and a higher quality product. In addition, the process can make BDO's derivatives such as THF in variable ratios which are adjustable according to market need. This licensing package will enable us to construct and operate a 100,000 metric ton per year capacity plant that uses bio-based succinic acid as the feedstock to produce 70,000 metric tons of 1,4 BDO and 30,000 metric tons of THF. We have also secured the right to license that same technology for two additional BDO/THF plants. Additionally, for the conversion of bio-succinic acid to bio-based 1,4 BDO, we own

two U.S. patents, one U.S. patent applications, and counterpart patent applications in Europe, Canada, and in other countries directed to the conversion of bio-succinic acid to 1,4 BDO. Our two U.S. patents to the conversion of bio-succinic acid to bio-based 1,4 BDO are scheduled to expire in 2031 and patents, if granted, on our pending patent applications to this technology could expire in 2031. In addition, we own one international patent application, four U.S. patent applications, and counterpart patent applications in Europe, Canada, and in other countries directed to the conversion of bio-succinic acid to other compounds such as diaminobutane, succinic dinitrile, succinamide, and pyrrolidones. Patents, if granted on these applications, could expire in 2031. We also own or have rights in patents and patent applications directed to the use of succinic acid and succinic acid salts. For example, we own a U.S. granted patent and a Canadian granted patent directed to deicing compositions. Those patents are scheduled to expire in 2029.

BioAmber re-branded in November of 2014. At that time, we commissioned the creation of a new trademark, which included our stylized name and “infinity” logo. Protection for the logo and composite trademark (name & logo) in association with chemicals for industrial purposes, namely, organic acids, difunctional alkanes, organic salts, and derivatives were sought in the United States as well as internationally in the jurisdictions of China, Japan, South Korea, European Union, Switzerland, India, Mexico, Turkey, Canada, Thailand, Taiwan and Brazil.

We still maintain our trademarks for our C4 and C6 technology platform, including BIO-SA (bio-based succinic acid), BIO-AA (adipic acid), BIO-BDO (1,4-butanediol), mPBS and BIOmPBS (modified polybutylene succinate), BIOCAPRO (caprolactam) BIOGBL and BIOTHF (gamma-butyrolactone and tetrahydrofuran).

We also protect our proprietary information through written agreements. Our employees, consultants, contractors, partners and other advisors are required to execute nondisclosure and assignment of invention agreements upon commencement of employment or engagement. In addition, we protect our proprietary information through written confidentiality agreements with outside parties who may be exposed to confidential information.

Our Feedstock Strategy

Our yeast can use a range of renewable feedstocks as a source of fermentable “sugars” including glucose (also called dextrose) from corn, wheat, tapioca and other starch and cellulose sources, sucrose (also called sugar) from cane, beets or sorghum, and biomass sugars containing significant quantities of xylose and or glucose, derived from agricultural and forestry waste. Given the small quantity of fermentable sugars that we require to produce bio-succinic acid, we have initially sourced commercially available dextrose syrup for our facility in Sarnia, which we believe to be the most cost competitive source of fermentable sugars today in Canada. We have entered into a multi-year glucose supply agreement with a leading producer that operates several glucose production plants in North America. As biomass sugar technologies mature and become commercially available at competitive prices, our plan is to also source them for the production of our chemicals (feedstock hedging and diversification)

We would require less than 0.35% of the 13.6 billion bushels of corn harvested in the United States in 2015 to produce $1.0 billion worth of bio-succinic acid, based on management estimates and our projected selling price for succinic acid. We would require less than 0.6% of the 16.0 billion pounds of high fructose corn syrup produced in North America in 2015 to operate our Sarnia facility at its full nameplate capacity of 30,000 metric tons per year. As such, a rapid growth in our production capacity will not have a material impact on the North American glucose market

We recognize the growing need to focus the food chain on human nutrition, and to use sustainable, non-food, sources of biomass to produce chemicals and materials. As such, we plan to move to biomass fermentable sugars when they become commercially available and economically viable. We will pursue three strategies to achieve this goal: (i) incorporate Cargill's proven technology into the succinic acid producing yeast, so that it can consume ligno-cellulosic sugars efficiently at low pH; (ii) actively screen ligno-cellulosic sugar technologies to determine which are best adapted to our technology (our yeast and purification process) and have the most competitive cost structure; and (iii) develop a next-generation organism that can consume methanol or methane as the source of carbon to produce succinic acid. This would allow us to use alternative feedstock such as syngas.

Our Approach to Sustainability

We are committed to managing our economic, social, environmental and ethical performance through continued sustainable business practices. Bio-based chemicals as a foundational technology offer the potential to significantly reduce greenhouse gas emissions, energy use, and fossil fuel consumption by displacing chemicals derived from fossil resources. Environmental impact is measured by the life cycle analysis, or LCA, of the bio-based chemical production process. LCA results for bio-based chemicals and products have grown in importance in recent years as a distinct measure of impact relative to petrochemical production processes. Investors and corporate partners are interested in life cycle results as an evaluation of a conversion technology's environmental performance. Customers, including large global chemical and consumer companies are interested in LCA results as they strive to meet or exceed their sustainability targets, and meet growing consumer demand for greater transparency and more sustainable products.

Manufacturing Operations

Sarnia, Ontario

Our facility in Sarnia, Ontario is on land we own and is located within a bio-industrial park. The site is co-located in a large petrochemical hub with existing infrastructure that facilitates access to utilities and certain raw materials and finished product shipment, including steam, electricity, cooling water and water treatment. The facility has a nameplate capacity of 30,000 metric tons of bio-succinic acid per year and we started commercial scale production in October 2015. We anticipate that this facility will ramp up to full capacity in 2017. In the first months of operations, the plant encountered some operational inefficiencies related to human errors, equipment adjustments and minor equipment failures. These difficulties were expected and pertain to the learning curve associated with operating a new facility.

The plant has received ISO 9001 (for its quality management system), ISO 14001 (for its environmental management system, OHSAS 18001 (for its health and safety management system) and FSSC 22000 certification (for its food safety management system). These certifications were granted by accredited certification bodies following audits of the Sarnia plant in the fourth quarter of 2015.

In November 2011, we entered into a joint venture agreement with Mitsui to finance and build and operate our facility in Sarnia, Ontario through BioAmber Sarnia, a joint venture 70% owned by us and 30% owned by Mitsui. On February 8, 2016, we, together with our subsidiaries BioAmber International s.à r.l. and BioAmber Sarnia, entered into a binding term sheet with Mitsui pursuant to which Mitsui agreed to provide BioAmber Sarnia with additional capital contributions for an aggregate amount of CAD$25 million, which will increase Mitsui's share ownership to approximately 40%. We have retained effective operational control of the joint venture.

(Sarnia facility)

Government Grants and Loans and Commercial Institutions Loans Related to Sarnia Facility

BioAmber Sarnia, our joint venture entity with Mitsui that built and now operates the Sarnia plant, has received certain government grants and loans in connection with the construction of our facility. Grants and loans totaling CAD $72.0 million were received as of December 31, 2015 and are described below.

On September 16, 2011, BioAmber Sarnia entered into a contribution agreement with the Federal Economic Development Agency for Southern Ontario, or FEDDEV, pursuant to which FEDDEV has agreed to make a repayable contribution of up to CAD $12.0 million to construct our planned facility in Sarnia, Ontario. The contribution is interest free and requires repayment of principal from October 2015 to September 2020 in 60 monthly payments of CAD $0.2 million, according to the latest amended agreement from May 2014. The agreement contains a statement of work that requires BioAmber Sarnia to work towards reaching certain distinct project goals that relate to the physical construction of the facility and certain other objectives including addressing the growing global demand for bio-succinic acid and job-creation. A federal environment assessment was required as a condition of the loan. The final report was submitted to FEDDEV and approved in 2015.

On September 30, 2011, BioAmber Sarnia entered into a loan agreement with Minister of Economic Development, Employment and Infrastructure, or MEDEI, pursuant to which MEDEI has agreed to make available to BioAmber Sarnia a secured non-revolving term loan in principal amount of CAD $15.0 million in connection with the construction of our facility in Sarnia, Ontario. The loan is interest free for the first five years if BioAmber Sarnia is successful in creating an average of 31 jobs, calculated on an annual basis. Thereafter, the loan bears interest at an annual rate of 3.98%, or if BioAmber Sarnia is not successful in reaching the job target for the first five years, an annual rate of 5.98%. The principal is required to be repaid in five annual equal installments from the sixth anniversary of the date of the disbursement of the loan. The loan is guaranteed by BioAmber Inc. and Mitsui & Co. (U.S.A.) and is secured by collateral including BioAmber Sarnia’s present and future accounts, inventory, equipment and other property including the land purchased from Lanxess on which the facility is located.

On November 29, 2011, BioAmber Sarnia entered into a contribution agreement with Sustainable Development Technology Canada, or SDTC, pursuant to which SDTC has agreed to grant BioAmber Sarnia up to CAD $7.5 million in connection with the construction of our facility in Sarnia, Ontario. The funds are payable in installments, the first CAD $1.9 million of which was paid upon execution of the agreement. The deliverable as defined under the first milestone which has already been met, included conducting site-specific engineering work and environmental assessments, and recruiting plant personnel. All subsequent installments are contingent on meeting certain deliverables as defined in three milestones, which was amended to four milestones in a modification to the Contribution Agreement dated December 18, 2014. This amendment also included an increase to the SDTC contribution from CAD $7.5 million to CAD $14.5 million.

SDTC advanced CAD $3.4 million (less a 10% holdback as provided in the contribution agreement) for purposes of the second milestone, part a), which was met as of December 31, 2014. Deliverables defined under the second milestone, part a) was re-engineering of the production process and plant design. BioAmber Sarnia received an amount of CAD $0.90 million for the second milestone, part b) defined as engineering site preparation and general contractor selection, which was fulfilled as of December 31, 2014. SDTC advanced CAD $2.4 million for the purpose of milestone III as of December 31, 2014. In May 2015, the third milestone was reached, which includes the engineering, procurement of equipment and construction of the plant, and an amount of CAD$4.8 million was advanced for milestone IV. The fourth and final milestone, expected to be met prior to March 2016, includes commissioning, start-up and optimization of the facility.

On November 30, 2011, BioAmber Sarnia was issued a loan for CAD $0.5 million from the Sustainable Chemistry Alliance in connection with the construction of our facility in Sarnia, Ontario. The principal amount is repayable in 20 successive quarterly installments of CAD $25,000 each beginning upon the fourth anniversary of the funding. Interest is accrued at 5% per annum since October 1, 2013. Accrued interest is payable upon the third anniversary of funding then quarterly thereafter.

On March 10, 2014, BioAmber Sarnia entered into a repayable contribution agreement in the form of a non-interest bearing loan with the Minister of Agriculture and Agri-Food of Canada in the amount of CAD $10 million for the AgriInnovation Program. The loan provides for progressive disbursements as eligible costs are incurred up to an amount of CAD $10 million, for building construction, installation of equipment and start-up and commissioning of the Sarnia facility. This loan is repayable in equal, monthly installments beginning March 31, 2016 through March 31, 2025. The loan agreement contains various legal and financial covenants ordinarily found in such government agency loan agreements.

On June 20, 2014, BioAmber Sarnia signed a loan agreement with a financial consortium, comprised of Comerica Bank, Export Development Canada and Farm Credit Canada for a senior secured loan in the principal amount of CAD $20.0 million. The loan bears interest at a floating interest rate per annum based on the greater of (i) the Canadian prime rate and (ii) the Canadian dealer offered rate plus 1%, in either case plus an interest spread of 5%. The loan's principal is repayable in 26 equal, quarterly installments, which began on September 30, 2015. Between the signed loan agreement date and the drawdown of the CAD$20.0 million term loan, on May 12, 2015, BioAmber Sarnia paid a 1.0% per annum commitment fee on the undrawn amount. BioAmber Sarnia may prepay all or a portion of the loan outstanding from and after the date of the first principal repayment, without penalty.

BioAmber Sarnia's obligations under the loan are secured by (i) a security interest on all of BioAmber Sarnia's assets and (ii) a pledge of all the shares of BioAmber Sarnia. In addition, the Company will provide the lenders with a guarantee representing 70% of the secured obligations under the loan, and Mitsui & Co., Ltd. will provide a guarantee representing 30% of the secured obligations under the loan that is capped at CAD $6.0 million plus all accrued interest on the secured obligations and fees and expenses. The proceeds of the loan was used by BioAmber Sarnia to complete the construction of the Sarnia Plant and fund its startup and commissioning. The loan agreement contains certain representations and warranties, financial covenants, affirmative covenants, negative covenants and conditions that are customarily required for similar financings, including in connection with the disbursement of the loan.

Additional Planned Manufacturing Facilities

We plan to build a second integrated manufacturing facility that will produce approximately 200,000 metric tons per year of bio-succinic acid and then transform a majority of the bio-succinic acid into 100,000 metric tons per year of bio-based 1,4 BDO and THF, along with 70,000 metric tons per year of crystalline succinic acid. We have signed two 15 year offtake agreements with Vinmar for 100% of the BDO and THF output (100,000 metric tons per year) and 71.5% of the succinic acid output (50,000 metric tons per year) of this second planned facility. Vinmar plans to take a 10% equity stake in the plant. We are actively seeking other minority equity partners for this facility, as well as government support in the form of low interest loans and loan guarantees. Based on current estimates and assumptions, we expect this commercial scale manufacturing facility to have construction costs of approximately $500 million, and it would be commissioned in late 2018 assuming we achieve a financial close in late 2016.

As part of the succinic acid offtake agreement, Vinmar has also committed to purchase for 15 years, 75% of the output (150,000 metric tons per year) from a third manufacturing facility that would have an annual capacity of 200,000 metric tons of bio-succinic acid and which we plan to begin building in 2019 and commission in 2021. As part of the BDO offtake agreement, Vinmar has an option to secure 100% of the output from a fourth manufacturing facility that would produce 100,000 metric tons of BDO and THF per year and would be commissioned in 2023 or 2024.

Research and Development

As of December 31, 2015, our research and development department activities funded an internal team of 36 scientists and engineers that were employed by us. We also work with partners, including Cargill, to accelerate time to market and leverage existing know-how and infrastructure. Our technology development was initially focused on capabilities in fermentation engineering, analytical chemistry and molecular biology. We have more recently expanded our focus to include catalysis, purification process development and application development for bio-succinic acid.

Our net research and development expenditures were approximately $20.3 million, $15.1 million and $16.6 million for the years ended December 31, 2015, December 31, 2014 and December 31, 2013 respectively.

Competition

We expect our advanced bio-based specialty chemicals to compete with petrochemical equivalents that are proven in the market and manufactured by established companies, such as Gadiv Petrochemical Industries Ltd., Kawasaki Kasei, Nippon Shokubai, and numerous Chinese producers including Anqing Hexing Chemical Co. Ltd, and Anhui Sunsing Chemicals Co., Ltd. In addition, our products will compete against other companies in the bio-based specialty chemical industry, both early stage companies, such as Genomatica, Inc. (for bio-based 1,4 BDO) and Myriant Corporation (for bio-succinic acid), and established companies, such as Reverdia, a collaborative venture between DSM and Roquette Frères S.A. and Succinity, a collaborative venture between BASF and Corbion (both for bio-succinic acid).

We believe that the primary competitive drivers include:

- the ability to use yeast as opposed to a bacterium in the production of bio-succinic acid;
- technology performance including overall yields and fermentation productivity relative to our bio-based competitors;
- price and production costs relative to both bio-based and petroleum-derived suppliers of our products;
- capital requirements and access to capital, particularly in relation to our bio-based competitors;

- feedstock (sugar) flexibility;
- location and size of production facilities, which dictate raw material and utility prices and the economies of scale that can be achieved for capital expenditures, labor and maintenance;
- drop-in and replacement capability for existing markets;
- the ability to rapidly scale-up production to large scale, produce meaningful volumes and offer customers reliable supply in qualified facilities;
- the purity and quality of our products; and

We believe we compete favorably with respect to all of these drivers. With our yeast and our simple purification process, we are confident that we will be a cost competitive producer of high quality bio-succinic acid both relative to our bio-based competitors and existing petroleum producers. In addition to our technology advantage, we believe the size of our Sarnia plant also provides a cost advantage in terms of depreciation and fixed operating costs, given that our bio-succinic competitors operate plants that are less than half our annual capacity, and in the case of DSM-Roquette and Purac-BASF, one third the size of Sarnia. The location of our plant also provides us with lower cost sugars and energy than in Southern Europe, where the DSM-Roquette (Italy) and Purac-BASF (Spain) plants are located.

Our first-to-market leadership in bio-succinic acid provides us with a lead-time advantage that we have leveraged to secure customer relationships, enter into contractual agreements and establish partnerships for new succinic acid applications and derivative products. However, our competitors include large chemical companies that are better capitalized, with larger research and development departments and budgets, and well-developed distribution systems and networks for their products. These companies have relationships with our potential customers and have sales and marketing programs in place to promote their products.

With respect to our bio-based 1,4 BDO/THF, we believe we can be cost competitive with petroleum derived processes. We calculate that our technology to produce bio-based 1,4 BDO will require approximately 20% less capital than the n-butane-based process and will have comparable cash costs (variable costs and fixed costs). As we scale-up our processes and our variable costs decrease, we believe our bio-based 1,4 BDO will cost approximately 10% less than the n-butane-based process in the future. Given the competitive cost structure of our bio-succinic acid, which will serve as the starting material for the production of bio-based 1,4 BDO/THF in our integrated production plants, we project that our full cost for bio-based 1,4 BDO and THF will be situated in the bottom third of the cost stack for existing worldwide capacity.

We also believe that we will be cost competitive with other bio-based routes to 1,4 BDO due to the high yield on sugar that we gain from converting sugar to succinic acid. Our integrated process involves two steps: fermentation of sugar to produce succinic acid, followed by the catalytic conversion of succinic acid to 1,4 BDO, as opposed to a single step production that other companies, such as Genomatica achieve by directly fermenting sugar to 1,4 BDO. However, sugar is a significant component of variable cost in both processes, and the theoretical yield for the Genomatica one-step process requires roughly 50% more sugar than the theoretical yield of our two-step process. The term “theoretical sugar yield” with respect to these processes refers to the quantity of sugar obtained from the complete conversion of a feedstock in a chemical reaction under ideal conditions with perfect efficiency. Real-life processes inevitably incur processing losses and produce small quantities of by-products that reduce the overall yield on sugar, so that the actual yields are inferior to theoretical yields. Because there is approximately 24% weight loss during the conversion of bio-succinic acid to bio-based 1,4 BDO due to the production of water, the theoretical sugar yield for bio-based 1,4 BDO production is 85%, which is approximately 50% higher than the theoretical sugar yield for direct fermentation to 1,4 BDO.

We believe the cost competitiveness of converting succinic acid to BDO/THF is significantly reduced if the process is not integrated in a common production facility. If the succinic acid is produced and sold at arm’s length to a third party for subsequent conversion to 1,4 BDO, with a selling price that recovers the depreciation costs and an acceptable

return on capital employed, the cost of the resulting 1,4 BDO is significantly higher and the production cost of the BDO is in our view not competitive. We believe that we are currently the only bio-succinic acid producer with an integrated technology for making both bio-succinic acid and bio-based 1,4 BDO and THF. We recognize however, that BASF is the world leader in 1,4 BDO production and as such, could have the ability to integrate its bio-succinic acid production in its Corbion joint venture with its existing 1,4 BDO production in the future.

Regulatory Overview

We are subject to various international, federal, state and local regulatory laws, rules and regulations, including those relating to pollutant discharges into the environment, the management of hazardous materials, the protection of endangered species and the health

and safety of our employees. For example, in the United States, the Occupational Safety and Health Act and analogous state laws and regulations govern the protection of the health and safety of employees. The Clean Air Act and analogous state laws and regulations impose obligations related to emissions of air pollutants, including greenhouse gases. CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) and analogous state laws and regulations govern the clean-up of hazardous substances. The Water Pollution Control Act, also known as the Clean Water Act, and analogous state laws and regulations govern discharges into waters. The TSCA and analogous state laws and regulations impose requirements on the production, importation, use and disposal of chemicals and genetically modified microorganisms.

In Canada, similar regulatory programs exist under the Canadian Environmental Protection Act (CEPA 1999). In particular, a regulatory program similar to TSCA requires that Environment Canada approve the manufacture of any chemical not already included on the Domestic Substances List (DSL). We obtained the approval from Environment Canada with respect to the use of our yeast in 2013. If Environment Canada requires any of our future C6-based products, to undergo extensive testing, which we currently do not anticipate, securing approval to manufacture such products would potentially be subject to significant delays or costs. In the European Union, we are subject to a chemical regulatory program known as REACH (Registration, Evaluation, Authorization, and Restriction of Chemical Substances). Under REACH, we are required to register our products with the European Commission. The registration process requires the submission of information to demonstrate the safety of chemicals as used and could result in significant costs or delay the manufacture or sale of our products in the European Union. BioAmber's bio-based succinic acid has been approved under REACH.

