

**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549**

FORM 10-K

ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934.

For the fiscal year ended December 31, 2018.

or

TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934.

For the transition period from _____ to _____.

Commission file number: 000-26966

ADVANCED ENERGY INDUSTRIES, INC.

(Exact name of registrant as specified in its charter)

Delaware

(State or other jurisdiction of incorporation or organization)

1625 Sharp Point Drive, Fort Collins, CO

(Address of principal executive offices)

Registrant's telephone number, including area code: (970) 221-4670

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

84-0846841

(I.R.S. Employer Identification No.)

80525

(Zip Code)

Title of each class

Common Stock, \$0.001 par value

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

Name of each exchange on which registered

NASDAQ Global Select Market

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

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

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

Indicate by check mark whether the registrant has submitted every electronically Interactive Data File required to be submitted 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 such files). Yes No

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.

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

Large accelerated filer

Accelerated filer

Non-accelerated filer
(Do not check if a smaller reporting company)

Smaller reporting company

Emerging growth company

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

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act).

Yes No

The aggregate market value of voting and non-voting common stock held by non-affiliates of the registrant was \$2,263,559,280 as of June 29, 2018, based upon the price at which such common stock was last sold on such date.

As of February 19, 2019, there was 38,203,956 shares of the registrant's common stock outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Part III of this Annual Report on Form 10-K incorporates information by reference from the registrant's definitive proxy statement for its 2019 Annual Meeting of Stockholders (to be filed with the Commission under Regulation 14A no later than 120 days after the end of the registrant's fiscal year ended December 31, 2018).

ADVANCED ENERGY INDUSTRIES, INC.
FORM 10-K
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PART I

Unless the context otherwise requires, as used in this Form 10-K, references to "Advanced Energy", "the Company", "we", "us" or "our" refer to Advanced Energy Industries, Inc. and its consolidated subsidiaries.

ITEM 1. BUSINESS

Overview

Advanced Energy provides highly-engineered, mission-critical, precision power conversion, measurement and control solutions to our global customers. We design, manufacture, sell and support precision power products that transform, refine, and modify the raw electrical power from the utility and convert it into various types of highly- controllable usable power that is predictable, repeatable and customizable. Our power solutions enable innovation in complex semiconductor and thin film plasma processes such as dry etch, strip, chemical and physical deposition, high and low voltage applications such as process control, analytical instrumentation and medical equipment, and in temperature-critical thermal applications such as material and chemical processing. We also supply related instrumentation products for advanced temperature measurement and control, electrostatic instrumentation products for test and measurement applications, and gas sensing and monitoring solutions for multiple industrial markets. Our network of global service support centers provides local repair and field service capability in key regions as well as provide upgrades and refurbishment services, and sales of used equipment to businesses that use our products.

Recent Acquisitions

In July 2017, Advanced Energy acquired all of the issued and outstanding shares of capital stock of Excelsys Holdings Limited ("Excelsys"), an electronics manufacturer in Cork, Ireland. This acquisition is part of Advanced Energy's strategy to continue to grow and diversify its revenue in new and adjacent markets through organic and inorganic opportunities. The high-efficiency, low voltage, configurable power supplies that Excelsys manufactures for medical and industrial applications further enhance Advanced Energy's product portfolio.

In February 2018, we acquired Trek Holding Co., Ltd ("Trek"), a privately held company with operations in Tokyo, Japan and Lockport, New York. Trek has a 95% ownership interest in its U.S. subsidiary which is also its primary operation. Trek designs, manufactures and sells high-voltage amplifiers, power supplies and generators, high-performance electrostatic measurement instruments and electrostatic discharge (ESD) sensors and monitors to the global marketplace. Trek's standard and custom-OEM products are used in production and research in aerospace, automotive, electronics, electrostatics, medical, military, nanotechnology, photovoltaic/solar, plasma, semiconductor and test and measurement applications. Trek's comprehensive portfolio of power supply products strengthen and accelerate Advanced Energy's growth in high voltage applications.