In addition, we are or will be required to obtain, maintain or file various approvals, permits, licenses, registrations, certifications, intents to manufacture, environmental assessments and other requirements, such as air emission and water discharge permits, construction permits and boiler licenses. Such laws, regulations and permit conditions can result in substantial liabilities and the potential for permit revocations and plant shutdowns in the event we fail to comply with the applicable law, regulation or permit condition. The development of new processes, manufacture of new products using our processes, commercial sales of products produced using our processes, as well as geographic expansion, and in particular international expansion, will subject us and our industry partners to additional regulatory laws, rules and regulations. Finally, as we enter new markets such as the food, feed or cosmetic industries, we will be required to follow specific rules and regulations for these new applications.

The construction and operation of our production plants require obtaining permits and other approvals in various jurisdictions. For example, the production plant in Sarnia, Ontario, Canada required Certificates of Approval from the Ministry of Environment, an Environmental Assessment under the Canadian Environmental Assessment Act, approval of the organism under the Canadian Environmental Protection Act (CEPA 1999) and planning, construction, building, occupancy and fire permits from the City of Sarnia. Similar requirements are anticipated to apply in other countries where production plants are or may be planned. As a condition to granting the permits and other approvals, regulators could make demands that increase our partnerships' construction and operating costs and result in the need to procure additional financing. Failure to obtain and comply with all applicable permits and other approvals could halt construction and subject us and our partners to future claims. We therefore cannot guarantee procurement or compliance with the terms of all permits and all other approvals needed to complete, and later continue to operate, our and our partners' production plants. In addition to actual plant operations, liabilities could arise from investigation and clean-up of environmental contamination at our and our partners' production plants. We and our partners may also be subject to third-party claims alleging property damage or personal injury due to the release of or exposure to hazardous substances.

In addition, new laws, new regulations, new interpretations of existing laws or regulations, future governmental enforcement of environmental laws or other developments could result in significant expenditures. For example, in 2009, the Environmental Protection Agency announced its "Essential Principles for Reform of Chemicals Management

Legislation" and in April 2011, the Safe Chemicals Act of 2011 was introduced in Congress. This bill would amend TSCA to be more like REACH and require safety testing of all industrial chemicals and could result in the need to disclose confidential business information relating to chemical safety. We are monitoring this and other legislative and regulatory developments. Any failure by us or our industry partners to comply with applicable regulatory rules and regulations could harm our reputation as well as our business, financial condition and operating results. In addition, regulatory approvals, registrations, permits, licenses, certifications and other requirements may be denied or rescinded resulting in significant delays, additional costs and abandonment of certain planned activities or require us to engage in costly and time consuming efforts to remediate. Compliance with applicable regulatory rules and regulations can be costly and time consuming.

Employees

As of December 31, 2015, we had 98 full-time employees. Of these employees, 14 were engaged in research and development, 9 were engaged in sales and marketing, 19 were engaged in general and administrative activities and 56 were engaged in operations activities including engineering. 74 employees are based in Canada, 18 are based in the United States and the remaining six

employees are located in Europe and Asia. We also employ other temporary staff across the organization to augment support for our employees. None of our employees are represented by a labor union. We have never experienced any employment-related stoppages and we consider our employee relations to be good.

Item 1A. Risk Factors

You should carefully consider the risks described below and the other information in this Annual Report on Form 10-K. Our business, prospects, financial condition, or operating results could be harmed by any of these risks, as well as other risks not currently known to us or that we currently consider immaterial. If any of such risks and uncertainties actually occurs, our business, financial condition or operating results could differ materially from the plans, projections and other forward-looking statements included in the section titled "Management's Discussion and Analysis of Financial Condition and Results of Operations" and elsewhere in this report and in our other public filings. The trading price of our common stock could decline due to any of these risks, and, as a result, you may lose all or part of your investment.

Risks Related to Our Business and Our Industry

We have a limited operating history, a history of losses, anticipate continuing to incur losses for a period of time, and may never achieve or sustain profitability.

We have only been in existence since October 2008 and, therefore, we have a limited operating history upon which you can base your evaluation of our business. As a result, any assessments of our current business and predictions you make about our future success or viability may not be as accurate as they could have been if we had a longer operating history. Since our inception, we have incurred substantial net losses, including net losses of $41.2 million for the year ended December 31, 2015, $47.4 million for the year ended December 31, 2014, and $27.9 million for the year ended December 31, 2013. We expect these losses to continue. We expect to continue to incur substantial costs and expenses related to the continued development and expansion of our business, including those related to the development, continuation and operation of our additional manufacturing facilities, research, testing and development of new products and the growth of our sales and marketing efforts. We will need to generate and sustain increased revenues in future periods in order to become profitable. We cannot assure you that we will ever achieve or sustain profitability on a quarterly or annual basis.

To achieve profitability, we need to execute our manufacturing expansion strategy, including the ramp up of our facility in Sarnia, Ontario.

We are currently ramping up our first facility in cooperation with Mitsui in Sarnia, Ontario. We expect this facility to be operating at full capacity in 2017. We intend to build and operate additional facilities over the next three to five years. We have limited experience in operating a commercial-scale production facility, and our technology may not perform as expected in future plants

There is no guarantee that our Sarnia facility will produce at full capacity and even if we do meet these goals, we may encounter operational challenges for which we are unable to devise a workable solution or which may result in additional costs. To date, we have entered into agreements that contemplate, but do not obligate, us to supply approximately 28,000 metric tons of bio-succinic acid and its derivatives per year until the end of 2017, and we are actively seeking to enter into additional supply agreements. Some of these supply agreements obligate our customers to exclusively fulfill their needs for bio-succinic acid from us, contingent on our ability to meet their price and other requirements, however there are no penalties in the event they do not purchase or we do not supply them with bio-succinic acid in the projected purchase volumes they have indicated in the agreements. Without increasing our production capacity by completing future facilities, we may not be able to meet the demands of our customers and our customer relationships and commercialization growth may suffer.

We have entered into an offtake agreement with Vinmar which require us to supply bio-succinic acid to them. In the event that we are unable to supply Vinmar reliably with succinic acid according to the terms of our agreement, due to production or quality issues other than a force majeure, we would incur financial penalties payable to Vinmar.

We began operations at our facility in Sarnia, Ontario in October 2015 and we may encounter substantial difficulties in ramping up commercial operations and meeting the expectations of our customers. Because we produce all of our products at our single facility, any disruptions or delays may have a material adverse effect on our business, financial condition and results of operations.

We began commissioning and start-up of our Sarnia facility in March 2015, and started operations in October 2015. Because our facility is the first of its kind, none of our employees have had any prior experience in its operation. As a result, we may experience unforeseen challenges and difficulties and, until the operations stabilize and we obtain more experience operating a commercial scale facility, the Sarnia facility may be more susceptible to start-ups, shutdowns, quality issues, or other delays or disruptions. For example, in the first months of operations at the Sarnia facility, the plant encountered some operational inefficiencies related to human errors, equipment adjustments and minor equipment failures. We cannot know with certainty when or if we will achieve optimized operations. The skills and knowledge gained in operating our large-scale demonstration facility in Pomacle, France may prove insufficient for successful operation of a larger-scale commercial facility, and we may be required to expend significant time and resources to develop our capabilities in commercial facility operations. We may also need to hire new employees or contract with third parties to help manage our operations, and our performance may suffer if we are unable to hire qualified parties or if they perform poorly.

Our operations at our Sarnia, Ontario facility may be adversely affected by changes and events, including the following:

- loss of key talent, including technical and administrative personnel, in operating the facility;
- failure to maintain or timely renew regulatory approvals, including environmental;
- issues with the quality of our products produced at the facility;
- shortages or changes in the price of equipment, materials or labor and related budget overruns;
- adverse changes in the political and/or regulatory environment;
- adverse weather conditions or natural disasters, accidents or other unforeseen events;
- insufficient capital to continue operations at the facility and the inability to obtain additional financing on satisfactory terms or at all;
- workplace health and safety issues at the facility;
- costs associated with the external processing of our co-products;
- issues associated with our environmental emissions, effluents, air and noise; and
- failure of a key piece of equipment, particularly one with long lead time delivery.

Currently, our only production site is our Sarnia facility. As a result, significant and prolonged disruptions at the facility would have a material adverse effect on our business, financial condition and results of operations. Our operations also may be disrupted by external events such as natural disasters, severe weather conditions, workplace or environmental accidents, mechanical failure, fires, explosions, interruptions of supply, work stoppage, losses of permits or authorizations or acts of terrorism. Some of these events can cause personal injury and loss of life, severe damage to or destruction of property and equipment and environmental damage, and may result in suspension or cessation of operations and the imposition of civil or criminal penalties. Our facilities and the manufacturing equipment we use would be very costly to replace and could require substantial lead time to repair or replace. In addition, telecommunications failures or other systems interruptions, such as computer viruses or other cyber-attacks, at any of the locations in which we do business could significantly disrupt our operations, laboratory processes and delay shipments to our customers. We can provide no assurance that we will not incur losses related to these or other events beyond the limits or outside the coverage of our insurance policies. Further, disruptions to our operations could have a material adverse effect on our business and results of operations during the period of time that the facility is not operating.

In addition, we may also experience difficulties in producing sufficient quantities or quality of products or in achieving sufficient quality and manufacturing yield levels. Our Sarnia facility is also subject to risks associated with having single suppliers for certain key inputs, such as sugar, power and steam, so the failure of any of these suppliers to perform as expected, would also have a material adverse effect on our performance and results of operations. If we are unable to successfully operate and manage our manufacturing operations at our Sarnia facility or otherwise fail to meet our manufacturing needs, we may not be able to provide our customers with the quality or quantity of products

they require, and thus could lose customers and suffer reduced revenues which may have a material adverse effect on our results of operations.

The funding, construction and operation of our facilities involve significant risks.

Having only recently completed construction of our Sarnia, Ontario facility, and we have limited experience constructing a manufacturing facility of the type and size required to produce commercial quantities of chemicals, and doing so is a complex and lengthy undertaking that requires sophisticated, multi-disciplinary planning and precise execution. The funding, construction and operation of manufacturing facilities are subject to a number of risks, any of which could prevent us from executing on our expansion strategy. In particular, the construction costs associated with future facilities may materially exceed budgeted amounts, which could adversely affect our results of operations and financial condition. For example, the total completion cost of this initial phase of our Sarnia facility was revised to approximately $141.5 million, which was above the initial estimated cost of $125.0 million (plus or minus 10%). Additionally, while the Sarnia facility could be expanded in the future beyond its initial nameplate capacity of 30,000

metric tons, the likelihood, timing and size of an eventual expansion will be a function of the timing of construction of our planned second facility as we are unlikely to undertake two construction projects simultaneously.

If we incur future cost overruns, we may not be able to expand our production capacity and product portfolio as quickly as we planned. While our goal is to negotiate contracts with engineering, procurement and construction firms that minimize risk, any delays or cost overruns we encounter may result in the renegotiation of our construction contracts, which could increase our costs. Further, our expansion strategy will require us and/or our subsidiaries to raise additional funds, including through government grants, if available, and the incurrence of additional debt, which may be in the form of interest-free or interest-bearing loans and which may be secured or unsecured. Such additional debt will likely be substantial.

In addition, the construction of our facilities may be subject to the receipt of approvals and permits from various regulatory agencies. Such agencies may not approve the projects in a timely manner or may impose restrictions or conditions on a production facility that could potentially prevent construction from proceeding, lengthen its expected completion schedule and/or increase its anticipated cost. If construction costs, or the costs of operating and maintaining our manufacturing facilities, are higher than we anticipate, we may be unable to achieve our expected investment return, which could adversely affect our business and results of operations.

We may also encounter new design and engineering or operational challenges as we seek to expand the range of organisms and feedstocks we use. Any design and engineering or operational issues at our facilities may result in diminished production capacity, increased costs of operations or periods in which our facilities are non-operational, all of which could harm our business, financial condition and results of operations. We intend to obtain and maintain insurance to protect against some of the risks relating to the construction of new projects. However, such insurance may not be available or adequate to cover lost revenues or increased costs if we experience construction problems, cost overruns or delays. If we are unable to address these risks in a satisfactory and timely manner, we may not be able to implement our expansion strategy as planned or at all. In addition, in the event that our products are defective or have manufacturing failures, we may have to write off and incur other charges and expenses for products that fail to meet internal or external specifications. We also may have to write off work-in-process materials and incur other charges and expenses associated with contamination and impurities should they occur.

Our failure to comply with milestone covenants contained in certain of our agreements, including certain debt instruments, government grants and government loans, could result in events of default, and if not cured, would require their accelerated or immediate repayment, in which case our assets and cash flow may be insufficient to make such repayments or fund our manufacturing expansion strategy.

The terms of our debt instruments require us to comply with various milestone covenants related to the start-up of our facility in Sarnia, Ontario. A breach of any of these covenants could result in an event of default under one or more of these debt instruments which, if not cured or waived, could give the holders of the defaulted indebtedness the right to terminate commitments to lend and cause all amounts outstanding with respect to the indebtedness to be due and payable immediately. In addition, we are party to certain agreements with governmental entities that provide grants and loans in connection with the operation of our Sarnia facility. If we fail to meet any of the milestones and project goals contained in these grant and loan agreements, we may be forced to repay grants received or the repayment of the loans may be accelerated. If we are forced to repay government grants or accelerate the repayment of government loans, our assets and cash flow may be insufficient to make such repayments or fund our manufacturing expansion strategy.

We have generated only limited sales of bio-succinic acid to date, are dependent on a limited number of customers and face challenges to developing our business.

To date, all our revenue has been derived from the sale of our bio-succinic acid through product and market development efforts related to our bio-succinic acid product, and we have not made sales of any other products. In order to generate sales of our bio-succinic acid and any future products, we must be able to achieve our production cost targets and produce sufficient quantities of our products, both of which are dependent on our ability to maintain our commercial-scale manufacturing facility and build additional manufacturing operations. If we are not successful in operating existing or constructing additional manufacturing facilities or otherwise increasing our manufacturing capacity, developing products that meet our customers' specifications, further advancing our commercial arrangements with existing customers and gaining new customers, we will be unable to generate meaningful revenue from the sale of our products. In addition, we depend, and expect to continue to depend, on a limited number of customers for sales of our bio-succinic acid. During the year ended December 31, 2015, 31% of our sales were to PTTMCC Biochem. During the year ended December 31, 2014, 47% our sales were to International Flavor and Fragrances, Inc., or IFF, Brenntag AG, or Brenntag and Olon Italy. In the future, a small number of customers may represent a significant portion of our total revenue in any given period. We

cannot be certain that such customers will consistently purchase our products at any particular rate over any subsequent period. A loss of, or any credit issues related to, any of these customers or a failure to capture additional customers could adversely affect our financial performance.

Our financial obligations are expected to continue to be substantial, and we may not obtain the additional financing we need in order to grow our business, develop or enhance our products or respond to competitive pressures.

We will need to raise additional funds in the future in order to grow our business. Any required additional financing may not be available on terms acceptable to us, or at all. Our ability to secure financing and the cost of raising such capital are dependent on numerous factors, including general economic and capital markets conditions, credit availability from lenders, investor confidence and the existence of regulatory and tax incentives that are conducive to raising capital. Current turmoil and uncertainty in the financial markets has caused banks and financial institutions to decrease the amount of capital available for lending and has significantly increased the risk premium of such borrowings. In addition, such turmoil and uncertainty has significantly limited the ability of companies to raise funds through the sale of equity or debt securities. If we are unable to raise additional funds, obtain capital on acceptable terms, secure government grants or co-sponsorships for some of our projects or take advantage of federal and state incentive programs to secure favorable financing, we may have to delay, modify or abandon some or all of our expansion strategies.

Our expansion strategy will require us and/or our subsidiaries to raise additional funds. The amount of any indebtedness that we may raise in the future may be substantial, and we may be required to secure such indebtedness with our assets and may have substantial interest expenses. If we default on any future indebtedness, our lenders could declare all outstanding principal and interest to be due and payable and our secured lenders may foreclose on the facilities securing such indebtedness. The incurrence of indebtedness could require us to meet financial and operating covenants, which could place limits on our operations and ability to raise additional capital, decrease our liquidity and increase the amount of cash flow required to service our debt. If we experience construction problems, cost overruns or delays that adversely affect our ability to generate revenues, we may not be able to fund principal or interest payments under any debt that we may incur.

Based on our current operating plan, we anticipate that the net proceeds from our public offerings, equity contributions from Mitsui, the loan from funds managed by TCP, a combination of government grants, interest-bearing and interest-free loans and our existing cash and cash equivalents, will be sufficient to enable us to maintain our currently planned operations. We have no additional committed external sources of funds and additional financing may not be available when we need it or may not be available on terms that are favorable to us. In addition, we may seek additional capital due to favorable market conditions or strategic considerations, even if we believe we have sufficient funds for our current or future operating plans. The issuance of additional equity securities could result in dilution to our stockholders and the newly-issued securities may have rights senior to those of the holders of our common stock.

Our ability to execute our business plan is dependent on our ability to generate sufficient cash flows from operations, raise additional capital or refinance our indebtedness to meet our obligations. If adequate funds are not available to us on a timely basis, or at all, we may be unable to fund our debt service obligations and be required to reduce or delay operating and capital expenses as deemed appropriate in order to conserve cash.

We cannot assure you that we would be able to take any of these actions or that any effort to sell additional debt or equity securities would be successful or would raise sufficient funds to meet our financial obligations or finance additional facilities or that these actions would be permitted under the terms of our existing or future debt agreements. If additional financing is not available when required or is not available on acceptable terms, we may need to delay, modify or abandon our expansion strategy and we may be unable to take advantage of business opportunities or

respond to competitive pressures, which could have a material adverse effect on our offerings, revenue, results of operations and financial condition.

Our prior success in developing bio-succinic acid may not be indicative of our ability to leverage our bio-succinic acid technology to develop and commercialize derivatives of bio-succinic acid and other bio-based building block chemicals.

The success we have had in manufacturing bio-succinic acid using our four carbon, or C4, platform to date may not be indicative of our future ability to develop and commercialize derivatives of bio-succinic acid, and bio-based six carbon, or C6, building block chemicals. Although we expect to be able to leverage our bio-succinic acid technology for use in higher value-added products, we have never produced derivatives of bio-succinic acid or bio-based C6 building block chemicals at commercial scale. We may find that the new chemicals that we produce using our processes are more complex than we anticipated or require processes that we are unfamiliar with or which require larger scale development facilities than expected. The development of new products has required, and will require, that we expend significant financial and management resources. We have incurred, and expect to continue to incur, significant research and development expenses. If we are unable to devote adequate resources to develop new products or

cannot otherwise successfully develop new products or enhancements that meet customer requirements on a timely basis, our products could lose market share, our revenues and/or margins could decline and we could experience operating losses. Although our management team has significant experience with industrial biotechnology, purification processes and chemical catalysis, the skills and knowledge gained in these fields and in the large-scale production of bio-succinic acid does not guarantee that we will be successful in our efforts to cost-effectively produce and commercialize bio-succinic acid derivatives or bio-based C6 building block chemicals at commercial scale.

In addition, each of the chemicals that we plan to manufacture are used in multiple and diverse end-markets and applications, each of which present unique requirements, pricing pressures and competitors. As a result, we may not be able to sufficiently serve each end-market adequately. In order to effectively compete in the chemicals industry, we will need to, among other things, be able to adapt our development and production processes to meet the rapidly changing demands of the industry and our customers and ensure that the quality, performance attributes and cost of our bio-based products compare favorably to their petroleum-derived equivalents. In each end-market, there may also be barriers to entry due to third-party intellectual property rights or difficulties forming and maintaining strategic partnerships. In addition, the products currently derived from our processes and the feedstocks we use in the production of bio-succinic acid and our future products, may not be applicable to or compatible with demands in existing or future markets. We may not be able to identify new opportunities as they arise since future applications of any given product may not be readily determinable.

If we are not able to successfully develop, commercialize, produce and sell new products, we may be unable to expand our business. Consequently, we may not succeed in our strategy to expand our product platform as expected or at all. If our ability to expand our product platform is significantly delayed or if we are unable to leverage our bio-succinic acid platform as expected, our business and financial condition could be materially and adversely affected.

Demand for our bio-succinic acid, bio-based 1,4 BDO, THF and other bio-succinic acid derivatives may take longer to develop or be reduced by technological innovations in our industry that allow our competitors to produce them at a lower cost.

The development of sufficient customer demand for bio-succinic acid, bio-based 1,4 BDO, THF and other bio-succinic acid derivatives will be affected by the cost competitiveness of our products, and the possible emergence of more competitive products. The market for bio-based chemicals will require most potential customers to switch from their existing petroleum-based chemical suppliers. In addition, there has been intense growth and interest in bio-based chemicals, and these industries are subject to rapid technological change and product innovation. Our products are based on our proprietary fermentation and purification process, but a number of companies are pursuing alternative processes and technologies and our success will depend on our ability to maintain a competitive position with respect to technological advances. It is possible that those advances could make bio-succinic acid, bio-based 1,4 BDO, THF and other bio-succinic acid derivatives less efficient or obsolete, causing the renewable chemicals we produce to be of a lesser quality than competing bio-based chemicals or causing the yield of our products to be lower than that for competing technologies. These advances could also allow our competitors to produce bio-based chemicals at a lower cost than ours. We cannot predict when new technologies may become available, the rate of acceptance of new technologies by our competitors or the costs associated with such new technologies.

Technological breakthroughs in our industry or innovations in alternative sources of bio-based chemicals could reduce demand for our products. Our technologies and products may be rendered uneconomical by technological advances, more efficient and cost-effective biocatalysts or entirely different approaches developed by one or more of our competitors. If we are unable to adopt or incorporate technological advances or adapt our products to be competitive with new technologies, our costs could be significantly higher than those of our competitors, which could make our facilities and technology less competitive or uncompetitive.

Changes we make to our business model, product development and manufacturing process, or changes to our commercial partnerships and collaborations may not yield the benefits we expect and may have adverse impacts that we did not anticipate.

We are continually working to lower our operating costs, improve our product performance, increase our speed to market and access new markets. As a result, we have made and will continue to make changes we believe will accomplish these goals. For example, we transitioned from an E. coli organism to our yeast for our Sarnia facility operations. In addition, we have expanded the breadth of products we are seeking to commercialize, and entered into a number of early stage partnerships and collaborations related to those products, that we believe will significantly increase our accessible market. We can give no assurances that these and other changes we make will yield the benefits we expect and will not have adverse impacts that we did not anticipate. If these changes are not successful, we may incur additional costs, experience reputational and competitive harm and our business, financial condition and results of operations may be materially and adversely affected.

We are dependent on our relationships with strategic partners, licensors, collaborators and other third parties for research and development, the funding, construction and operation of our manufacturing facilities and the commercialization of our products. The failure to manage these relationships could delay or prevent us from developing and commercializing our products.

We have built our business largely by forming technology partnerships and licensing and other relationships with market leaders in the industrial biotechnology and chemicals industries. For example, through an exclusive worldwide license from Cargill, we have developed a next-generation yeast microorganism. In addition, we have developed a proprietary purification process that we believe will provide a key cost differentiator to our competitors by reducing the cost profile of our products and the capital intensity of our plants. We have also entered into license agreements with Davy for the conversion of succinic acid to BDO and THF, and with Celexion for the production of bio-based adipic acid and other C6 chemicals using a proprietary metabolic pathway. We expect that our ability to maintain and manage these collaborations will be significant factors in the success of our business.

Also, we expect that our ability to maintain and manage partnerships for the funding, construction and operation of our manufacturing facilities will be a significant factor in the success of our business.

We entered into a joint venture agreement with Mitsui for the financing and construction of our facility in Sarnia, Ontario. We began commissioning and start-up in March 2015, achieved mechanical completion in June 2015 and started commercial scale production in October 2015. Our joint venture with Mitsui also contemplates the potential construction and operation of an additional facility, which we expect to build and commission in late 2018. We may not be able to maintain our partnership with Mitsui if it decides to exercise certain rights granted to it in our joint venture agreement. In the event of an occurrence of a dissolution event under the agreement prior to December 31, 2020, Mitsui has the right to sell its shares and we have the obligation to purchase those shares at 100% of the investment value. The remaining dissolution events giving Mitsui this right are: (i) cumulative losses accrued from 2016 through 2020 exceeding 75% of paid-in capital, (ii) no after-tax profit earned in any three consecutive years from 2016 onwards, and (iii) any act of insolvency, bankruptcy, or similar event. Until December 31, 2018, Mitsui in its sole discretion may sell its shares and we must purchase those shares at a discount of 50% to the cumulative investment value. In addition, we intend to leverage Mitsui’s global sales platform for the commercialization of our products, and such commercialization efforts may be adversely affected if we are unable to maintain our relationship with Mitsui.

We are working with strategic partners and collaborators through whom we either own or license the technology needed to develop new specialty chemical products. We will rely on these partners to commercialize our products and the success of these relationships will impact the market opportunity and demand for our products across our target end-markets.

Our partnering or collaboration opportunities could be harmed and our anticipated timelines could be delayed if:

- we do not achieve our objectives under our arrangements in a timely manner, or at all;
- our existing or potential industry partners become unable, unwilling or less willing to expend their resources on research and development or commercialization efforts with us due to general market conditions, their financial condition, feedstock pricing or other circumstances, many of which are beyond our control;
- we disagree with a strategic partner or collaborator regarding strategic direction, economics of our relationship, intellectual property or other matters;
- we are unable to successfully manage multiple simultaneous partnering arrangements;
- our strategic partners and collaborators breach or terminate their agreements with us or fail to perform their agreed activities or make planned equity contributions;
- our industry partners become competitors of ours or enter into agreements with our competitors;
- applicable laws and regulations, domestic or foreign, impede our ability to enter into strategic arrangements;
- we develop processes or enter into additional partnering arrangements that conflict with the business objectives of our other arrangements; or
- consolidation in our target markets limits the number of potential industry partners.

If any of these events occur, or if we fail to maintain our agreements with our strategic partners and collaborators, we may not be able to commercialize our existing and future products, further develop our business or generate sufficient revenues to support our operations. Additionally, our business could be negatively impacted if any of our industry partners undergo a change of control or assign the rights or obligations under any of our agreements.

Our operations are dependent upon certain raw materials and utilities, principally sugars, hydrogen, steam and electricity, which make us vulnerable to supply availability and price fluctuations.

We are vulnerable to the supply availability and price fluctuations of certain raw materials and utilities, principally sugars, hydrogen (in the production of BDO and THF), steam and electricity. In some cases, we do not have long-term supply agreements in place, which may result in supply problems in the future. Our operations may also be adversely impacted by the failure of our suppliers to follow specific protocols and procedures or comply with applicable regulations, equipment malfunctions and environmental factors, any of which could delay or impede their ability to meet our demand. Our reliance on third-party suppliers also subjects us to other risks that could harm our business, including that:

- we may not be able to obtain adequate supply in a timely manner or on commercially reasonable terms;
- we may have difficulty locating and qualifying alternative suppliers for sole-source supplies;
- we may have production delays if products we source from alternative suppliers do not meet our standards;
- we are not, and do not expect to become, a major customer of most of our suppliers and such suppliers may give other customers' needs higher priority than ours; and
- our suppliers may encounter financial hardships unrelated to our demand for components, which could inhibit their ability to fulfill our orders and meet our requirements.

In the event one or more of our suppliers are unable to meet our supply demands, we may not be able to quickly replace them or find adequate supply from a different source. Any interruption or delay in the supply of sugars, carbon dioxide, hydrogen, steam or electricity, or our inability to obtain these raw materials and utilities from alternate sources at acceptable prices in a timely manner, could impair our ability to meet the demands of our customers and expand our operations, which would have a material adverse effect on our business, financial condition and results of operations.

In addition, the variable cost of our bio-succinic acid is based significantly on the price of sugars, which can be derived from corn (which we currently principally rely on), wheat, cane or other feedstocks. Fluctuations in the commodity prices of sugars or other inputs required in our production processes may reduce our profit margins, especially if we do not have long-term contracts for the sale of our output at fixed or predictable prices. The price and availability of sugars or other inputs may be influenced by factors outside of our control, including general economic, market and regulatory factors. For instance, over the past five years, the price of corn ranged from a low of $2.82 per bushel to a high of $8.44 per bushel. As of March 7, 2016, the spot price was $3.49 per bushel and the six-month forward price was $3.64 per bushel We estimate that a $1.00 increase or decrease in the per bushel price of corn would result in just a $0.024 per pound change in the variable cost of our bio-succinic acid.

Our failure to successfully introduce improved organisms and feedstocks into our processes could adversely affect our business, financial condition and results of operations.

We intend to introduce improved organisms into our processes and are working to increase our conversion yields, feedstock flexibility, manufacturing efficiency and product range through our research and development efforts and strategic partnerships. We may not, however, succeed in ramping up our yeast technology in Sarnia for a number of reasons, including our inability to adapt our purification process for our yeast, the failure of our yeast to produce products that meet the quality standards of our customers and a higher than expected production cost as a result of using our yeast. We plan to use our yeast in future facilities, but the implementation may not be as seamless as we expect, and our yeast may require different operating conditions or otherwise differ from our expectations and design.

If we are unable to manage our growth and expand our operations successfully, our business, financial condition and results of operations may be harmed.

We have significantly expanded our business since our inception and have grown to 98 full-time employees as of December 31, 2015. We currently conduct our business in several countries, including the United States, Europe and Canada, and we may continue to expand geographically in the future. We expect our growth to continue and accelerate in connection with our expansion strategy. As our operations continue to expand, we will need to continue to manage multiple locations and additional relationships with various

third parties. We may not be able to maintain or accelerate our current growth rate, manage our expanding operations effectively or achieve planned growth on a timely or profitable basis. Managing our anticipated growth and expanding our operations will require us to do, among other things, the following:

- enhance our operational, financial and management controls and infrastructure, human resource policies, and reporting systems and procedures;
- effectively scale our operations, including successfully constructing future manufacturing facilities;
- diversify our product line to leverage our bio-succinic acid for use in multiple value-added products and derivatives, and develop bio-based C6 building block chemicals;
- successfully identify, recruit, train, maintain, motivate and integrate additional employees and continue to retain, motivate and manage our existing employees;
- maintain partnerships with third parties for the development of our technologies, funding and construction of our plants and the commercialization of our products; and
- maintain, defend and grow our intellectual property portfolio.

These enhancements and improvements will require significant capital expenditures and allocation of valuable management and employee resources, which will place a strain on our operational, financial and management infrastructure. Our future financial performance and our ability to execute on our business plan will depend, in part, on our ability to effectively manage any future growth and expansion. There are no guarantees we will be able to do so in an efficient or timely manner, or at all. Our failure to effectively manage growth and expansion could have a material adverse effect on our business, financial condition and results of operations.

We have entered into certain non-binding letters of intent, memoranda of understanding and other arrangements with future customers and others, and cannot assure you that such arrangements will lead to definitive agreements, which could harm our commercial prospects.

We have entered into non-binding letters of intent, memoranda of understanding and other arrangements with future customers and others. We have also entered several non-binding memoranda of understanding with third parties related to our product development efforts. We cannot assure you that we will be able to negotiate final terms and enter into definitive agreements with any of our future customers or others in a timely manner, or at all, and there is no guarantee that the terms of any final, definitive, binding agreement will be favorable to us or reflect the terms currently contemplated under the letters of intent, memoranda of understanding and other arrangements we have. Delays in negotiating final, definitive, binding agreements could slow the development and commercialization of the products in our pipeline, which could prevent us from growing our business, result in wasted resources and cause us to consume capital significantly faster than we currently anticipate.

We have signed a binding 15-year offtake agreement for 1,4 BDO and THF with Vinmar, under which Vinmar has committed to purchase 100% of the BDO and THF produced in our next plant, a 100,000 metric ton per year capacity plant that we plan to build in North America and commission in late 2018. Vinmar also plans to invest in the BDO plant alongside us. Following the financing, construction and commissioning of the 100,000 metric ton BDO and THF plant, Vinmar will be obligated to purchase 100% of the BDO and THF produced there for 15 years, and we will be obligated to sell exclusively to Vinmar. As part of the agreement, Vinmar has a right of first refusal to invest in and secure 100% of the off-take from a second BDO plant that BioAmber would build in the future. While this agreement is binding, our inability to finance and construct the BDO plant would relieve Vinmar of its obligation to purchase BDO and THF under the terms of the offtake agreement. We have signed a second offtake agreement in July 2014 with Vinmar to supply 10,000 metric tons of bio-succinic acid per year for 15 years from the Sarnia plant. This offtake agreement also covers our next plant, which will have an annual nameplate capacity of 70,000 metric tons per year of bio-succinic acid, with Vinmar committed to off-taking 50,000 metric tons of the bio-succinic acid produced there for

15 years. Vinmar has also committed to off-take 150,000 metric tons of the production from our third plant, which has a planned nameplate capacity of 200,000 metric tons per year.

We cannot assure you that we will be able to meet the product specification requirements of our customers or that our products will be accepted by our target customers.

We are currently selling our bio-succinic acid to customers today after having met their quality, purity, performance and cost requirements and intend to sell our product to other customers in the chemicals industry. These sales were made in connection with our product and market development efforts. We also intend to expand our market reach with the new products that we are developing as alternatives to the chemicals currently in use. Our potential customers include large specialty chemical companies that have well-developed manufacturing processes for the chemicals they use or pre-existing arrangements with suppliers for the chemical components they need. These potential customers frequently impose lengthy and complex product qualification procedures on their suppliers during which time they test and certify our products for use in their processes and, in some cases, determine whether products that contain the chemicals produced using our processes satisfy additional third-party specifications. Meeting these suitability standards could be a time-consuming and expensive process and we may invest substantial time and resources into such qualification efforts without ultimately securing approval by our customers. If we are unable to convince our potential customers that our products are equivalents of or comparable to the chemicals that they currently use or that using our products is otherwise beneficial to them, we will not be successful in expanding our market and our business will be adversely affected.

In addition, agreements for the sale and purchase of our products are customarily subject to the satisfaction of certain technical, commercial and production requirements. These agreements contain conditions that we and our counterparties agree on product specifications for our chemical products and that our products conform to those specifications. If we do not satisfy these contractual requirements, demand for our products and our reputation may be adversely affected.

If the recent decline in the price of petroleum and petroleum-based succinic acid and other chemicals continues, the gross margins and or the demand for our products may decrease.

The bio-succinic acid we produce is a renewable alternative to petroleum-based succinic acid. Based on our current financial modeling with respect to our facility in Sarnia, Ontario, we anticipate that if the price of oil falls below $30 per barrel for a sustained period of time and corn prices are above $4.00 per bushel, the resulting selling price of our succinic acid would result in lower gross margins and we may be unable to compete on cost with petroleum-based succinic acid products, which would adversely impact our operating results. World prices for oil have fluctuated widely in recent years. For example, during the last five years the market price per barrel of West Texas Intermediate crude oil ranged from a low of $26.21 to a high of $112.93 and was $37.90 on March 7, 2016 $37.19. In addition, recently, oil prices have declined significantly. From January 2, 2015 through March 11, 2016, the West Texas Intermediate posted oil price had declined from a high of $61.43 per barrel of oil to a low of $26.21 per barrel of oil. We expect that prices will continue to fluctuate, and may continue to decline in the future. Declining oil prices, or the perception of a future decline in oil prices, may adversely affect the prices we can obtain from our potential customers, dissuade potential customers from entering into agreements with us to buy our products, and delay or modify our expansion and investment strategies or those of our collaborators. In addition, a sustained drop in oil prices will reduce the price of certain petrochemicals, making it uneconomical to produce them from our bio-based succinic acid feedstock. These include the production of butadiene and N-vinyl pyrrolidone, which are not economical when oil prices are below $50 to $70 per barrel. A sustained period of oil prices at or below $30 per barrel could also make it uneconomical to sell bio-succinic acid at the same market price as petroleum-derived adipic acid, thereby slowing the substitution of adipic acid in polyurethane and coatings markets.

For example, the significant decline in global oil prices over the past 18 months has moderately reversed a shift in recent years from naphtha cracking to natural gas liquid cracking in certain geographies that historically resulted in increased volatility of the prices of petroleum-derived C4 chemicals for which we produce and intend to produce

bio-based alternatives. As a result, this reversal may lead to less demand for our bio-based products. Additionally, the significant slowdown in oil and gas drilling operations in North America has led us to believe that n-vinyl-pyrrolidone, or NVP, for which we have established a collaboration with a specialty chemicals company, will not be a near-term market opportunity for our succinic acid.

The addressable market sizes we believe exists for bio-succinic acid and the products we plan to sell in the future are based on management's estimates and third-party information, and the actual market sizes may be smaller that we believe.

Management's estimates of the addressable market sizes are based on industry reports from 2008 through today, pricing information in the industry reports and from ICIS pricing, publicly available information and management's estimates of what portion of the total market size may be addressable through bio-succinic acid. In many cases, such information and reports differ among sources as to addressable market sizes. While we believe that management's estimates and these sources are reliable, there may be significant differences in actual market size compared to the information presented.

If the addressable markets for bio-succinic acid and the products we plan to sell in the future are smaller than we expect, then it may be more difficult for us to achieve our business plan and to attain profitability and meet our expectations with respect to cash flow.

Some of our competitors have significantly more experience and resources than we do and technology developed by our competitors could become more commercially successful than our technology, which could negatively impact our results of operations and market share.

Competition in the bio-based chemicals business from other chemicals companies is well established, with many substantial entities having well-financed multi-national operations. Our products will compete against those produced by established companies, including a collaborative venture between DSM and Roquette Frères S.A., as well as a collaborative venture between BASF and Corbion. Competition in the bio-based chemicals business is expanding with the growth of the industry and the evolution of new technologies. In addition to competing with new technologies, we also compete against traditional petroleum-derived chemicals, many of which are produced by large companies that have greater financial and other resources than we do. Larger companies, due to their better capitalization, will be better-positioned to develop and commercialize new technologies, build new production facilities and install existing or more advanced equipment, which could reduce our market share and harm our business. In addition, our products could face competition from those produced by early stage companies, such as Genomatica Inc. and Myriant Corporation. Our ability to compete successfully will depend on our ability to deploy and operate our technologies and cost effectively produce renewable alternatives to petroleum-based chemicals. Some of our competitors are developing new technologies that may be more successful than our technology. These competitors may also have substantially greater production, financial, research and development, personnel and marketing resources than we do or may benefit from local government programs and incentives that are not available to us. As a result, our competitors may be able to compete more aggressively and sustain that competition over a longer period of time than we could. Our technologies and products may be rendered less competitive 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 increases of a competitor acquiring patent or other rights that may limit our products or potential markets, which could lead to litigation. In addition, we may be subject to aggressive competitive tactics from our competitors, who may use their strong positions in the market and established relationships with existing suppliers and customers to take measures that negatively affect our ability to compete effectively in this industry. Our inability to maintain our competitiveness and grow our market share may, adversely affect our results of operations and financial position, and prevent us from achieving or maintaining profitability.

Failure to obtain regulatory approvals or permits could adversely affect our operations.

While our business currently has all necessary operating approvals material to our current facility in Sarnia, we will need to obtain and maintain numerous regulatory approvals and permits in order to operate our planned manufacturing facilities. In any given jurisdiction, new legislation could be implemented that would require additional or new regulatory approvals. Obtaining necessary approvals and permits could be a time-consuming and expensive process, and we may not be able to obtain them on a timely basis or at all. In the event that we fail to ultimately obtain all necessary permits, we may be forced to delay operations of the facility and the receipt of related revenues or abandon the project altogether and lose the benefit of any development costs already incurred, which would have an adverse effect on our results of operations. In addition, governmental regulatory requirements may substantially increase our construction costs, which could have a material adverse effect on our business, results of operations and financial condition. If there is a delay in obtaining any required regulatory approvals or if we fail to obtain and comply with any required regulatory approvals, the operation of our facilities or the sale of our bio-based chemicals could be delayed. For example, many countries require registration of chemicals before they can be distributed in the country, and a failure to register our chemicals would limit our ability to expedite sales into these markets. In addition, we may be required to make capital expenditures on an ongoing basis to comply with increasingly stringent federal, state,

provincial and local environmental, health and safety laws, regulations and permits. We could also experience delays in obtaining approval for the sale of our waste streams as nutrients for animal feed, which would hinder our ability to reduce our cost of goods by restricting our ability to turn a disposal cost into a source of revenue.

We face risks associated with our international business.

We have completed building and are currently operating a manufacturing facility in Sarnia, Ontario, and we plan to build and operate additional manufacturing facilities in the future. Our international business operations are subject to a variety of risks, including:

- difficulties in staffing and managing foreign and geographically dispersed operations;
- having to comply with various Canadian, U.S. and other laws, including export control laws;

- changes in or uncertainties relating to foreign rule and regulations that may adversely affect our ability to sell our products, perform services or repatriate profits to the United States;
- tariffs, export or import restrictions, restrictions on remittances abroad, imposition of duties or taxes that limit our ability to move our products out of these countries or interfere with the import of essential materials into these countries;
- fluctuations in foreign currency exchange rates;
- imposition of limitations on production, sale or export of bio-based chemicals in foreign countries;
- imposition of limitations on or increase of withholding and other taxes on remittances and other payments by foreign subsidiaries or joint ventures;
- imposition of differing labor laws and standards;
- economic, political or social instability in foreign countries;
- an inability, or reduced ability, to protect our intellectual property, including any effect of compulsory licensing imposed by government action; and
- the availability of government subsidies or other incentives that benefit competitors in their local markets that are not available to us.