In May 2018, we acquired the electrostatic technology and product line from Monroe Electronics, Inc. located in Lyndonville, New York. The electrostatic detection and measurement instrumentation products serve specific areas of testing and monitoring of ionization systems across a variety of applications. In addition, the non-contact electrostatic voltmeters and field meters complement those of Trek. Production of these electrostatic products has been integrated into Trek's manufacturing facility in nearby Lockport, New York.

In September 2018, we acquired LumaSense Technologies Holdings, Inc. ("LumaSense"), a privately held company with primary operations in Santa Clara, California, Frankfurt, Germany, Magdeburg, Germany and Ballerup, Denmark. LumaSense designs, manufactures and sells a line of photonic-based measurement and monitoring solutions that are synergistic with the Company's precision power control technologies in both semiconductor and industrial markets allowing customers' the ability to better control critical parameters of thermal and material processes. The acquisition of LumaSense complements our leading pyrometry solutions with additional fiber optic thermometry for an extended range of semiconductor applications in etch and deposition, provides integrated industrial temperature control and metrology applications for both thin films coating and thermal processing, and adds industrial pyrometry and gas sensing technologies.

For additional information, see *Note 2. Business Acquisitions* in Item 8 "Financial Statements and Supplementary Data".

We incorporated in Colorado in 1981 and reincorporated in Delaware in 1995. Our executive offices are located at 1625 Sharp Point Drive, Fort Collins, Colorado 80525, and our telephone number is 970-407-4670.

Products and Services

PRODUCTS

Our precision power products and solutions are designed to enable new process technologies, improve productivity, and lower the cost of ownership for our customers. These products must meet demanding requirements in efficiency, flexibility, performance, and reliability. We also provide repair and maintenance services for all of our products.

We principally serve global original equipment manufacturers ("OEM") and end customers in the semiconductor and industrial technology markets with process power and applied power products. Our process power products are used in a diverse set of processes and applications in semiconductor device manufacturing such as dry etch, strip, chemical and physical deposition, and in thin film application of advanced materials for architectural glass, flat panel displays, crystalline silicon solar cells and industrial coatings. Our applied power products are used across a variety of industrial technology applications and include high and low voltage power supplies, power control modules, thermal instrumentation and gas detection and monitoring products.

Our process power solutions include direct current ("DC"), pulsed DC, low frequency alternating current ("AC"), high voltage, and radio frequency ("RF") power supplies, RF matching networks, remote plasma sources for reactive gas applications and RF instrumentation. These solutions are used in a wide range of thin film processes across the semiconductor applications and for deposition of advanced materials in adjacent industries such as flat panel display, solar cell manufacturing, thin film coating, and hard coatings.

Our power control modules and thermal instrumentation products are used in the semiconductor industry, and also in adjacent thin film applications for solar PV and light emitting diode ("LED") industries, in which time-temperature cycles affect material properties, productivity, and yield. These products are used in rapid thermal processing, chemical vapor deposition, crystal growing, and other semiconductor and adjacent thin film applications requiring non-contact temperature measurement. They are also used in many industrial production applications for chemical processing, metal and glass manufacturing, and numerous other general industrial power applications.

Our high voltage products are designed to meet the demanding requirements of OEMs worldwide. Our high voltage power solutions and custom-built power conversion products offer high frequency, high voltage topology, providing wide input and output operating ranges while retaining excellent stability and efficiencies ranging from benchtop and rackmount systems to micro-size printed circuit board mount modules. The products target applications including semiconductor wafer processing and metrology, electrostatic clamping of substrates, scientific instrumentation, mass spectrometry, and analytical x-ray systems for industrial and analytical applications.

Our gas detection and monitoring products are based on proven infrared technologies to detect and analyze gases in a wide range of industrial applications, including automotive, energy, environmental controls, aerospace, medical and research. Our products offer cost-effective online monitoring solution, allowing our customers to automate manual monitoring or sampling process that will achieve process efficiency, waste reduction, and lower costs of maintenance.