We expect that we will begin expanding into other target markets, however there can be no assurance that our expansion plans will be realized, or if realized, be successful. We expect each market to have particular regulatory, feedstock sourcing and funding hurdles to overcome and future developments in these markets, including the uncertainty relating to governmental policies and regulations, could have a material adverse effect on us. If we expend significant time and resources on expansion plans that fail or are delayed, our business, reputation and financial condition may be materially and adversely affected.

Natural or man-made disasters, political, social or economic instability, or occurrence of a catastrophic or disruptive event in any of the areas where our existing or planned manufacturing facilities are located may adversely affect our business and results of operations.

We plan to build and operate manufacturing facilities strategically located throughout the world near sources of feedstock and our target markets. The operation of facilities may be harmed by natural or man-made disasters, including, without limitation, earthquakes, floods, tornadoes, fires, tsunamis, epidemics and nuclear disasters. Our facilities and the manufacturing equipment we use would be very costly to replace and could require substantial lead time to repair or replace. In addition, telecommunications failures or other systems interruptions, such as computer viruses or other cyber-attacks, at any of the locations in which we do business could significantly disrupt our operations, laboratory processes and delay shipments to our customers. Even in the absence of direct damage to our operations, large disasters, terrorist attacks, systems failures or other events could have a significant impact on our partners' and customers' businesses, which in turn could result in a negative impact on our results of operations. Extensive or multiple disruptions in our operations, or our partners' or customers' businesses, due to natural disasters or other unanticipated catastrophes could have a material adverse effect on our results of operations.

In the event any of our facilities are affected by a disaster, we may:

- be unable to meet the deadlines of our customers;
- experience disruptions in our ability to manufacture and ship our products and otherwise operate our business, which could negatively impact our business;
- need to expend significant capital and other resources to address any damage caused by the disaster; and
- lose customers and we may be unable to regain those customers thereafter.

Our precautions to safeguard our facilities, including insurance and health and safety protocols, may not be adequate to cover our losses in any particular case. Although we possess insurance for damage to our property and the disruption of our business from casualties, this insurance may not be sufficient to cover all of our potential losses and may not continue to be available to us on acceptable terms, or at all. Moreover, our facilities may experience unscheduled downtime or may not otherwise operate as planned or expected, which could have adverse consequences on our business and results of operations.

We may incur significant costs complying with environmental laws and regulations, and failure to comply with these laws and regulations could expose us to significant liabilities.

We use biological materials and genetically modified organisms, or GMOs, in our production processes and are subject to a variety of federal, state, and local laws and regulations governing the use, generation, manufacture and disposal of these materials. For example, the Toxic Substances Control Act, or TSCA, and analogous state laws and regulations impose requirements on the production, importation, use and disposal of chemicals and GMOs in the United States. In Canada, similar regulatory programs exist under the Canadian Environmental Protection Act. In particular, a regulatory program similar to TSCA requires that Environment Canada approve the manufacture of any chemical not already included on the Domestic Substances List, or DSL. We have secured approval from Environment Canada for our use of yeast in the manufacture of our bio-based succinic acid and the derivatives of succinic acid that we plan to commercialize. If Environment Canada requires our future C6-based products to undergo extensive testing, which we currently do not anticipate, securing approval to manufacture such products could potentially be subject to significant delays or costs. In the European Union, we are subject to a chemical regulatory program known as REACH (Registration, Evaluation, Authorization, and Restriction of Chemical Substances). Under REACH, we are required to register our products with the European Commission. The registration process requires the submission of information to demonstrate the safety of chemicals as used and could result in significant costs or delay the manufacture or sale of our products in the European Union.

We obtained requisite regulatory approvals for the use of our yeast in Canada. Although we have implemented safety procedures for the disposal of yeast and waste products to comply with these laws and regulations, we cannot be sure that our safety measures are compliant or capable of eliminating the risk of accidental injury or contamination from the use, generation, manufacture, or disposal of hazardous materials. In the event of contamination or injury, we could be held liable for any resulting damages, and any liability could exceed our insurance coverage. There can be no assurance that violations of environmental, health and safety laws will not occur 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, regulatory oversight costs, 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. We expect to encounter similar laws and regulations in most if not all of the countries in which we may seek to establish production capabilities, and the scope and nature of these regulations will likely be different from country to country. Environmental laws could become more stringent over time, requiring us to change our operations, or 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. Similarly, our business may be harmed if initiatives to reduce emissions of greenhouse gases, which tend to improve the competitiveness of our products relative to petrochemicals, do not become legally enforceable requirements, or if existing legally enforceable requirements relating to greenhouse gases are amended or repealed in the future. The costs of complying with environmental, health and safety laws and regulations and any claims concerning noncompliance, or liability with respect to contamination in the future could have a material adverse effect on our financial condition or operating results.

We use hazardous materials in our business and any claims relating to improper handling, storage or disposal of these materials or noncompliance with applicable laws and regulations could adversely affect our business and results of operations.

We use chemicals and biological materials in our business and are subject to a variety of federal, regional/state, provincial and local laws and regulations governing the use, generation, manufacture, storage, handling and disposal of these materials. Although we have implemented safety procedures for handling and disposing of these materials and waste products, we cannot be sure that our safety measures are compliant with legal requirements or adequate to eliminate the risk of accidental injury or contamination. In the event of contamination or injury, we could be held liable for any resulting damages, and any liability could exceed our insurance coverage. There can be no assurance that we will not violate environmental, health and safety laws as a result of human error, accident, equipment failure or other causes. Compliance with applicable environmental laws and regulations is expensive and time consuming, 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. Our liability in such an event 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. Accordingly, violations of present and future environmental laws could restrict our ability to expand facilities,

or pursue certain technologies, and could require us to acquire equipment or incur potentially significant costs to comply with environmental regulations.

Loss of key personnel or our inability to attract and retain additional key personnel could harm our research and development efforts, delay launch of new products and impair our ability to meet our business objectives.

Our business involves complex operations spanning a variety of disciplines that demands a management team and employee workforce that is knowledgeable in the many areas necessary for our operations. While we have been successful in attracting experienced, skilled professionals to our company, the loss of any key member of our management team or key research and development or operational employees, or the failure to attract and retain additional such employees, could slow our development and commercialization of our products for our target markets and executing our business plans. We may not be able to attract or retain qualified employees due to the intense competition for qualified personnel among biotechnology and other technology-based businesses and the scarcity of personnel with the qualifications or experience necessary for our business. Hiring, training and successfully integrating qualified personnel into our operation is a lengthy and expensive process. The market for qualified personnel is very competitive because of the limited number of people available with the necessary technical skills and understanding of our technology and anticipated products. 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 support our internal research and development programs or satisfy customer demands for our products. In particular, our product development and research and development programs are dependent on our ability to attract and retain highly skilled scientific, technical and operational personnel. Competition for such personnel from numerous companies and academic and other research institutions may limit our ability to do so on acceptable terms, or at all. Substantially all of our employees are at-will employees, which means that either the employee or we may terminate their employment at any time.

In the ordinary course of business, we may become subject to lawsuits or indemnity claims, including those related to product liability, 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, infringement of the intellectual property rights of others, property damages or 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. In addition, the development, production and sale of our products involve an inherent risk of product liability claims and the associated adverse publicity. Our products may contain undetected defects or impurities that are not discovered until after the products have been used by customers and incorporated into products for end-users. This could result in claims from our customers or others, which could damage our business and reputation and entail significant costs to correct. We may also be sued for defects resulting from errors of our commercial partners or unrelated third parties, but any product liability claim brought against us, regardless of its merit, could result in material expense, divert management’s attention and harm our business and reputation. Insurance coverage is expensive, may be difficult to obtain or not available on acceptable terms and may not adequately cover potential claims or losses. If claims or losses exceed our liability insurance coverage, we may go out of business. In addition, insurance coverage may become more expensive, which would harm our results of operations.

Adverse conditions in the global economy and disruption of financial markets may prevent the successful development and commercialization of our products, as well as significantly harm our results of operations and ability to generate revenue and become profitable.

We are subject to the risks arising from adverse changes in global economic and market conditions. The worldwide economy has been experiencing significant economic turbulence, and global credit and capital markets have experienced substantial volatility and disruption. These adverse conditions and general concerns about the fundamental soundness of domestic and international economies could limit our partners' or potential partners' ability or willingness to invest in new technologies or capital. Moreover, these economic and market conditions could negatively impact our current and prospective customers' ability or desire to purchase and pay for our products, or negatively impact our feedstock prices and other operating costs or the prices for our products. Changes in governmental banking, monetary and fiscal policies to address liquidity and increase credit availability may not be effective. Significant government investment and allocation of resources to assist the economic recovery of various sectors which do not include the bio-based chemical industry may reduce the resources available for government grants and related funding that could assist our

expansion plans or otherwise benefit us. Any one of these events, and continuation or further deterioration of these financial and macroeconomic conditions, could prevent the successful and timely development and commercialization of our products, as well as significantly harm our results of operations and ability to generate revenue and become profitable.

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

If appropriate opportunities become available, we may acquire additional businesses, assets, technologies, or products to enhance our business in the future. In connection with any future acquisitions, we could:

- issue additional equity securities which would dilute our current stockholders;
- incur substantial debt to fund the acquisitions; or
- assume significant 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 businesses, adverse effects on existing business relationships with current and/or prospective collaborators, customers and/or suppliers, risks associated with entering markets in which we have no or limited prior experience and potential loss of key employees. We do not have experience in managing the integration process and 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. Acquisitions may also require us to record goodwill and non-amortizable intangible assets that will be subject to impairment testing on a regular basis and potential periodic impairment charges, incur amortization expenses related to certain intangible assets, and incur large and immediate write offs and restructuring and other related expenses, all of which could harm our operating results and financial condition. 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 any of our acquisitions and are unable to efficiently operate as a combined organization, our business and financial condition may be adversely affected.

Our ability to use our net operating loss carryforwards to offset future taxable income may be subject to certain limitations.

We are subject to income taxes in Luxembourg, the United States and Canada. We have incurred significant losses and have not generated taxable income in these jurisdictions, with the exception of Canada. As of December 31, 2015, we had approximately $17.7 million of net operating loss carryforwards (or NOLs) in Canada. As of December 31, 2015, we had approximately $116.5 million of U.S. federal tax NOLs. Each jurisdiction in which we operate may have its own limitations on our ability to utilize NOL or tax credit carryovers generated in that jurisdiction. Also, we generally cannot utilize NOLs or tax credits generated in one jurisdiction to reduce our liability for taxes in any other jurisdiction. Accordingly, we may be subject to tax liabilities in certain jurisdictions in which we operate notwithstanding the existence of NOLs or tax credits in other jurisdictions. In general, under Section 382 of the U.S. Internal Revenue Code of 1986, as amended, or the Code, a corporation that undergoes an "ownership change" (as defined in Section 382 of the Code) is subject to limitations on its ability to utilize its pre-change NOLs to offset future taxable income. We have not performed a detailed analysis to determine whether an ownership change has occurred after each of our previous issuances of common stock and warrants. In addition, if we undergo an ownership change as a result of any offerings that we may undertake, our ability to utilize NOLs could be limited by Section 382 of the Code. Future changes in our stock ownership, some of which are outside of our control, could result in an

ownership change. We have a full valuation allowance against our net deferred tax assets.

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 modified organisms, or GMOs. The use of GMOs is subject to laws and regulations in many countries, some of which are new and some of which are still evolving. In the United States, the Environmental Protection Agency regulates the commercial use of GMOs as well as potential products from the GMOs. Public attitudes about the safety and environmental hazards of, and ethical concerns over, genetic research and GMOs could influence public acceptance of our technology and products.

While our yeast has been approved for use in Canada and has been given the lowest classification in terms of risk, our ability to commercialize our products in the future could be impacted by the following factors:

- public attitudes about the safety and environmental hazards of, and ethical concerns over, 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.

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. In addition, 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.

We identified a material weakness in our internal control over financial reporting as of September 30, 2015 and we may identify additional material weaknesses in the future that may cause us to fail to meet our reporting obligations or result in material misstatements of our financial statements. If we fail to remediate any material weaknesses or if we otherwise fail to establish and maintain effective control over financial reporting, our ability to accurately and timely report our financial results could be adversely affected.

In connection with the preparation of our condensed consolidated financial statements for the quarter ended September 30, 2015, we identified a material weakness in internal control over financial reporting that, if not corrected, could result in a material misstatement in our financial statements. A material weakness is a deficiency, or a combination of deficiencies, in internal control over financial reporting such that there is a reasonable possibility that a material misstatement of our financial statements will not be prevented or detected on a timely basis.

The material weakness identified in our internal control over financial reporting was in the inappropriate review process of non-routine complex financial instruments in an inappropriate review process of non-routine complex financial instruments that may have embedded derivatives or other provisions that may have complex accounting impacts, and resulted in an error in the accounting treatment of the legacy warrants. This error resulted in the reclassification of the legacy warrants from equity to a non-cash liability and in the correction of our comparative consolidated financial statements as presented in the Note 19 of our consolidated financial statements for the year ended December 31, 2015, see Note 19 to the Consolidated Financial Statements (Part II, Item 8). The accounting treatment of warrants previously issued was reviewed during the quarter ended September 30, 2015, and we determined that the error was limited to these legacy warrants. Our review process for non-routine complex financial instruments allowed this error to go undetected, and management has assessed the potential magnitude and concluded that this represents a material weakness in our internal control over financial reporting, but did not result in a material misstatement in our audited consolidated financial statements for the years ended June 30, 2009 to December 31, 2014 or any interim condensed consolidated financial statements for the quarters included therein. We have taken certain actions to remediate this material weakness, including, improving processes and implementing additional controls around review of new complex financial instruments to identify appropriate accounting treatment and monitoring implication thereafter, and strengthening management's review controls. However, we cannot assure you that these measures will be sufficient to remediate the material weakness that has been identified, or prevent future material

weaknesses or significant deficiencies from occurring. We also cannot assure you that we have identified all of our existing material weaknesses. Our independent registered public accounting firm has not performed an evaluation of our internal control over financial reporting during any period in accordance with the provisions of Sarbanes Oxley. In light of the control deficiencies and the resulting material weakness that were previously identified as a result of the limited procedures performed, we believe that it is possible that, had our independent registered public accounting firm performed an evaluation of our internal control over financial reporting in accordance

with the provisions of the Sarbanes Oxley, additional material weaknesses and significant control deficiencies may have been identified.

If we identify future material weaknesses in our internal controls over financial reporting or fail to meet the demands that will be placed upon us as a public company, including the requirements of the Sarbanes Oxley, we may be unable to accurately report our financial results, or report them within the timeframes required by law or stock exchange regulations. Under Section 404, we are required to evaluate and determine the effectiveness of our internal control over financial reporting and, beginning with the annual report for the year ended December 31, 2018 (or such earlier date if we cease to be an emerging growth company) if we are not a smaller reporting company as of such time, comply with the auditor attestation requirements on the effectiveness of our internal control over financial reporting. Failure to comply with Section 404 could also potentially subject us to sanctions or investigations by the SEC or other regulatory authorities. We cannot assure that our existing material weakness will be remediated or that additional material weaknesses will not exist or otherwise be discovered, any of which could adversely affect our reputation, financial condition and results of operations.

We have incurred and will continue to incur significant increased costs as a result of operating as a public company and our management is required to devote substantial time to new compliance initiatives.

As a public company and particularly after we cease to be an “emerging growth company” (and cease to take advantage of certain exceptions from reporting requirements that are available under the Jumpstart Our Business Startups Act of 2012, or the JOBS Act, as an “emerging growth company”), we incurred and will incur significant legal, accounting, administrative and other costs and expenses that we did not face as a private company. As a public company, we are subject to rules and regulations that regulate corporate governance practices of public companies, including the Exchange Act, the Sarbanes-Oxley Act, and rules promulgated by the NYSE. The compliance with these public company requirements increased and will increase our costs and make some activities more time consuming and may result in a diversion of management’s time and attention from revenue-generating activities. For example, we created new board committees, adopted new internal controls and disclosure controls and procedures, and devoted significant management resources to our SEC reporting requirements. A number of those requirements will require us to carry out activities we have not performed previously. Furthermore, if we are unable to maintain our internal controls and accounting capabilities or subsequently identify any issues in complying with those requirements (for example, if we or our registered public accounting firm identify a material weakness or significant deficiency in our internal control over financial reporting), such as that identified in connection with the preparation of our condensed consolidated financial statements for the quarter ended September 30, 2015, we could incur additional costs rectifying those issues, and the existence of those issues could adversely affect us, our reputation or investor perceptions of us. The additional reporting and other obligations imposed on us by these rules and regulations have increased our legal and financial compliance costs and the costs of our related legal, accounting and administrative activities significantly. These increased costs required and will continue to require us to divert a significant amount of money that we could otherwise use to expand our business and achieve our strategic objectives.

We are an “emerging growth company” and have elected to take advantage of reduced reporting requirements applicable to emerging growth companies, which could make our securities less attractive to investors.

We are an “emerging growth company,” as defined in the JOBS Act, and we have elected to take advantage of certain exemptions from various reporting requirements that are applicable to other public companies that are not emerging growth companies, including, but not limited to, not being required to comply with the auditor attestation requirements of Section 404 reduced disclosure obligations regarding executive compensation in our periodic reports and proxy statements, exemptions from the requirements of holding a nonbinding advisory vote on executive

compensation and stockholder approval of any golden parachute payments not previously approved, and delaying the adoption of new or revised accounting standards until they are applicable to private companies. As a result of our election to use the extended transition period provided in Section 7(a)(2)(B) of the Securities Act, our financial statements may not be comparable to companies that comply with new or revised accounting standards on the relevant dates on which adoption of such standards is required for companies that comply with public company effective dates. We cannot predict if investors will find our securities less attractive as a result of our choice to rely on these exemptions. If some investors find our securities less attractive as a result, there may be a less active trading market for our securities and the market price of our securities may be more volatile.

We will remain an “emerging growth company” for up to five years after our initial public offering, or until the earliest of (i) the last day of the first fiscal year in which our annual gross revenues exceed $1 billion, (ii) the date that we become a “large accelerated filer” as defined in Rule 12b-2 under the Exchange Act, which would occur if the market value of our common stock that is held by

non-affiliates exceeds $700 million as of the last business day of our most recently completed second fiscal quarter, or (iii) the date on which we have issued more than $1 billion in non-convertible debt during the preceding three year period.

If we fail to augment and 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 securities.

Our management is required to deliver a report that assesses the effectiveness of our internal control over financial reporting. Additionally, Section 404 may require our auditors to deliver an attestation report on the effectiveness of our internal controls over financial reporting in conjunction with their opinion on our audited financial statements beginning with the second annual report that we will be required to file with SEC. However, we have elected to take advantage of certain exceptions from reporting requirements that are available to "emerging growth companies" under the JOBS Act and therefore we will not be required to make our first annual assessment of our internal control over financial reporting pursuant to Section 404 until after the date we are no longer an "emerging growth company" as defined in the JOBS Act, which may be up to five years from our initial public offering.

The process of designing and implementing effective internal controls and procedures, and expanding our internal accounting capabilities, is a continuous effort that requires us to anticipate and react to changes in our business and the economic and regulatory environments and to expend significant resources to establish and maintain a system of internal controls that is adequate to satisfy our reporting obligations as a public company. The standards that must be met for management to assess the internal control over financial reporting as effective are complex, and require significant documentation, testing and possible remediation to meet the detailed standards. We cannot be certain at this time whether we will be able to successfully complete the implementation of controls and procedures or the certification and attestation requirements of Section 404. In connection with the preparation of our condensed consolidated financial statements for the quarter ended September 30, 2015, we identified a material weakness in internal control over financial reporting that, if not corrected, could result in a material misstatement in our financial statements. See "—We identified a material weakness in our internal control over financial reporting as of September 30, 2015 and we may identify additional material weaknesses in the future that may cause us to fail to meet our reporting obligations or result in material misstatements of our financial statements. If we fail to remediate any material weaknesses or if we otherwise fail to establish and maintain effective control over financial reporting, our ability to accurately and timely report our financial results could be adversely affected." In the future we may have significant deficiencies, which could cause us to fail to meet the periodic reporting obligations that we will be subject to under Section 404 or result in material misstatements in our financial statements. If we identify and report a material weakness or any additional significant deficiencies, it could adversely affect our stock price.

If securities or industry research analysts do not publish or cease publishing research or reports about our business or if they issue unfavorable commentary or downgrade our common stock, the market price of our securities and trading volume could decline.

The trading market for our securities relies in part on the research and reports that securities and industry research analysts publish about us, our industry and our business. We cannot assure you that any research analysts will continue to provide research coverage on us or our securities. We do not have any control over these analysts. The market price of our securities and trading volumes could decline if one or more securities or industry analysts downgrade our securities, issue unfavorable commentary about us, our industry or our business, cease to cover our company or fail to regularly publish reports about us, our industry or our business.

Our financial results could vary significantly from quarter to quarter and are difficult to predict.

Our quarterly operating results may fluctuate significantly in the future. As a result of these fluctuations, we may fail to meet or exceed the expectations of research analysts covering our company or of investors, which could cause the market price of our securities to decline. Future quarterly fluctuations, many of which are beyond our control, may result from a number of factors, including but not limited to:

- the timing and cost associated with the construction of our additional planned manufacturing facilities;
- the level and timing of expenses for product development and sales, general and administrative expenses;
- delays or greater than anticipated expenses associated with the scale-up and the commercialization of chemicals produced using our processes;

- our ability to successfully enter into or maintain partnering arrangements, and the terms of those relationships;

- commercial success with our existing product and success in identifying and sourcing new product opportunities;

- the development of new competitive technologies or products by others and competitive pricing pressures;

- fluctuations in the prices or availability of the feedstocks required to produce chemicals using our processes or those of our competitors, including producers of petroleum-based chemicals;

- changes in demand for our products, including any seasonal variations in demand and fluctuations due to volatility in the global petroleum market;

- changes in product development costs due to the achievement of certain milestones under third-party development agreements;

- changes in the amount that we invest to develop, acquire or license new technologies and processes;

- business interruptions, including disruptions in the production process at any facility where chemicals produced using our processes are manufactured as well as a result of changes in the technologies we employ;

- departures of executives or other key management employees;

- foreign exchange fluctuations;

- changes in general economic, industry and market conditions, both domestically and in our foreign markets; and

- changes in governmental, accounting and tax rules and regulations, environmental, health and safety requirements, and other rules and regulations.

Based on the above factors and other uncertainties, we believe our future operating results will vary significantly from quarter-to-quarter and year-to-year. As a result, quarter-to-quarter and year-to-year comparisons of operating results are not necessarily meaningful nor do they indicate what our future performance will be.

Risks Related to Our Intellectual Property

Our inability to adequately protect, or any loss of our intellectual property rights, could materially adversely affect our business, financial condition and results of operations.

Our success will depend, in part, upon our ability to maintain patents and other intellectual property rights to protect our products from competition. We rely principally on a combination of patent, copyright, trademark and trade secret laws, confidentiality agreements, and physical security measures to establish and protect the intellectual property rights relevant to our business. We own or have rights in issued patents and pending patent applications in the United States and in certain other jurisdictions. These patents and patent applications cover various aspects of our technologies, including the microorganism (biocatalyst) we use in our fermentation processes, methods of producing our products, and the use of our products in specific applications. In addition, we generally enter into confidentiality and invention assignment agreements with our employees, consultants, contractors, collaboration partners and scientific and other business advisers. These measures, which seek to protect our intellectual property from infringement, misappropriation or other violation, may not be effective for various reasons, including the following:

- we may fail to apply for patents on important technologies or processes in a timely fashion, or at all, or abandon applications when we determine that a product or method is no longer of interest;
- we cannot predict which of our pending patent applications, if any, will result in issued patents for various reasons, including the existence of prior art that we had not been aware of, conflicting patents by others, or defects in our applications;

- we do not know whether the examination of any of our patent applications by the United States Patent and Trademark Office, or USPTO, or any similar foreign patent offices will require us to narrow or even cancel any of the claims in our pending patent applications, or to abandon a patent application altogether;
- even if our patents are granted, they may be challenged by third parties through reexamination or interference proceedings in the U.S., or opposition or cancellation proceedings in Europe, or via similar proceedings in other jurisdictions, which could result in the cancellation of certain of our patent claims or the loss of the challenged patent entirely;
- we may not be able to protect some of our technologies, and even if we receive patent or similar protection, the scope of our intellectual property rights may offer insufficient protection against lawful competition or unauthorized use;
- our products and processes may rely on the technology of others and, therefore, may require us to obtain intellectual property licenses, if available, from third parties in order for us to manufacture or commercialize our products or practice our processes;
- the patents we have been granted or may be granted may not include claims covering our products and processes, may lapse or expire, be challenged, invalidated, circumvented or be deemed unenforceable, or we may abandon them;
- our confidentiality agreements may not effectively prevent disclosure or use of confidential information and may not provide an adequate remedy in the event of unauthorized disclosure or use;
- the costs associated with enforcing patents, confidentiality and invention assignment agreements or other intellectual property rights may make aggressive enforcement prohibitive;
- we may not be aware of infringement or misappropriation of our intellectual property rights, or we may elect not to seek to prevent them;
- our efforts to safeguard our trade secrets may be insufficient to prohibit the disclosure of our confidential information;
- even if we enforce our rights aggressively, injunctions, fines and other penalties may be insufficient to deter violations of our intellectual property rights;

- if we seek to enforce our rights, we may be subject to claims that our intellectual property rights are invalid, anti-competitive, otherwise unenforceable, or are already licensed to the party against whom we are asserting the claim; and

- other persons may independently develop proprietary technology, information and processes that are functionally equivalent or superior to our proprietary intellectual property and processes but do not infringe or conflict with our patented or unpatented proprietary rights, or may use their own proprietary intellectual property rights to block us from taking full advantage of the market.

Our patent rights may not protect us against competition.

An important part of our business strategy is to obtain patent protection in the United States and in other countries for patent applications that we own or in-license from others that cover certain technologies used in, or relating to, our products and processes. Interpreting the scope and validity of patents and success in prosecuting patent applications involves complex legal and factual questions, and the issuance, scope, validity, and enforceability of a patent cannot be predicted with any certainty. Patents issued or licensed to us may be challenged, invalidated or circumvented. Moreover, third parties could practice our inventions in secret and/or in territories where we do not have patent protection. Such third parties may then try to sell or import resulting products in and into the United States or other territories. We may be unable to prove that such products were made using our inventions or infringed our intellectual property rights. Additional uncertainty may result from recent changes in the U.S. patent laws under the Leahy-Smith America Invents Act, or the Leahy-Smith Act, which was signed into law on September 16, 2011, and from legal precedent handed down by the U.S. Court of Appeals for the Federal Circuit, the U.S. Supreme Court and the courts

of other countries, as they determine legal issues relating to the scope, validity and construction of patent claims. The Leahy-Smith Act includes a number of significant changes to U.S. patent law, including provisions that affect the way patent applications will be prosecuted, and may also affect patent litigation. The USPTO has issued regulations and procedures to govern administration of the Leahy-Smith Act, but many of the substantive changes to patent law associated with the Leahy-Smith Act have only recently become effective. Accordingly, it is not clear what, if any, impact the Leahy-Smith Act will have on the operation of our business.

In addition, because patent applications in the United States and in many foreign jurisdictions typically are not published until 18 months after filing, if at all, and because the publication of discoveries in the scientific literature often lags behind the actual discoveries, there is additional uncertainty as to the priority dates of our inventions compared to inventions by others, and uncertainty

as to the patentability of the claims in our pending patent applications and the validity and enforceability of claims in our issued patents. Accordingly, we cannot be certain that any of our or our licensors' patent applications will result in issued patents, or if issued, the validity and/or enforceability of the issued patents. Also, we cannot guarantee that a competing patent application will not be granted with claims that cover our proposed organism or processes, or that our or our licensors' patent applications or patents will not be subject to an interference proceeding with a competing patent or patent application.

Moreover, we cannot be sure that any of our or our licensors' patent rights will be broad enough in scope to provide commercial advantage and prevent circumvention. Furthermore, patents are enforceable only for a limited term, and some of the U.S. patents that we have in-licensed exclusively relating to our biocatalyst have started to expire in 2015.

We may be involved in lawsuits to protect or enforce our patents or the patents of our licensors, or lawsuits asserted by a third party, which could be expensive, time consuming and unsuccessful.

The success of our business is highly dependent on protecting our intellectual property rights. Unauthorized parties may attempt to copy or otherwise obtain and use our products and/or technology. Policing the unauthorized use of our intellectual property rights is difficult, expensive, time-consuming and unpredictable, as is enforcing these rights against unauthorized use by others. Identifying unauthorized use of our intellectual property rights is difficult because we may be unable to monitor the processes and/or materials being employed by other parties. In addition, in an infringement proceeding, a patent of ours or our licensors may be found invalid, unenforceable, anti-competitive or not infringed. An adverse result in any litigation or defense proceedings could put one or more of our patents at risk of being invalidated or interpreted narrowly and could put our patent applications at risk of not issuing.

Third parties may challenge our or our licensors' patents via reexamination proceedings or inter partes review in the United States, opposition or cancellation proceedings in Europe, or similar proceedings in other jurisdictions. The outcome of these proceedings can be unpredictable and may result in the claims being substantially narrowed or cancelled altogether. As a result of changes in U.S. patent law under the Leahy-Smith Act, any U.S. patent that we or our licensors obtain having an effective filing date on or after March 16, 2013 could be challenged by a third party using the new post-grant review process, which could result in the claims of the challenged patents being narrowed or even cancelled. Furthermore, in the United States, patents with an effective filing date prior to March 16, 2013 are awarded to the first person to make an invention rather than to the first person to file a patent application, and therefore such patents could be subject to an interference proceeding conducted by the USPTO to determine which party was the first to create an invention. As result, interference proceedings provoked by third parties or brought by the USPTO may be necessary to determine the priority of inventions with respect to our patents or patent applications or those of our collaborators or licensors. An unfavorable outcome could require us to cease using the related technology or to attempt to license rights from the prevailing party. As a result, our business could be harmed if the prevailing party does not offer us a license on commercially reasonable terms. Litigation or interference proceedings may fail and, even if successful, may take several years to resolve, result in substantial costs, and distract our management and other employees, and otherwise interfere with the running of our business. We may be unable to prevent, alone or with our licensors, infringement or misappropriation of our proprietary rights, particularly in countries where the laws may not protect those rights as fully as in the United States. Furthermore, because of the amount of discovery required in connection with intellectual property litigation, there is a risk that some of our confidential information could be compromised by disclosure during this type of litigation.

We may be unable to enforce our intellectual property rights throughout the world, which could negatively affect our rights, competitive position and business.

We may in the future decide to build, or partner with others in building manufacturing facilities using our technologies in countries other than the United States and Canada. We may not have sufficient patent or other intellectual property rights in those countries to prevent a competitor from using our or competing technologies. Furthermore, the laws of some foreign countries do not protect intellectual property rights to the same extent as federal, state and provincial laws in the United States and Canada. Many companies have encountered problems in protecting and enforcing intellectual property rights in certain foreign jurisdictions. The legal systems of certain countries do not favor the enforcement of patents and other intellectual property protection. This could make it difficult for us or our licensors to prevent or stop any infringement of our or our licensors' patents or misappropriation of the subject matter of our other proprietary or intellectual property rights. Proceedings to enforce our and our licensors' 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 or in-license.

We may be unable to operate our business without infringing the intellectual property rights of others, which could subject us to costly litigation or prevent us from offering certain products which could have a material adverse effect on our business.

Although we are currently unaware of any claims or threatened claims, our ability to manufacture and commercialize our proposed technologies, processes and products depends upon our and our licensors' ability to develop, manufacture, market, license and/or sell such technologies, processes and products without violating the proprietary rights of third parties. Numerous U.S. and foreign patents and pending patent applications owned by third parties exist in fields that relate to our proposed technologies, processes and products and our underlying methodologies and discoveries. In addition, many companies actively police and enforce their intellectual property rights, including their patent rights, to gain a competitive advantage. Third parties may allege that our existing or proposed technologies, processes and products or our methods infringe their intellectual property rights. It is possible that the number and frequency of lawsuits alleging infringement of intellectual property rights may increase as the number of products and competitors in our market increases. In addition, to the extent that we gain greater visibility and market exposure as a public company, we face a greater risk of being the subject of intellectual property infringement claims. We cannot be certain that the conduct of our business does not and will not infringe intellectual property or other proprietary rights of others. If the making, using, selling, offering for sale or importing of our proposed products or practice of our proprietary technologies or processes are found to infringe third party intellectual property rights, including patent rights, we could be prohibited from manufacturing and commercializing the infringing technology, process or product unless we obtain a license under the applicable third party patent and pay royalties or are able to design around such patent. Securing rights to such third party intellectual property, or securing non-enforcement commitments from such third parties, could result in the payment of additional royalty fees in the form of one-time payments and/or running royalties, which would negatively impact our net margins.

We may be unable to obtain a license on terms acceptable to us, if at all, and we may be unable to redesign our products, biocatalysts or processes to avoid infringement. Even if we are able to redesign our products, biocatalysts or processes to avoid an infringement claim, our efforts to design around the patent could require significant effort and expense and ultimately may lead to an inferior or more costly product and/or process. Any claim of infringement by a third party, even one without merit, could cause us to incur substantial costs defending against the claim, could distract our management and employees, and generally interfere with our business. Furthermore, if any such claim is successful, a court could order us to pay substantial damages, including compensatory damages for any infringement, plus prejudgment interest and could, in addition, treble the compensatory damages and award attorney fees. These damages could be substantial and could harm our reputation, business, financial condition and operating results. A court also could enter orders that temporarily, preliminarily or permanently prohibit us, our licensees and our customers from making, using, selling, offering to sell or importing one or more of our products or practicing our proprietary technologies or processes, or could enter an order requiring us to undertake certain remedial activities. Any of these events could seriously harm our business, operating results and financial condition.

We also rely in part on trade secret laws, confidentiality agreements, and security procedures, which can be difficult to protect and enforce, and which may not adequately prevent disclosures of trade secrets and other proprietary information; our failure to obtain or maintain such protections could adversely affect our competitive position.

We rely in part on trade secret laws and contractual agreements to protect some of our confidential and proprietary information, technology and processes, particularly where we do not believe patent protection is appropriate or obtainable. We have taken various measures to protect our trade secrets and other confidential or proprietary information, including requiring new employees and consultants to execute confidentiality agreements upon the commencement of employment or consulting engagement with us. However, trade secrets are difficult to maintain and protect and our security procedures may be insufficient to prevent disclosure of our trade secrets. In addition, discussions with our business partners, including our licensors, may require us to share confidential and proprietary

information with them and other third parties. Our business partners' employees, consultants, contractors or scientific and other business advisers may unintentionally or willfully breach their confidentiality and/or non-use obligations, including by disclosing our confidential or proprietary information to our competitors. Such agreements may be deemed unenforceable, fail to provide adequate remedies, or become subject to disputes that may not be resolved in our favor. Enforcement of claims that a third party has illegally obtained and is using trade secrets is expensive, time consuming and uncertain. In addition, foreign courts are sometimes less willing than U.S. courts to protect trade secrets. Our failure to obtain or maintain trade secret protection could adversely affect our competitive business position. Furthermore, trade secret laws do not prevent our competitors from independently developing equivalent knowledge, methods and know-how that could be used to compete with us and our products.

We may lose our competitive advantage if our competitors develop similar, analogous or alternative organisms that produce bio-succinic acid or other competing chemical products.

We currently use proprietary microorganisms (biocatalysts) in our production of bio-succinic acid and other cellular metabolites such as C6 compounds. If our organisms are stolen, or misappropriated, they could be used by third parties for their own commercial gain, even though they may be in breach of our intellectual property rights. Furthermore, third parties may use similar or analogous

organisms in jurisdictions where we or our licensors do not have patent protection. Third parties may also independently develop similar, analogous or alternative organisms that can also produce bio-succinic acid or other metabolites without infringing our intellectual property rights. If any of these were to occur, it could be difficult for us to discover, challenge or prevent the third party from using their organisms and competing with us in the production of bio-succinic acid or other metabolites.

Our rights to key intellectual property are in-licensed from third parties, and the limitation or termination of these and related agreements would be highly detrimental to us and our business.

We are a party to certain license agreements that provide us with the right to practice key technology used in our business. For example, we have entered into license agreements with Cargill for our yeast to produce bio-succinic acid, Davy for catalysts and methods for converting our bio-succinic acid into bio-based 1,4 BDO and Celexion for a metabolic pathway to make C6 compounds, such as adipic acid. All of these license agreements impose various obligations on us, including royalty payments and, in certain instances, milestone payments. If we fail to comply with these or other obligations, certain agreements provide that the licensors may have the right to terminate the license or convert the exclusive license to a nonexclusive license, in which case our competitors may gain access to these important licensed technologies, and we may be unable to develop or market products, technologies or processes covered by the licensed intellectual property. Often our licensors have the right to control the filing, prosecution, maintenance and defense of the licensed intellectual property and, if a third party infringes any of the licensed intellectual property, some of our licensors may control the resulting legal or other proceeding against that third party to stop or prevent such infringement. As a result, our licensors may take actions or make decisions relating to these matters that could harm our business or impact our rights.

Risks Related to Our Common Stock

Our stock price has been and could remain volatile, which could further adversely affect the market price of our stock, our ability to raise additional capital and/or cause us to be subject to securities class action litigation.

The market price of our common stock has historically experienced and may continue to experience significant volatility. Between June 10, 2013 (the date our common stock commenced trading) and December 31, 2015, the sales price of our common stock fluctuated from a high of $15.29 per share to a low of $2.86, and on March 11, 2016, the closing sale price of our common stock was $3.99 per share. Our start of commercial operations of our Sarnia facility, our ability to commence commercial sales and execute on our commercial expansion plan, our quarterly operating results, our perceived prospects, changes in securities analysts' recommendations or earnings estimates and our ability to meet such estimates, changes in general conditions in the economy or the financial markets, adverse events related to our strategic relationships, significant sales of our common stock by existing stockholders, and other developments affecting us or our competitors could cause the market price of our common stock to fluctuate substantially. In addition, in recent years, the stock market has experienced significant price and volume fluctuations. This volatility has affected the market prices of securities issued by many companies for reasons unrelated to their operating performance and may adversely affect the price of our common stock. Such market price volatility could adversely affect our ability to raise additional capital. In addition securities class action litigation as a result of volatility in the price of our common stock, which could result in substantial costs and diversion of management's attention and resources and could harm our stock price, business, prospects, results of operations and financial condition.

The market price of our common stock may be adversely affected by market conditions affecting the stock markets in general, including price and trading fluctuations on the NYSE.

Market conditions may result in volatility in the level of, and fluctuations in, market prices of stocks generally and, in turn, our common stock and sales of substantial amounts of our common stock in the market, in each case being

unrelated or disproportionate to changes in our operating performance. Concerns over global stability and economic conditions in the United States and abroad have contributed to the extreme volatility of the markets which may have an effect on the market price of our common stock.

Future sales of common stock or warrants by existing stockholders could cause our stock price to decline.

If our existing stockholders sell, or indicate an intent to sell, substantial amounts of our common stock or warrants in the public market the trading price of our common stock or warrants could decline significantly. We cannot predict the effect, if any, that future public sales of these securities or the availability of these securities for sale will have on the market and trading price of our securities. Holders of 8,488,213 shares of our common stock, including the shares of common stock issuable upon exercise of our stock options and all outstanding warrants have the right to require us to register these shares under the Securities Act pursuant to a stockholders' agreement. If our existing stockholders sell substantial amounts of our common stock or warrants in the public market, or if the public perceives that such sales could occur, this could have an adverse impact on the market and trading price of our securities, even if there is no relationship between such sales and the performance of our business.

In the future, we may sell additional shares of our common stock to raise capital or issue stock in connection with acquisitions. In addition, a substantial number of shares of our common stock are reserved for issuance upon the exercise of warrants, stock options and the vesting of restricted stock awards. We cannot predict the size of future issuances or the effect, if any, that they may have on the market price for our common stock. The issuance and sale of substantial amounts of common stock, or the perception that such issuances and sales may occur, could adversely affect the market and trading price of our common stock and impair our ability to raise capital through the sale of additional equity securities.

Our legacy warrants and IPO warrants contain anti-dilution adjustment mechanisms that may be triggered by issuances of equity by us at prices below the then-prevailing exercise prices for such warrants.

All of the IPO warrants, and the legacy warrants that we issued in June 2009 and April 2011 contain anti-dilution protection in the event that we issue any common stock, securities convertible into common stock, or other securities at a price below the then-existing exercise price of such warrants, with certain exceptions. The anti-dilution protection contains a price adjustment and an adjustment to the number of shares issuable upon exercise of such warrants. This anti-dilution protection was triggered in connection with our underwritten public offerings in 2015 and January 2016. The issuance of additional securities in connection with the adjustment to the exercise price of such warrants could result in further dilution to our stockholders.

Provisions of Delaware law and our charter documents could delay or prevent an acquisition of our company and could make it more difficult for you to change management.

Provisions of our amended and restated certificate of incorporation and amended and restated by-laws may discourage, delay or prevent a merger, acquisition or other change in control that stockholders may consider favorable, including transactions in which stockholders might otherwise receive a premium for their shares. These provisions may also prevent or delay attempts by stockholders to replace or remove our current management or members of our board of directors. These provisions include:

- a classified board of directors;
- limitations on the removal of directors;
- advance notice requirements for stockholder proposals and nominations;
- the inability of stockholders to act by written consent or to call special meetings;
- the ability of our board of directors to make, alter or repeal our amended and restated by-laws; and
- the authority of our board of directors to issue “blank check” preferred stock, the terms of which may be established and the shares of which may be issued without stockholder approval.