We also design and manufacture MIL-COTS power supplies that meet the high reliability and often harsh operating environments of the military electronics industry and are ideal for use in a variety of applications, including radar systems, communications equipment, test and measurement equipment.

GLOBAL SUPPORT

Our global support services group offers in-warranty and out-of-warranty repair services in the regions in which we operate, providing us with revenue opportunities from repair, upgrades and retrofit offerings to our installed base. Our customers continue to pursue low cost of ownership of their capital equipment and are increasingly sensitive to the significant costs of system downtime. They expect that suppliers offer comprehensive local repair service and customer support. In addition to product repairs our customers look for upgrade and retrofit offerings to extend the useable life of their capital equipment for additional technology generations. To meet these market requirements, we maintain a worldwide support organization comprising both direct and indirect activities through partnership with local distributors primarily in the United States ("U.S."), the People's Republic of China ("PRC"), Japan, South Korea, Taiwan, Germany, and United Kingdom.

As of December 31, 2015, we discontinued the production, engineering, and sales of our solar inverter product line representing a strategic shift in our business. As such, all Inverter revenues, costs, assets and liabilities are reported in Discontinued Operations for all periods presented herein and we currently report as a single unit. However, extended warranties historically sold and reflected as "Deferred Revenue" on our Consolidated Balance Sheets, represent future

revenue and service costs to be incurred by our global services group and are reflected as continuing operations for historical periods and future periods. See *Note 4. Discontinued Operations* in Item 8 "Financial Statements and Supplementary Data."

Markets

Our products compete in markets for high tech applications using capital equipment. The majority of our markets are not generally subject to seasonality; however, these markets are cyclical due to sudden changes in customers' manufacturing capacity requirements and spending, which depend in part on capacity utilization, demand for customers' products, inventory levels relative to demand, government incentives and subsidies, and access to affordable capital. Other factors, such as global economic and market conditions and technological advances in the applications we serve can also have an impact on our financial results, both positively and negatively. For more information related to the markets in which we compete and the current environment in those markets, see *Business Environment and Trends* in Item 7 "Management's Discussion and Analysis of Financial Condition and Results of Operations."

SEMICONDUCTOR MARKET

Customers in the semiconductor capital equipment market incorporate our products into equipment that make integrated circuits. Our process power conversion products and systems provide the energy to enable thin film plasma-based processes, such as dry etch, strip, chemical and physical deposition. Our high voltage products are used in applications such as ion implant, wafer inspection and metrology, electrostatic measurement, and electrostatic clamping of the wafers. Our thermal instrumentation products measure the temperature of the processed substrate or the process chamber. Our power control modules are used in rapid thermal processing applications and for epitaxial growth applications for use in photonics, microelectronics, and photovoltaics. Our remote plasma sources deliver ionized gases for reactive chemical processes used in cleaning, surface treatment, and gas abatement. Precise control over the energy delivered to plasma-based processes enables the production of integrated circuits with reduced feature sizes and increased speed and performance. Our strategy in the semiconductor market is to expand our content of power related products and grow share.

INDUSTRIAL TECHNOLOGY MARKETS

Customers in our industrial technology markets incorporate our products into a variety of production equipment for the processing of advanced materials, standalone instrumentation or devices, and measurement systems for temperature, electrostatic or other power related measurements. Our industrial technology markets include medical and life science, consumer and computing, and industrial production and energy. In the medical and life science industry, our low voltage products and solutions are used in clinical diagnostic equipment, medical lasers, X-ray machines, CT-scanners and MRI scanners, and scientific instrumentation. In the consumer and computing markets, our solutions are used in flat panel display applications and thin-film hard and optical coatings on a variety of materials used in consumer electronics products. In industrial production and energy our products are used in glass and metal manufacturing as well as thin film solar PV applications.

Our industrial technology products fall into two broad categories; Advanced Materials applications, and Applied Power applications.