The affirmative vote of the holders of not less than 75% of our shares of capital stock entitled to vote, and not less than 75% of the outstanding shares of each class entitled to vote thereon as a class, is generally necessary to amend or repeal the above provisions that are contained in our amended and restated certificate of incorporation. Also, absent approval of our board of directors, our amended and restated by-laws may only be amended or repealed by the affirmative vote of the holders of at least 75% of our shares of capital stock entitled to vote.

In addition, we are subject to the provisions of Section 203 of the Delaware General Corporation Law, which limits business combination transactions with stockholders of 15% or more of our outstanding voting stock that our board of directors has not approved. These provisions and other similar provisions make it more difficult for stockholders or potential acquirers to acquire us without negotiation. These provisions may apply even if some stockholders may consider the transaction beneficial to them.

As a result, these provisions could limit the price that investors are willing to pay in the future for shares of our common stock. These provisions might also discourage a potential acquisition proposal or tender offer, even if the

acquisition proposal or tender offer is at a premium over the then current market price for our common stock.

We do not intend to pay cash dividends. We have never paid dividends on our capital stock and we do not anticipate paying any dividends in the foreseeable future. Consequently, any gains from an investment in our securities will likely depend on whether the price of our common stock increases.

We have not paid dividends on any of our capital stock to date and we currently intend to retain our future earnings, if any, to fund the development and growth of our business. As a result, capital appreciation, if any, of our common stock will be your sole source of gain for the foreseeable future. Consequently, in the foreseeable future, you will likely only experience a gain from your investment in our securities if the price of our common stock increases.

The warrants sold as part of our initial public offering may not have any value, and the holders of those warrants will have no rights as common stockholders until such holders exercise their warrants and acquire our common stock.

The warrants sold as part of our initial public offering will expire at 5:30 p.m. on May 9, 2017 unless we in our sole discretion extend the expiration date. In the event our common stock price does not exceed the exercise price of the warrants during the period when the warrants are exercisable, the warrants may not have any value. Until holders of warrants acquire shares of our common stock upon exercise of the warrants, holders of warrants will have no rights with respect to the shares of our common stock underlying such warrants. Upon exercise of the warrants, the holders thereof 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.

Item 1B. Unresolved Staff Comments

Not applicable.

Item 2. Properties

We have offices in Plymouth, Minnesota, Montreal, Canada and Sarnia, Canada.

Our Plymouth research and development facility consists of approximately 27,000 square feet of office and laboratory space, including a state of the art research and development facility with capabilities in molecular biology, fermentation, analytical chemistry, pilot scale catalysis and purification. We lease this space under an agreement that expired on February 29, 2016. We have extended the lease on a month to month basis and are evaluating several options to optimize our facility costs.

Our head office is located in Montreal, where we occupy a total of approximately 6,786 square feet of administrative office space under a lease that expires in May 2022. We have the option to extend the term of the lease for an additional five-year period.

We are in commercial operation at our production facility in Sarnia, Ontario, with a nameplate capacity of 30,000 metric tons of bio-succinic acid per year. Our joint venture entity with Mitsui has purchased 11.25 acres of land for this facility, and has signed long-term steam and services agreements with LANXESS to serve the facility.

We believe that our current facilities are suitable and adequate to meet our short term needs.

Item 3. Legal Proceedings

From time to time, we may be subject to various legal proceedings and claims that arise in the ordinary course of our business activities. Management does not believe that the outcome of these claims will have a material adverse effect on our consolidated financial position, results of operations or cash flows based on the status of proceedings at this time. We are not currently a party to any material litigation or other material legal proceedings.

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

Our securities have been traded on the New York Stock Exchange, or NYSE, since June 10, 2013, when the units issued in our initial public offering on May 9, 2013 (trading under the symbol "BIOA.U") were split into our common stock, trading under the symbol "BIOA" and our warrants, trading under the symbol "BIOA.WS". In connection with the initiation of the separate trading of our common and warrants, the trading of the units were suspended and delisted from NYSE. Prior our initial public offering, there was no public market for our securities. The following table shows the high and low sale prices per share of our securities as reported on the NYSE for the periods indicated:

	Common Stock		Warrants	
	High	Low	High	Low
First Quarter 2016 (through March 11, 2016)	$3.09	$2.86	$1.98	$0.69
First Quarter 2015	$9.99	$7.43	$1.88	$1.40
Second Quarter 2015	$11.30	$8.10	$2.41	$1.41
Third Quarter 2015	$8.72	$4.64	$2.19	$1.51
Fourth Quarter 2015	$8.92	$4.97	$2.03	$1.20
First Quarter 2014	$15.05	$7.37	$3.13	$0.71
Second Quarter 2014	$12.99	$9.05	$2.88	$1.68
Third Quarter 2014	$15.29	$9.66	$2.79	$2.20
Fourth Quarter 2014	$10.80	$7.38	$2.74	$0.80

On March 11, 2016, the last reported sale price for our common stock on the NYSE was $3.99 per share, and the last reported sale price for our warrants was $1.90 per warrant.

Equity Compensation Plans

The information required by Item 5 of Form 10-K regarding equity compensation is incorporated herein by reference to Item 12 of Part III of this Annual Report.

Dividend Policy

We have never paid or declared any cash dividends on our common stock. We currently intend to retain any cash flow to finance the growth and development of our business, and we do not expect to pay any cash dividends on our common stock in the foreseeable future. Payment of future dividends, if any, will be at the discretion of our board of directors and will depend on our financial condition, results of operations, capital requirements, restrictions contained in current or future financing instruments and other factors our board of directors deems relevant. In addition, our credit facility contains covenants limiting our ability to pay dividends on our capital stock.

Stockholders

As of March 11, 2016, there were approximately 100 holders of record of our common stock (not including beneficial holders of stock held in street name) and one holder of record of our publicly traded warrants.

Sales of Unregistered Securities

During the year ended December 31, 2015, we issued an aggregate of 405,370 shares of common stock pursuant to the exercise of unregistered warrants to acquire common stock, pursuant to which exercise we received an aggregate of $253,059. The issuance of the shares was exempt from registration by virtue of Section 4(a)(2) of the Securities Act of 1933, as amended.

Purchases of Equity Securities by the Issuer or Affiliated Purchasers

There were no repurchases of shares of common stock made during the year ended December 31, 2015.

Item 6. Selected Financial Data

The following selected consolidated financial data should be read in conjunction with "Management's Discussion and Analysis of Financial Condition and Results of Operations", the consolidated financial statements and related notes, and other financial information included in this Annual Report on Form 10-K.

We derived the consolidated financial data for the years ended December 31, 2015, 2014 and 2013 and as of December 31, 2015 and 2014 from our audited consolidated financial statements, which are included elsewhere in this Annual Report on Form 10-K. We derived the consolidated financial data for the year ended December 31, 2012 and 2011 and as of December 31, 2013, 2012 and 2011 from audited financial statements which are not included in this Annual Report on Form 10-K. Historical results are not necessarily indicative of the results to be expected in future periods.

	12 Months ended December 31, 2015	12 Months ended December 31, 2014	12 Months ended December 31, 2013	12 Months ended December 31, 2012	12 Months ended December 31, 2011
	(in thousands, except share and per share data)				
Revenues					
Product sales	2,172	1,543	2,665	2,291	560
Total revenues	2,172	1,543	2,665	2,291	560
Cost of goods sold	2,613	6,044	2,689	1,746	837
Gross (loss) profit	(441)	(4,501)	(24)	545	(277)
Operating expenses					
General and administrative	10,594	10,655	9,757	11,665	6,776
Research and development, net(1)	20,286	15,156	16,579	20,417	16,717
Sales and marketing	4,002	4,482	4,730	4,193	2,471
Depreciation of property and equipment and amortization of intangible assets	1,080	260	1,165	2,116	522
Impairment loss and write-off of intangible assets	1,141	—	8,619	1,213	—
Foreign exchange (gain) loss	984	151	306	50	99
Operating expenses	38,087	30,704	41,156	39,654	26,585
Operating loss	38,528	35,205	41,180	39,109	26,862
Amortization of deferred financing costs and debt discounts	1,079	292	240	100	12
Financial charges (income) (2)	1,589	11,789	(13,298)	(116)	10,399
(Gain) loss on debt extinguishment	—	171	(314)	—	—
Equity participation in losses of equity method	1	—	15	274	—

investments					
Other income	(22)	(183)	—	—	—
Loss before income taxes	41,175	47,274	27,823	39,367	37,273
Income taxes	(4)	75	103	55	108
Net loss (2)	$41,171	$47,349	$27,926	$39,422	$37,381
Net loss attributable to:					
BioAmber Inc. shareholders (2)	37,226	46,474	27,353	$39,235	$37,150
Non-controlling interest	3,945	875	573	187	231
	$41,171	$47,349	$27,926	$39,422	$37,381
Net loss per share attributable to BioAmber Inc. shareholders—basic	$1.52	$2.32	$1.75	$3.81	$4.72
Weighted-average of common shares outstanding—					
basic	24,499,970	20,016,180	15,590,814	10,296,633	7,864,371

(1) Research and development expenses include some costs of production related to product development and are net of research and development tax credits.

(2) In the third quarter of 2015, we reclassified the legacy warrants from stockholders' equity to liability, with changes in fair value recorded as non-cash financial charges (income) in our consolidated statements of operations and the impact from previous years recorded retrospectively to accumulated deficit. The reclassification was to correct the misapplication of an accounting principle in the third quarter of 2015 and to record the impact from previous years retrospectively. The Company assessed the impact of this adjustment in previous years to be immaterial.

	As of December 31, 2015	As of December 31, 2014	As of December 31, 2013	As of December 31, 2012	As of December 31, 2011
	(in thousands)				
Cash	$6,974	$51,043	$83,728	$25,072	$47,956
Working capital	(18,838)	34,192	77,150	22,162	44,910
Total assets	143,087	152,440	114,079	50,004	68,096
Long-term debt, including current portion	40,090	37,631	29,730	2,600	255
Total liabilities [1]	72,148	72,174	48,347	19,473	16,064
Accumulated deficit [1]	(198,290)	(161,064)	(114,590)	(87,237)	(48,003)
Shareholders' equity[1]	46,355	56,076	65,732	30,531	49,187

(1) In the third quarter of 2015, we reclassified the legacy warrants from stockholders' equity to liability, with changes in fair value recorded as non-cash financial charges (income) in our consolidated statements of operations and the impact from previous years recorded retrospectively to accumulated deficit. The reclassification was to correct the misapplication of an accounting principle in the third quarter of 2015 and to record the impact from previous years retrospectively. The Company assessed the impact of this adjustment in previous years to be immaterial.

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

The following discussion and analysis of our financial condition and results of operations should be read in conjunction with the financial statements and related notes appearing elsewhere in this Annual Report on Form 10-K. The following discussion contains forward-looking statements that reflect our plans, estimates, and beliefs. Our actual results could differ materially from those discussed in the forward-looking statements. Factors that could cause or contribute to these differences include those discussed below and elsewhere in this Annual Report on Form 10-K, particularly in "Risk Factors."

Additional Information

Our investors and others should note that we announce material financial and other information using our company website (www.bio-amber.com), our investor relations website (investor.bio-amber.com), SEC filings, press releases, public conference calls and webcasts. In addition, our 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 Securities Exchange Act of 1934 are available free of charge through the investor relations page of our internet website as soon as reasonably practicable after we electronically file such material with, or furnish it to, the Securities and Exchange Commission. Alternatively, these reports may be accessed at the SEC's website at www.sec.gov. Information about BioAmber, its business, and its results of operations may also be announced by posts on the following social media channels

BioAmber's Twitter feed (https://twitter.com/bioamber)

BioAmber's Facebook feed (https://www.facebook.com/bioamber)

BioAmber's LinkedIn feed (https://goo.gl/YhtwRZ)

BioAmber's Google+ feed (https://plus.google.com/+BioamberInc/posts)

BioAmber's youtube feed (www.youtube.com/user/BioAmber)

The information that we post on these social media channels could be deemed to be material information. As a result, we encourage investors, the media, and others interested in BioAmber to review the information that we post on these social media channels. These channels may be updated from time to time on BioAmber's investor relations website.

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Overview

We are an industrial biotechnology company producing sustainable chemicals. Our proprietary technology platform combines industrial biotechnology and chemical catalysis to convert renewable feedstocks into sustainable chemicals that are cost-competitive replacements for petroleum-derived chemicals, which are used in a wide variety of everyday products including plastics, resins, paints, food additives and personal care products. We currently sell our first product, bio-succinic acid, to customers in a variety of chemical markets. We produce bio-succinic acid at our facility in Sarnia, Ontario, pursuant to a joint venture agreement with Mitsui.

We believe we can produce bio-succinic acid that is cost-competitive with succinic acid produced from oil priced as low as $30.00 per barrel, based on management's estimates of production costs at our facility in Sarnia, Ontario and an

assumed corn price of $4.00 per bushel. While we can provide no assurance that we will be able to secure corn at $4.00 per bushel given the fluctuations in corn prices, we believe this assumption is reasonable given the historic price of corn and management's expectations as to their ability to manage the cost of corn and other inputs for our facility in Sarnia, Ontario. Over the past five years, the price of corn ranged from a low of $2.82 per bushel to a high of $8.44 per bushel. As of March 7, 2016, the spot price was $3.49 per bushel and the six-month forward price was $3.64 per bushel We estimate that a $1.00 increase or decrease in the per bushel price of corn would result in just a $0.024 per pound change in the variable cost of our bio-succinic acid. We expect the productivity of our yeast and on-going process improvements to further reduce our production costs. Our ability to compete on cost is not dependent on government subsidies or tariffs. We began commissioning and start-up of our Sarnia facility in March 2015, achieved mechanical completion in June 2015 and started commercial production in October 2015. We also intend to build and operate additional facilities over the next three to five years.

Prior to the completion of our Sarnia facility, we manufactured our bio-succinic acid at a large-scale demonstration facility in Pomacle, France for five years, under a toll manufacturing arrangement pursuant to which we compensated a third party, including for labor costs and the cost of producing our product. We shipped commercial quantities to customers, such as shipments of one ton super sacks and container loads. We and our customers used the products produced at the facility as part of our efforts to validate and optimize our process and to continue to refine and improve our bio-succinic acid to meet our customers' specifications. In preparation

for transitioning our production from our Pomacle facility to our Sarnia facility, we accumulated a reserve inventory of our product, which was produced at a higher cost per metric ton of succinic acid than that expected cost of production at our Sarnia facility.

As we scale-up our manufacturing capacity at our Sarnia facility, the majority of our revenue will initially come from sales of bio-succinic acid. We intend to leverage our proprietary technology platform and expertise in the production of bio-succinic acid to target additional high value-added products, such as bio-based 1,4 BDO, THF, bioplastics, de-icing solutions and plasticizers. In addition, we are also working to expand our product portfolio to additional building block chemicals, including adipic acid and caprolactam.

In the years ended December 31, 2014 and 2015, we have observed a modest shift in our customer base from direct customers to distributors, which has had the effect of reducing the number of purchasers of our product directly from us. However, we do not believe this channel shift has materially reduced, and do not expect that it will materially reduce, the total amount of product sales or the ultimate number of purchasers of our product.

On May 9, 2013, we raised net proceeds of $71.7 million from the initial public offering of our equity securities. In July 2014, we completed a secondary public offering and issued 3,220,000 shares of common stock, at a public offering price of $12.00 per share, for a total of approximately $36.0 million in net proceeds, after deducting underwriting discounts and commissions and expenses payable by us. On May 6, 2015, we completed the closing of a secondary public offering and issued 3,900,000 shares of common stock, at an offering price to the public of $9.00 per share, for a total of approximately $32.8 million in net proceeds, after deducting underwriting discounts and commissions and expenses payable by us. On January 21, 2016, we completed the closing of a secondary public offering and issued 2,600,000 shares of common stock, at an offering price to the public of $5.00 per share, for a total of approximately $11.8 million in net proceeds, after deducting underwriting discounts and commissions and expenses payable by us.

As of December 31, 2015, we had raised an aggregate of $263.2 million from public offerings of our equity securities, private placements of our equity securities, and the sale of shares issued by a subsidiary and convertible notes.

Manufacturing Expansion Plan

In 2011, we entered into a joint venture with Mitsui to finance, build and operate a manufacturing facility in Sarnia, Ontario through our BioAmber Sarnia subsidiary in which we own a 60% equity interest and Mitsui owns the remaining 40%. The joint venture agreement, which was entered into on November 2, 2011 and subsequently amended on January 24, 2014 and February 8 2016, also establishes our non-binding intent to build and operate a BDO and/or succinic acid production facility with Mitsui, which we expect to commission in late 2018.

In the event of an occurrence of a dissolution event prior to December 31, 2020, Mitsui has the right to sell its shares and we have the obligation to purchase those shares at 100% of the investment value. The remaining dissolution events giving Mitsui this right are: (i) cumulative losses accrued from 2016 through 2020 exceeding 75% of paid in capital, (ii) no after-tax profit earned in any three consecutive years from 2016 onwards, and (iii) any act of

insolvency, bankruptcy, or similar event. Until December 31, 2018, Mitsui in its sole discretion may sell its shares and we must purchase those shares at a discount of 50% to the cumulative investment value.

For future facilities, we currently expect to fund the construction of these facilities using internal cash flows, minority interest partners, debt financing, government subsidies and we may also require fundraising through the capital markets.

We also expect to grow our revenue base by developing new value-added applications and derivative products. In January 2014, we entered into an offtake supply contract with Vinmar, to supply BDO and THF from a planned facility with an annual capacity of 100,000 metric tons. Under the terms of the 15-year master off-take agreement, Vinmar has committed to purchase 100% of the BDO and THF produced in the 100,000 metric ton per year capacity plant that we plan to build in North America and commission in late 2018. In addition to a guarantee of the purchase of the off-take from the planned facility, Vinmar plans to take an equity stake of at least 10% in the facility and assist in seeking other financing for the planned facility. BDO and THF are building block chemicals used in a wide range of products, including engineering plastics for the automotive industry, polyurethanes, biodegradable plastics, and spandex. While this agreement is binding, our inability to finance and construct the plant would relieve Vinmar of its obligation to purchase BDO and THF under the terms of the offtake agreement. We believe the current size of the global BDO and THF market is approximately $6 billion. We believe our bio-based BDO is cost competitive with petroleum-derived BDO.

We signed a second offtake agreement in July 2014 with Vinmar to supply 10,000 metric tons of bio-succinic acid per year for 15 years from the Sarnia plant. This offtake agreement also includes Vinmar off-taking 50,000 metric tons of the 70,000 metric tons of

bio-succinic acid that we plan to produce in our next plant for 15 years. Vinmar has also committed to off-take 150,000 metric tons of the production from a third bio-succinic acid plant with 200,000 metric tons of annual capacity that we plan to build in 2019 and commission in 2021.

Sarnia Facility

Our first commercial-scale facility, which we built in partnership with Mitsui, is located in a bio-industrial park in Sarnia, Ontario. We began commissioning and start-up of this facility in March 2015, achieved mechanical completion in June 2015 and started production in October 2015. The facility has a nameplate capacity of 30,000 metric tons of bio-succinic acid per year. The total construction cost of our facility in Sarnia was approximately $141.5 million, slightly above the initial estimated cost of $125.0 million +/- 10%. The facility was funded through capital contributions from us and from Mitsui, and interest free and low-interest loans and governmental grants. As of December 31, 2015, we had received loans and grants proceeds from Canadian government agencies of CAD$70.6 million.

Additional Planned Manufacturing Facilities

Based on current estimates and assumptions, we anticipate our second manufacturing facility, which we plan to build in North America and expect to commission in late 2018, to have a projected initial BDO/THF capacity of 100,000 metric tons per year and a bio-succinic acid capacity of 70,000 metric tons per year, with total construction costs of approximately $500.0 million. We have entered into an offtake contract with Vinmar to purchase 100% of the annual production of the BDO and THF from this planned facility, with Vinmar also off-taking 50,000 metric tons of the 70,000 metric tons of bio-succinic acid that we plan to produce from this planned facility for 15 years. In addition, Vinmar plans to invest at least 10% in the equity of the facility and will help us to secure other funding to construct the planned facility. We anticipate that Vinmar and other potential parties will be equity partners in this facility, but we may also seek low interest loans and government subsidies to fund the facility, which would substantially reduce our equity funding requirement.

Our second offtake contract with Vinmar also commits to them to purchase 75% of the production from a third bio-succinic acid plant with 200,000 metric tons per year capacity, which we plan to build in 2019 and commission in 2021. As part of the BDO offtake agreement, Vinmar has an option to secure 100% of the output from a fourth manufacturing facility that would produce 100,000 metric tons of BDO and THF per year and would be commissioned in 2023 or 2024.

Our business strategy is to leverage the value of our technology by building and operating production facilities around the world. However, depending on our access to capital and third-party demand for our technology, we may also enter into technology licenses on an opportunistic basis.

Performance Drivers

We expect that the fundamental drivers of our results of operations going forward will be the following:

Commercialization of our products. We commenced recognizing revenue from sales of our existing bio-succinic acid product in 2011. Our ability to grow revenue from this product will be dependent on expanding the addressable market for succinic acid using our low-cost, bio-based alternative. We also expect to grow our revenue base by developing new value-added applications and derivative products. For example, we signed a supply agreement with PTTMCC Biochem in April 2014 for biodegradable plastics, and we have signed additional supply agreements in other new applications such as synthetic leather and other polyurethane applications, including coatings (polyurethane dispersions) made from bio-based succinic acid and recycled PET. We also plan to develop and commercialize

derivatives of succinic acid, such as BDO and THF, and to target large and established chemical markets such as adipic acid, where succinic acid can partially substitute the incumbent chemical.

In April 2014, we entered into a three year supply agreement with PTTMCC Biochem, a joint venture between PTT Public Company Limited and Mitsubishi Chemical Corporation that was established to produce and sell polybutylene succinate, or PBS, a biodegradable plastic made from succinic acid and BDO. PTTMCC has constructed a PBS plant in Thailand and is currently ramping-up the plant production, which is expected to consume approximately 14,000 metric tons of succinic acid per year at full capacity. This supply agreement provides that we will exclusively supply a minimum of 80% of PTTMCC Biochem's total bio-succinic needs until the end of 2017, with approximately 50% of the total purchases under offtake terms. We also entered into a second offtake agreement with Vinmar in July 2014, to supply Vinmar with 10,000 metric tons of bio-succinic acid per year for 15 years from the Sarnia plant. Our arrangements with PTTMCC and Vinmar represent two of the potential customers and applications that we are

targeting for the bio-succinic acid produced at our Sarnia facility. These supply agreements reflect our ongoing efforts to expand the succinic acid addressable market into new applications.

We have also entered into several agreements and memorandum of understanding, or MOUs, that contemplate, but do not obligate, us to supply approximately 28,000 metric tons of bio-succinic acid until the end of 2017 and, as we continue operation of our facility in Sarnia, Ontario, we are actively seeking to enter into definitive supply agreements and form new relationships with potential customers.

Our revenue for future periods will be impacted by our ability to develop new applications and the speed with which we are able to bring our succinic acid derivatives to market. To accelerate this process, we have developed our sales and marketing capability and entering into distribution and joint development agreements with strategic partners. On February 8, 2016, we, together with our subsidiaries BioAmber International s.à r.l. and BioAmber Sarnia, entered into a binding term sheet with Mitsui pursuant to which Mitsui agreed to provide BioAmber Sarnia with additional capital contributions for an aggregate amount of CAD$25 million, which will increase Mitsui's share ownership to approximately 40%. We have retained effective operational control of the joint venture.

We are also engaging in a collaborative process with our customers to test and optimize new applications and derivative products such as BDO and THF in order to ensure that they meet specifications in each of their potential applications. We continue to seek to establish supply agreements and distribution agreements with strategic customers as we expand our markets and product offerings. For example, in October 2014, we entered into a five-year exclusive supply agreement with Xuchuan Chemicals, a global leader in polyester polyols, to supply bio-based succinic acid from our Sarnia facility to be used in manufacturing cast polyurethane elastomers. Xuchuan is initially launching polyurethane (PU) systems for cast polyurethane elastomers (CPU) made with bio-succinic acid. CPU is used in applications including automotive instruments, caster wheels, industrial and mining equipment, power tools, industrial tires, coating rolls, drive belts, mold makers and hoses. By replacing adipic acid with succinic acid, Xuchuan has produced CPUs that offer better properties: they are more abrasion/scratch resistant and more resistant to solvents. Other applications for our bio-based succinic acid include polyurethane elastomers and dispersions for shoe soles and synthetic leather.

Production capacity. Our ability to lower our production costs and drive customer adoption of our product is dependent on our manufacturing strategy. We expect to produce bio-succinic acid that is cost-competitive with succinic acid produced from oil priced as low as $30.00 per barrel. We expect to further reduce costs by implementing on-going process improvements. We intend to capitalize on our first-to-market advantage by rapidly expanding our production capacity and building additional facilities. Our results will be impacted by the speed with which we execute on this strategy, the capital costs and operating expenses of each of these facilities, and the price of oil and the impact it has on the price of petrochemicals our succinic acid substitutes.

Feedstock and other manufacturing input prices. We use sugars that can be derived from wheat, corn, cane and other feedstocks. We intend to locate our facilities near readily available sources of sugars and other inputs, such as steam, electricity and hydrogen, in order to ensure reliable supply of cost-competitive feedstocks and utilities. While our process requires less sugar than most other renewable products and is therefore less vulnerable to sugar price increases relative to other bio-based processes, our margins will be affected by significant fluctuations in these required inputs.

Petroleum prices. We expect sales of our bio-based products to be impacted by the price of petroleum. In the event that petroleum prices increase, we may see increased demand for our products as chemical manufacturers seek lower-cost alternatives to petroleum-derived chemicals. Conversely, a long-term reduction in petroleum prices below $30.00 per barrel may result in our products being less competitive with petroleum-derived alternatives. In addition, oil prices may also impact the cost of certain feedstocks we use in our process, which may affect our operating profits.

Recent Developments

Davy license and engineering agreement

On December 11, 2014, we entered into a license agreement with Davy, and we intend to use the licensed technology in our planned 100,000 metric ton per year capacity plant that uses bio-succinic acid as the feedstock to produce 70,000 metric tons of BDO and 30,000 metric tons of THF. We also secured the right to license the Davy technology for two additional BDO/THF plants. We also entered into an engineering agreement with Davy in relation with the license agreement, under which Davy provides a complete basic engineering package for converting bio-succinic acid to bio-BDO and bio-THF, along with certain pieces of equipment and the catalysts needed to operate the plant. Davy will also provide on-site construction and commissioning support, and performance guarantees for the subsequent operation of the plant. As of December 31, 2015, we incurred a total of $3.1 million in license fees and

a total of $3.2 million in engineering fees, recorded under intangible assets and property and equipment respectively, in the consolidated balance sheets.

Termination notice of DuPont license agreement

On April 20, 2015, we elected to terminate our license with DuPont for its BDO catalysts as a result of the decision to pursue the BDO technology licensed from Davy. As a result, the carrying value of the DuPont license of $1.1 million was written-off.

Public Offering of Common Stock

On May 6, 2015, we completed the closing of a follow-on public offering and issued 3,900,000 shares of common stock, at an offering price to the public of $9.00 per share. The gross aggregate proceeds from this secondary public offering were approximately $35.1 million, with net proceeds of approximately $32.8 million, after deducting underwriting discounts and commissions and expenses payable by us.

The completion of this public offering at a public offering price of $9.00 per share triggered an adjustment to the exercise price of the outstanding warrants to purchase common stock that we issued upon the completion of our initial public offering, which we refer to as the IPO Warrants. The exercise price of such warrants was reduced from $11.00 per whole share of common stock to $9.00 per whole share of common stock, pursuant to the terms of such warrants. The exercise price of the warrants that we issued in April 2011, which we refer to as the 2011 Warrants, were also reduced following the completion of this public offering, from $10.35 per share to $10.11 per share, and an additional 4,124 warrants at an exercise price of $10.11 per share were issued.

On January 21, 2016, we completed the closing of another follow-on public offering and issued 2,600,000 shares of common stock, at an offering price to the public of $5.00 per share. The gross aggregate proceeds from this secondary public offering were approximately $13.0 million, with net proceeds of approximately $11.8 million, after deducting underwriting discounts and commissions and expenses payable by us. This public offering also triggered a further adjustment to the exercise price of the outstanding IPO Warrants, from $9.00 per whole share of common stock to $5.00 per whole share of common stock. The exercise price of the 2011 Warrants and the warrants that we issued in June 2009 were also reduced following the completion of this public offering, from $10.11 per share and $5.74 per share, respectively, to $9.65 per share and $5.67 per share, respectively. An additional 4,713 warrants at an exercise price of $10.11 and an additional 2,580 warrants at an exercise price of $5.67 per share were issued following a quantity adjustment triggered by this issuance.

Partial repayment of Tennenbaum loan

On December 16, 2015, we entered into an amendment to our loan agreement, which we refer to as the TCP loan, with funds managed by Tennenbaum Capital Partners, or TCP, to prepay approximately $12.5 million of the outstanding principal amount of the loan, bringing the outstanding principal balance of the loan to $10.0 million as of that date. Additionally, the amendment eliminated the requirement that we maintain a minimum cash balance, and provided that the amount of indebtedness that we are permitted to allow BioAmber Sarnia to incur would be increased to CAD$72.5 million less the aggregate repayments of principal on such indebtedness.

In connection with this prepayment, we paid half of the end of term charge of $514,781, and the prepayment fee of $374,386 and the remaining other half of the end of term fee associated with the prepayment was deferred, interest free, until the closing of the public offering in January 2016. Beginning with the payment due on February 1, 2016, the outstanding principal balance of the loan shall be repaid in equal monthly installments so that all principal and interest accrued thereon shall be repaid on the maturity date, which is December 1, 2017. The floating interest rate per annum under the TCP loan is the greater of 9.50% or the three-month LIBOR rate plus 9.27%, and is subject to an end of term charge of 8.25% based on the amount loaned, payable on the date on which the term loan is paid or becomes due and payable in full. At our option, we may prepay some or all of the loan balance, subject to a prepayment fee equal to 3% of the amount prepaid during the term of the Agreement (and a pro rata portion of the end of term fee if the prepayment is less than the full amount of the TCP loan).

The loan obligations are secured by a security interest on substantially all of our assets (subject to certain exceptions), including our intellectual property, but excluding certain identified licenses from third parties and our equity interest in our subsidiary, BioAmber Sarnia subject to the conditions specified in the Agreement. The security interest does not apply to any assets owned by BioAmber Sarnia, the entity that will own our Sarnia facility.

Mitsui additional capital contribution

On February 8, 2016, we, together with our subsidiaries BioAmber International s.à r.l. and BioAmber Sarnia, entered into a binding term sheet with Mitsui pursuant to which Mitsui agreed to provide BioAmber Sarnia with additional capital contributions for an aggregate amount of CAD$25 million, which will increase Mitsui's share ownership to approximately 40%. As a result of Mitsui's additional capital contribution, BioAmber Sarnia agreed to increase the size of its board of directors from five to six members, and we and Mitsui have the right to designate three members each. All BioAmber Sarnia board decisions will have to be approved by the affirmative vote of a simple majority of the BioAmber Sarnia board members, except that with respect to the following matters, we, as the controlling shareholder of BioAmber Sarnia, will have a deciding vote and will have the right to make a final decision: (i) the approval and any amendment to any annual budget, including capital expenditures required to maintain the plant in operation, (ii) the hiring and termination of BioAmber Sarnia personnel and their compensation, and (iii) the execution of any raw material or utility supply agreements that are needed in the ordinary course of business. We also agreed that in the event that Mitsui's equity stake in BioAmber Sarnia increases to above 45% in the future, we would no longer have the deciding votes described in the preceding sentence.

Financial Operations Overview

Revenue

Revenue comprises the fair value of the consideration received or receivable for the sale of products and services in the ordinary course of our activities and is presented net of discounts.

We expect revenue to grow as our sales and marketing efforts continue and our facility in Sarnia, Ontario increases its volumes of commercial production. We currently sell products manufactured in Pomacle, France and have started to sell our first product from our Sarnia facility.

Cost of Goods Sold

For products manufactured in Pomacle, France, cost of goods sold consists of the cost to produce finished goods under our tolling arrangement that ended on December 31, 2014. For finished goods produced at Sarnia facility, cost of goods sold consists of costs directly associated with the finish goods production, such as direct materials, direct labor, utilities and certain plant overhead.

The costs to produce product in Pomacle, France, was higher than we expect to incur in the future at Sarnia due to the higher raw material costs such as sugar and utilities, the amount of fixed costs relative to the total production capacity available to us, and the inefficiencies created by the need to stop production from time to time to allocate the capacity to other parties. Going forward, from the succinic acid produced in Sarnia, we expect our cost of goods sold as a percent of revenues to decrease as we will transition from a demo plant production to a full scale commercial production and will benefit from efficiencies in utilizing our yeast in the fermentation process at the Sarnia facility.

Operating Expenses

Operating expenses consist of general and administrative expenses, research and development expenses, net, sales and marketing expenses, depreciation of property and equipment, amortization of intangible assets, write-offs of intangible

assets and foreign exchange gains and losses.

General and Administrative Expenses

General and administrative expenses consist of personnel costs (salaries, and other personnel-related expenses, including stock-based compensation), recruitment and relocation expenses, accounting and legal fees, business travel expenses, rent and utilities for the administrative offices, web site design, press releases, membership fees, office supplies, corporate insurance programs, administration expenses related to our Sarnia facility, and other miscellaneous expenses.

We expect these expenses to increase in the future as we hire additional management, operational employees and finance and administration staff to respond to a growing revenue base and add infrastructure to support it, particularly as we ramp up commercial-scale production at our Sarnia facility. We also expect increased costs to comply with the requirements of being a publicly listed company.

Research and Development Expenses

Research and development expenses consist primarily of fees paid for contract research and internal research costs in connection with the development, expansion and enhancement of our proprietary technology platform. These costs also include personnel costs (salaries and other personnel-related expenses, including stock-based compensation), expenses incurred in our facility located in Plymouth, Minnesota, laboratory supplies, research consultant costs, patent and trademark maintenance costs, royalties, professional and consulting fees and business travel expenses. It also includes development costs for bringing our Sarnia facility in line for production.

We expect research and development expenses, including our patent maintenance expenses, to decrease since we have deployed and implemented our bio-succinic acid in a commercial scale manufacturing facility. We expect to continue conducting research and development in-house, but we may require less space than our current 27,000 square foot facility in Plymouth, Minnesota provides. We are currently assessing our options with respect to our research and development needs. Certain research and development activities that can be performed more effectively by outside consultants will be performed with their respective expertise as required.

Sales and Marketing Expenses

Sales and marketing expenses consist primarily of personnel costs (salaries, and other personnel-related expenses, including stock-based compensation), marketing services, product development costs, advertising, selling and distributor costs and feasibility study fees.

Following our agreement signed with Mitsui in February 2016, we expect to decrease our sales and marketing efforts while leveraging Mitsui’s global sales platforms along with its dedicated commercial team.

Depreciation of Property and Equipment and Amortization of Intangible Assets

Depreciation of property and equipment consists primarily of the depreciation of our office furniture, research and development equipment and computer equipment, which is depreciated using the straight-line method over their estimated useful lives. Amortization of intangible assets consists primarily of the amortization of computer software and licenses, which are amortized using the straight-line method over their estimated useful lives. We expect depreciation of property and equipment to increase significantly as our manufacturing facilities are put in to use. As of December 31, 2015, $19.1 million of grants were applied as a reduction of machinery and equipment and building. This reduces depreciation expense over the useful life of the asset.

Foreign Exchange Loss

We expect to conduct operations throughout the world. Our financial position and results of operations will be affected by economic conditions in countries where we plan to operate and by the changing foreign currency exchange rates. We are exposed to changes in exchange rates in Europe and Canada. The Euro and the Canadian Dollar are our most significant foreign currency exchange risks. A strengthening of the Euro and the Canadian Dollar against the U.S. Dollar may increase our revenues and expenses since they are expressed in U.S. Dollars. As we increase our production from our manufacturing facility in Sarnia, Ontario, we expect our foreign currency risk to continue as a significant portion of our uses of cash will be denominated in Canadian Dollars while our sources of cash will be primarily in U.S. Dollars and in Euros. We will monitor foreign currency exposures and will look to mitigate exposures through normal business operations such as manufacturing and selling in the same currencies where practical or buying required currencies at spot where advantageous. We may use forward contracts or currency swaps to mitigate any remaining exposures.

Amortization of Deferred Financing Costs and Debt Discounts

Amortization of deferred financing costs and debt discounts consists primarily of costs from past financings that are recognized over the life of the funding instrument and will continue to increase in line with the expenses incurred to obtain future financing. Those costs are deferred and amortized on a straight-line basis, which is approximately the effective interest method, over the term of the related debt. Amortization of deferred financing costs and debt discounts also includes the accretion of the debt discount on the interest free or low-interest loans received from the government agencies.

Financial Charges (Income), Net

Financial charges (income), net, include interest on long-term debt, end of term accretion charge from the TCP loan and the recognition of gains or losses resulting from the mark-to-market adjustment required at the balance sheet date on the warrants issued in connection with our initial public offering, or IPO, completed on May 9, 2013.

Following the reclassification of the 2009 Warrants and 2011 Warrants from equity to derivative liabilities (refer to the Note 19 of the consolidated financial statements included in Item 8 of this Annual Report on Form 10-K for details) in the third quarter of 2015, financial charges (income), net, also includes the gains or losses resulting from the mark-to-market adjustment from those warrants. Those mark-to-market adjustments are non-cash financial charges (income).

We account for common stock warrants in accordance with applicable accounting guidance provided in ASC 815, Derivatives and Hedging—Contracts in Entity's Own Equity, as either derivative liabilities or as equity instruments depending on the specific terms of the warrant agreement. Derivative warrant liabilities were valued using the Black-Scholes pricing model at the date of initial issuance and using the closing value as quoted on the New York Stock Exchange at each subsequent balance sheet date. The 2009 Warrants and 2011 Warrants are valued using the Monte Carlo method.

Income Taxes

We are subject to income taxes in Luxembourg, the United States and Canada. We have incurred significant losses and have not generated taxable income in these jurisdictions, with the exception of Canada. In the future, we expect to become subject to taxation based on the statutory rates in effect in the countries in which we operate and our effective tax rate could fluctuate accordingly. We have incurred net losses since our inception and have not recorded any federal, state or foreign current income tax provisions, with the exception of (i) recognition of unrecognized tax benefits since inception, (ii) a recovery of income taxes in the 258 day period ended September 30, 2009, and (iii) recognition of current income taxes in Canada. We have a full valuation allowance against our net deferred tax assets. Additionally, under the U.S. Internal Revenue Code, our net operating loss carryforwards and tax credits may be limited if a cumulative change in ownership of more than 50% is deemed to have occurred within a three year period. We have not performed a detailed analysis to determine whether an ownership change under Section 382 of the Internal Revenue Code has occurred after each of our previous issuances of shares of common stock and warrants.

Equity Participation in Losses of Equity Method Investments

Equity participation in losses of equity method investments consist primarily of our share of losses incurred by AmberWorks LLC. We recognize our 50% share of losses incurred by AmberWorks LLC, a joint venture formed on February 15, 2012.

Critical Accounting Policies and Estimates

We prepare our consolidated financial statements in accordance with accounting principles generally accepted in the United States of America. As such, management is required to make certain estimates, judgments and assumptions that it believes are reasonable based on the information available. These estimates and assumptions affect the reported amounts of assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses for the periods presented. The significant estimates which management believes are the most critical to aid in fully understanding and evaluating our reported financial results include fair value determination of assets, liabilities and consideration paid or payable in connection with business acquisitions, contingent consideration, fair value of intangible assets and goodwill, useful lives of intangible assets, income taxes, stock-based compensation and

the value of certain equity and debt instruments.

Our critical accounting policies are in the annual consolidated financial statements for the year ended December 31, 2015 included in Item 8 in this Annual Report on Form 10-K.These are the policies we believe are the most critical to aid in fully understanding and evaluating our financial condition and results of operations.

Inventories

Inventories are stated at the lower of cost or market. Cost is determined on a first-in, first-out (FIFO) basis. Prior to the Company having any customer orders for sample product, all production and development costs were expensed as part of the Company’s research and development efforts.

Property and equipment

Property and equipment are recorded at cost and are depreciated over their estimated useful lives using the straight-line method over the following periods:

Furniture and Fixtures	5-8 years
Machinery and Equipment	5-15 years
Computers, Office Equipment and Peripherals	3-7 years

Costs related to repairs and maintenance of property and equipment are expensed in the period in which they are incurred. Upon sale or disposal, the Company writes off the cost of the asset and the related amount of accumulated depreciation. The resulting gain or loss is included in the consolidated statement of operations. Assets in the course of construction are classified as construction in-progress and are carried at cost, net of grants received and any recognized impairment loss. They consist of expenditures directly related to building the manufacturing facility in Sarnia, Ontario. For qualifying assets, cost includes capitalized borrowing costs.

Intangible assets

Computer software and license are recorded at cost and are depreciated over their estimated useful lives of between 2 and 5 years using straight-line method. Costs incurred in obtaining patents and licenses with definitive-lived are capitalized and amortized on a straight-line basis over their estimated useful lives, generally between 8 and 15 years.

As required by FASB ASC 805, acquired IPR&D through business combinations is accounted for as an indefinite-lived intangible asset until completion or abandonment of the associated research and development efforts. Therefore, such assets are not amortized but are tested for impairment at least annually. Once the research and development activities are completed, the assets will be amortized over the related product’s useful life. If the project is abandoned, the assets will be written off if they have no alternative future use.

We review our portfolio of patents and acquired in-process research and development every quarter taking into consideration events or circumstances that may affect its recoverable value.

Long-lived asset impairment

We assess the fair value of our long-lived assets in accordance with FASB ASC 360, Property, Plant, and Equipment. At the end of each reporting period, we evaluate whether there is objective evidence of events or changes in business conditions which suggest that an asset may be impaired. In such cases we determine the fair value based upon forecasted, undiscounted cash flows which the assets are expected to generate and the net proceeds expected from their sale. If the carrying amount exceeds the fair value of the asset, it is decreased by the difference between the two being the amount of the impairment.

Government grants

We have entered into arrangements to receive government grants and government loans from which a portion of the proceeds was recorded as grants (refer to Part II, Item 8, Note 8—Long-term debt), that relate primarily to the construction of facilities. Government grants are recognized when there is reasonable assurance that the grant will be received and that the conditions of the grant have been complied with. Government grants received in advance of

complying with the conditions of the grant are deferred until all conditions are met. Government grants related to property and equipment are recorded as a reduction of the cost of the asset and result in reduced depreciation expense over the useful life of the asset. Government grants that relate to expenses are recognized in the income statement as a reduction of the related expense or as a component of other income.

Stock-based compensation

We account for our stock-based compensation expense in accordance with FASB ASC 718, Compensation—Stock Compensation. Stock options are granted to employees and consultants at exercise prices equal to the estimated fair value of our stock at the grant dates. Stock options generally vest over four years and have a term of ten years. Each stock option entitles the holder to purchase one share of common stock which comes from our authorized shares. Compensation expense is recognized over the period during which an employee is required to provide services in exchange for the award, generally the vesting period.

We recognize stock-based compensation for awards to employees based on the estimated fair value of the awards granted. The fair value method requires us to estimate the fair value of stock-based awards on the date of grant using an option pricing model. We use the Black-Scholes option-pricing model to estimate the fair value of awards granted to employees and consultants, and the requisite fair value is recognized as an expense on a straight-line basis over the service period of the award.

The Black-Scholes option pricing model requires the following inputs: expected life, expected volatility, risk-free interest rate, expected dividend yield rate, exercise price and closing price of the Company's common stock on the date of grant. Due to the Company's limited history of grant activity, the Company calculates its expected term utilizing the "simplified method" permitted by the Securities and Exchange Commission ("SEC"), which is the average of the total contractual term of the option and its vesting period. We calculate our expected volatility rate from the historical volatilities of selected comparable public companies within its industry, 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 its common stock becomes available. The risk-free interest rate is based on the US Treasury yield curve in effect at the time of grant for zero coupon US Treasury notes with maturities similar to the option's expected term. The expected dividend yield was assumed to be zero, as we have not paid, nor does it anticipate paying, cash dividends on shares of its common stock. We estimate our forfeiture rate based on an analysis of our actual forfeitures and will continue to evaluate the appropriateness of the forfeiture rate based on actual forfeiture experience, analysis of employee turnover and other factors.

Warrants financial liability

The Company accounts for common stock warrants in accordance with applicable accounting guidance provided in FASB ASC 815, Derivatives and Hedging—Contracts in Entity's Own Equity, as either derivative liabilities or as equity instruments depending on the specific terms of the warrant agreement. Derivative warrant liabilities issued in connection with the IPO were valued using the Black-Scholes pricing model at the date of initial issuance and are valued using the closing value as quoted on the New York Stock Exchange at each subsequent balance sheet date. The June 2009 and April 2011 Warrants are valued using the Monte Carlo method.

The liability is presented as warrants financial liability in the consolidated balance sheets, and changes in the fair value of the warrants are reflected in the consolidated statements of operations as part of financial charges (income), net.

See Note 2 to the Consolidated Financial Statements (Part II, Item 8) for a description of recent accounting pronouncements.

Results of Operations

The following tables set forth our results of operations for the periods presented. The period-to-period comparison of financial results is not necessarily indicative of future results.

Overview of Results of Operations for the Years Ended December 31, 2015 and 2014 (in thousands)

	Year Ended December 31,		Change	
	2015	2014		
	$	$	$	%
	(in thousands)			
Total revenues	$2,172	$1,543	$629	41 %
Cost of goods sold	2,613	6,044	(3,431)	-57 %
Gross loss	(441)	(4,501)	4,060	-90 %
Operating expenses				
General and administrative	10,594	10,655	(61)	-1 %
Research and development, net	20,286	15,156	5,130	34 %
Sales and marketing	4,002	4,482	(480)	-11 %
Depreciation of property and equipment and amortization of intangible assets	1,080	260	820	315 %
Impairment loss and write-off of property and equipment and intangible assets	1,141	—	1,141	100 %
Foreign exchange loss	984	151	833	552 %
Operating expenses	38,087	30,704	7,383	24 %
Operating loss	38,528	35,205	3,323	9 %
Amortization of deferred financing costs and debt discounts	1,079	292	787	270 %
Financial charges (income), net	1,589	11,789	(10,200)	-87 %
Loss (gain) on debt extinguishment	—	171	(171)	-100%
Equity participation in losses of equity method investments	1	—	1	100 %
Other expense (income), net	(22)	(183)	161	-88 %
Loss before income taxes	41,175	47,274	(6,099)	-13 %
Income (recovery) taxes	(4)	75	(79)	-105%
Net loss	41,171	47,349	(6,178)	-13 %
Net loss attributable to:				
BioAmber Inc. shareholders	37,226	46,474	(9,248)	-20 %
Non-controlling interest	3,945	875	3,070	351 %
	41,171	47,349	(6,178)	-13 %

Product sales

Product sales increased from $1.5 million for the year ended December 31, 2014 to $2.2 million for the year ended December 31, 2015 due to an increase in product volume sold, partially offset by a decrease in the average selling price.

Cost of goods sold

Cost of goods sold decreased from $6.0 million for the year ended December 31, 2014 to $2.6 million for the year ended December 31, 2015. This decrease is primarily due to a non-cash charge from an inventory reserve of $2.5 million taken in 2014, as opposed to an inventory reserve of approximately $300,000 in 2015, related to our inventory produced in Pomacle, France. This decrease is also due to toll-manufacturing fixed cost charges of $1.2 million recorded as cost of goods sold in 2014, which did not occur in 2015, but was partially offset by under-absorption of Sarnia production costs recorded in costs of goods sold in 2015, and lower unit inventory cost in 2015, due to prior year inventory reserve taken.

General and administrative expenses

General and administrative expenses slightly decreased by $61,000 to $10.6 million for the year ended December 31, 2015 as compared to $10.7 million for the year ended December 31, 2014. The decrease is primarily due to an expense of $0.6 million in stock-based compensation due to stock option cancellations in the second quarter of 2014, which did not occur in 2015. This decrease was partially off-set by financing fees incurred related to financing not pursued.

Research and development expenses, net

Research and development expenses, net, increased by $5.1 million to $20.3 million for the year ended December 31, 2015 as compared to $15.2 million for the year ended December 31, 2014. This was primarily due by an increase in expenses related to the commissioning and start-up of the Sarnia plant and an increase in royalty's payment from new technology agreement with Reverdia signed in December 2015. This was partially offset by a decrease in BDO related expenses that are now performed mainly by Davy under the license agreement, which is being capitalized, and a decrease in stock-option compensation expenses related to the stock option cancellations in the second quarter of 2014, which did not occur in 2015.

Sales and marketing expenses

Sales and marketing expenses decreased by $480,000 to $4.0 million for the year ended December 31, 2015 as compared to $4.5 million for the year ended December 31, 2014. The decrease is primarily due to a decrease in stock-based compensation expense due the stock option cancellations in the second quarter of 2014, which did not occur in 2015.

Depreciation of property and equipment and amortization intangible assets

Depreciation of property and equipment and amortization of intangible assets expense increased by $0.8 million to $1.1 million for the year ended December 31, 2015 as compared to $260,000 for the year ended December 31, 2014. This increase is due to the depreciation of the Sarnia facility assets associated with the beginning of the Sarnia production in the fourth quarter of 2015.

Impairment loss and write-off of property and equipment and of intangible assets

On April 20, 2015, we elected to terminate our license with DuPont for their BDO catalysts as a result of the decision to pursue the BDO technology licensed from Davy. As a result, the carrying value of the DuPont license of $1.1 million was written-off.

Foreign Exchange loss

The foreign exchange loss increased by $0.8 million to $0.9 million for the year ended December 31, 2015 as compared to $151,000 for the year ended December 31, 2014. The foreign exchange loss was driven by a strengthening of the U.S. Dollar versus the Canadian Dollar during the year ended December 31, 2015, which impacted the Canadian Dollar cash balances being carried on our books to meet vendor obligations for the Sarnia operations.

Financial charges (income), net

Financial charges (income), net comprised of a loss of $1.6 million for the year ended December 31, 2015 as compared to an income of $11.8 million for the year ended December 31, 2014. This expense decrease was due to the mark-to-market adjustment change of $9.5 million on our IPO Warrants and our 2011 Warrants and 2009 Warrants, and the decrease in the end of the term charge in 2015, due to acceleration of the end of term charge recorded in 2014 from the pre-payment of the loan with Hercules Technology Growth Capital in December 2014.

Overview of Results of Operations for the Years Ended December 31, 2014 and 2013 (in thousands)

	Year Ended December 31,		Change	
	2014	2013		
	$	$	$	%
Total revenues	1,543	2,665	(1,122)	-42 %
Cost of goods sold	6,044	2,689	3,355	125 %
Gross loss	(4,501)	(24)	(4,477)	18654 %
Operating expenses				
General and administrative	10,655	9,757	898	9 %
Research and development, net	15,156	16,579	(1,423)	-9 %
Sales and marketing	4,482	4,730	(248)	-5 %
Depreciation of property and equipment and amortization of intangible assets	260	1,165	(905)	-78 %
Impairment loss and write-off of property and equipment and intangible assets	—	8,619	(8,619)	-100 %
Foreign exchange loss (gain)	151	306	(155)	-51 %
Operating expenses	30,704	41,156	(10,452)	-25 %
Operating loss	35,205	41,180	(5,975)	-15 %
Amortization of deferred financing costs and debt discounts	292	240	52	22 %
Financial charges (income), net	11,789	(13,298)	25,087	-189
Loss (gain) on debt extinguishment	171	(314)	485	-154 %
Equity participation in losses of equity method investments	—	15	(15)	-100 %
Other expense (income), net	(183)	—	(183)	100 %
Loss before income taxes	47,274	27,823	19,451	70
Income taxes	75	103	(28)	-27 %
Net loss	47,349	27,926	19,423	48
Net loss attributable to:				
BioAmber Inc. shareholders	46,474	27,353	19,121	70
Non-controlling interest	875	573	302	53 %
	47,349	27,926	19,423	70

Product sales

Product sales decreased from $2.7 million for the year ended December 31, 2013 to $1.5 million for the year ended December 31, 2014 due to a decrease in the average selling price, partially offset by an increase in the quantity of product sold.

Supply contracts generated $709,000 and $2,035,000 for the years ended December 31, 2014 and 2013, respectively. Non-contracted sales generated $834,000 and $630,000 of these revenues for the years ended December 31, 2014 and 2013, respectively.

Cost of goods sold

Cost of goods sold increased from $2.7 million for the year ended December 31, 2013 to $6.0 million for the year ended December 31, 2014. This increase is primarily due to a non-cash charge from an inventory reserve of $2.5

million and toll-manufacturing fixed cost charges of $1.2 million recorded as cost of goods sold.

General and administrative expenses

General and administrative expenses increased by $0.9 million to $10.7 million for the year ended December 31, 2014 as compared to $9.8 million for the year ended December 31, 2013. The increase is primarily due to a $0.6 million increase in stock-based compensation due to stock option cancellations in the second quarter of 2014 and additional costs related to compliance and public company operations, including professional fees, filing fees, payroll and related expenses.

Research and development expenses, net

Research and development expenses, net, decreased by $1.4 million to $15.2 million for the year ended December 31, 2014 as compared to $16.6 million for the year ended December 31, 2013. This was primarily due to (i) a decrease of $0.6 million resulting from the completion of the yeast development project with Cargill in 2013 (ii) $0.7 million in reduction of expense related to our adipic acid platform, and (iii) a decrease of $0.9 million related to the streamlining of the patent portfolio which decreased the expenses for filing and maintain patents. In addition, stock-based compensation expense decreased by $0.4 million due to the accelerated vesting of Sinoven's stockholder shares of BioAmber and immediate vesting of certain stock options granted during the second quarter of 2013 upon the completion of the IPO, which was partially offset due to the stock option cancellations in the second quarter of 2014. These reductions were also partially offset by an increase in payroll costs that resulted from hiring additional personnel for our in-house research and development and engineering development work related to our Sarnia plant under construction.

Sales and marketing expenses

Sales and marketing expenses decreased by $248,000 to $4.5 million for the year ended December 31, 2014 as compared to $4.7 million for the year ended December 31, 2013. The decrease is primarily due to a decrease in outside market study expenses and a decrease in incentive remuneration.

Depreciation of property and equipment and amortization intangible assets

Depreciation of property and equipment and amortization of intangible assets expense decreased by $905,000 to $260,000 for the year ended December 31, 2014 as compared to $1.2 million for the year ended December 31, 2013. This decrease is due to the write-off of intellectual property (patent rights and licenses, and in-process research and development) during 2013, based on E. coli-technology.

Impairment loss and write-off of property and equipment and of intangible assets

There were no impairment loss or write-off of property and equipment and intangible assets expense during the year ended December 31, 2014. During the year ended December 31, 2013, as of result of approval from our board of directors to replace the E. coli technology in our production process with our yeast technology, we recorded a total impairment charge of $8.6 million related to the write-off of intellectual property based on E. coli technology, and the write-off of construction costs incurred in connection with the plant being built in Sarnia.

Foreign Exchange loss

The foreign exchange loss decreased by $155,000 to $151,000 for the year ended December 31, 2014 as compared to $306,000 for the year ended December 31, 2013. The decrease was driven mainly by the lower Canadian dollar cash balances in 2014 as compared to 2013, partially offset by a weaker Canadian Dollar versus the U.S. dollar during 2014 as compared to 2013.

Financial charges (income), net

Financial charges (income), net comprised of a loss of $11.8 million for the year ended December 31, 2014 as compared to an income of $13.3 million for the year ended December 31, 2013. This expense increase was due to the mark-to-market adjustment change of $23.4 million on the IPO Warrants, the June 2009 Warrants and the April 2011 Warrants, the increase in the interest expense and the end of the term charge on HTGC loan for a total of $3.0 million, and the issuance costs of $1.1 million related to warrants issued during our IPO in 2013.

Equity participation in losses of equity method investments

Equity participation in losses of equity method investments decreased by $15,000 to nil for the year ended December 31, 2014, due to lower losses incurred by AmberWorks LLC, a joint venture that was formed on February 15, 2012.

Liquidity and Capital Resources

From inception through December 31, 2015, we have funded our operations primarily from an aggregate of $263.2 million raised from public offerings of our equity securities, private placements of our equity securities, and the sale of shares issued by a subsidiary and convertible notes, including net proceeds of $32.8 million from our May 2015 public offering of our common stock. We also received CAD$70.6 million from loan and grants proceeds from various Canadian government agencies and net proceeds of

$24.5 million from a three year term loan with TCP. On January 15, 2016, we completed a public offering and received a net amount of $11.8 million from the issuance of common stock, to fund our corporate cash needs.

We began commissioning and start-up of our Sarnia facility in March 2015, achieved mechanical completion in June 2015 and started production in the last quarter of 2015. In addition to some remaining capital expenditures payable, we will require funds to ramp up production levels at our Sarnia operations, and build inventory levels, which are expected to be funded by us through available cash, additional loans, and Mitsui's capital contribution. On February 8, 2016, Mitsui agreed to provide an additional capital contribution of $CAD 25.0 million, for an additional 10% of share ownership.

In addition, we will require funds for our research and development programs and for general corporate purposes, which are expected to be funded by equity issuance, debt refinancing and/or by reducing or delay operating expenses as deemed appropriate.

Based on these funding activities, the additional equity from our partner Mitsui, the cash on hand at December 31, 2015, combined with the previously committed funding from grants not yet drawn as of December 31, 2015, we believe that we have sufficient cash to fund our operations for at least the next twelve months.

There are certain covenants in our debt and grant agreements, which are discussed in the notes to our consolidated financial statements. We are in compliance with all of the covenants provided in each of these agreements. We expect to continue to be in compliance with these covenants in the future.

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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,		
	2015	2014	2013
	(in thousands)		
Net cash used in operating activities	$(32,199)	$(22,453)	$(27,525)
Net cash used in investing activities	(64,803)	(85,018)	(12,788)
Net cash provided by financing activities	54,888	78,655	99,923

Operating activities

The cash from operating activities is primarily used for general and administrative expenses and research and development activities. These include expenses on research and development projects, consultancy and advisory fees from third parties, licensing and royalty expenses, payroll expenses, legal and accounting expenses and office rent and utilities.

Cash used in operating activities during the year ended December 31, 2015 of $32.2 million reflected our net loss of $41.2 million, which was adjusted for non-cash net charges, of $6.4 million and a positive change in operating assets and liabilities of $2.6 million. Non-cash expense adjustments included mainly stock-based compensation of $4.8

million and a gain on the mark-to-market accounting for our IPO warrants and 2011 Warrants and 2009 Warrants of $2.3 million. The change in operating assets and liabilities is a net inflow of $2.6 million due to a decrease in current assets and current liabilities.

Cash used in operating activities during the year ended December 31, 2014 of $22.5 million reflected our net loss of $47.3 million, which was adjusted for non-cash net charges, of $14.3 million and a positive change in operating assets and liabilities of $10.6 million. Non-cash expense adjustments included mainly stock-based compensation of $6.9 million and a gain on the mark-to-market accounting for warrants that were part of the units issued in our IPO of $7.3 million. The change in operating assets and liabilities is a net inflow of $10.6 million due to a decrease in current assets which offsets an increase in current liabilities.

Cash used in operating activities during the year ended December 31, 2013 of $27.5 million reflected our net loss of $27.9 million, which was adjusted for non-cash net charges, of $822,000 and a negative change in operating assets and liabilities of $420,000. Non-cash expense adjustments included depreciation and amortization of assets of $1.2 million, stock-based compensation of $6.7 million, and the impairment loss and write-off of property and equipment and of intangible assets of $8.6 million. Non-cash gain adjustments included the gain on the mark-to-market accounting for our IPO warrants and 2011 Warrants and 2009 Warrants of $16.2 million and the gain on debt extinguishment of $ 0.3 million. The change in operating assets and liabilities is a net outflow of $420,000 due to an increase in current assets which offsets an increase in current liabilities.

Investing activities

Cash used in investing activities during the year ended December 31, 2015 of $64.8 million represented mostly property and equipment purchases related to the building of our facility in Sarnia, Ontario.

Cash used in investing activities during the year ended December 31, 2014 of $85.0 million represented property and equipment purchases related to the building of our facility in Sarnia, Ontario of $85.0 million, and an increase in the restricted cash of $678,000, offset by a capital distribution from our equity investment in AmberWorks LLC of $675,000.

Cash used in investing activities during the year ended December 31, 2013 of $12.8 million represented property and equipment purchases related to the building of our facility in Sarnia, Ontario.

Financing activities

Cash provided by financing activities during the year ended December 31, 2015 of $54.9 million included the proceeds from issuance of shares including the May 2015 public offering, for a total of $33.1 million, an additional disbursement of $29.9 million from the government under the actual loans and grants agreements and the loan proceeds of the CAD$20.0 million commercial loan from a financial consortium including Export Canada Development (EDC), Comerica, and Farm Credit Canada. It also included capital contributions by Mitsui to our BioAmber Sarnia joint venture of $8.9 million, and repayment of our long term loans for a total of 16.1 million.

Cash provided by financing activities during the year ended December 31, 2014 of $78.7 million included proceeds from the completion of our second public offering of $36.2 million, a capital contribution by Mitsui maintaining its 30% equity in our BioAmber Sarnia joint venture of $24.6 million, the loan and grants proceeds from government agencies of $19.4 million and the net proceeds from the long term loan from TCP of $24.5 million, partially offset by $25.0 million from the repayment of the HTGC loan, and $1.1 million in deferred financing costs.

Cash provided by financing activities during the year ended December 31, 2013 of $99.9 million included $71.7 million net proceeds from the completion of our IPO, $24.2 million in net proceeds from the three year term loan from HTGC, $2.8 million from loans and grants for the construction of our planned facility in Sarnia, Ontario, partially offset by $140,000 of a cash consideration paid for the forfeiture of 70,000 shares by Sinoven’s selling shareholders.

Contractual Obligations and Commitments

Our principal commitments consist primarily of obligations under our leases for our office spaces and contractual commitments related to license agreements. The following table summarizes these contractual obligations at December 31, 2015:

	Payment Due by Period				
	Total	Less than 1 Year	1-3 Years	3-5 Years	More than 5 years
	(in thousands)				
Debt (including interest payments)	$57,711	$ 12,186	$17,852	$15,018	$ 12,655
Operating leases(1)	1,029	186	284	315	243
Minimum royalty payments(2)					