Advanced Materials applications utilize our process power technologies in non-semiconductor applications including glass coating, glass manufacturing, flat panel displays, solar cell manufacturing, and similar thin film manufacturing, including data storage, decorative, hard and optical coating and utilized the same technologies used in the semiconductor market to deposit films on non-semiconductor substrates. Our strategy in Advanced Materials is to leverage our thin film deposition technologies into a broadening set of new materials and applications in adjacent markets.

Applied Power applications represent mission critical power components that deliver high reliability, precise, low noise or differentiated power to the equipment they serve. These include power control modules and thermal instrumentation products for material fabrication, processing and treatment, high voltage products for analytical instrumentation, medical equipment and industrial applications, and low voltage applications for medical devices, test and measurement, medical lasers and scientific instrumentation. Our gas monitoring and measurement products serve multiple applications in the energy market, air quality monitoring and automobile emission monitoring and testing. Our strategy in Applied Power is to grow and expand our addressable market both organically through our global distribution channels and through acquisitions of products and technologies that are complimentary and adjacent to our core power conversion applications.

Customers

Our products are sold worldwide to approximately 370 OEMs and integrators and directly to more than 1,500 end users. Our ten largest customers accounted for approximately 62.5% of our sales in 2018 , 70.4% of our sales in 2017 , and 67.7% of our sales in 2016 . We expect that the sale of products to our largest customers will continue to account for a significant percentage of our sales for the foreseeable future.

Applied Materials Inc., our largest customer, accounted for 35.9% of our sales in 2018 , 33.5% of our sales in 2017 , and 35.2% of our sales in 2016 . Lam Research accounted for 15.2% of our sales in 2018 , 23.1% of our sales in 2017 , and 20.7% of our sales in 2016 . No other customer accounted for greater than 10% of our sales in 2018 , 2017 , or 2016 . The loss of Applied Materials, Inc. or Lam Research as a customer could have a material adverse effect on our results of operations.

Backlog

Our backlog was approximately \$74.7 million at December 31, 2018 , a 43.1% decrease from \$131.3 million at December 31, 2017 . This decrease primarily resulted from slowing demand in the semiconductor market. For more information related to our expectations for the markets we serve, see *Business Environment and Trends* in Item 7 "Management's Discussion and Analysis of Financial Condition and Results of Operations." Backlog orders are firm orders scheduled to be filled and shipped in the next 12 months.

Backlog orders are not necessarily an indicator of future sales levels because of variations in lead times and customer production demand pull systems, which are not reflected in orders or backlog. Customers may delay delivery of products or cancel orders prior to shipment, subject to possible cancellation penalties. Delays in delivery schedules and/or customer changes to backlog orders during any particular period could cause a decrease in sales and have a material adverse effect on our business and results of operations.

Marketing, Sales and Distribution

We sell our products through direct and indirect sales channels in North America, Europe and Asia. Our sales operations are primarily located in the United States, the PRC, the United Kingdom, Germany, Israel, Japan, South Korea, India, Singapore and Taiwan. In addition to a direct sales force, we have independent sales representatives and distributors that support our selling efforts. We maintain customer service offices at many of the locations listed above, as well as other sites near our customers' locations. We believe that customer service and technical support are important competitive factors and are essential to building and maintaining close, long-term relationships with our customers.

The following table presents our sales by geographic region for the years ended December 31, 2018 , 2017 , and 2016 , which includes a reclassification in prior periods to conform to the current presentation. Sales are attributed to individual countries based on customer location.

	Years ended December 31,		
	2018	2017	2016
Sales to external customers:			
United States	\$ 370,839	\$ 375,907	\$ 327,397
Other North American countries	1,995	1,440	161
North America	372,834	377,347	327,558
Republic of Korea	74,542	83,899	43,359
People's Republic of China	61,927	46,099	16,207
Other Asian countries	114,105	91,692	34,279
Asia	250,574	221,690	93,845
Germany	39,710	30,517	48,589
Other European countries	55,083	41,279	13,712
Europe	94,793	71,796	62,301
Other countries	691	179	—
Total	\$ 718,892	\$ 671,012	\$ 483,704

Total sales to all countries outside of the U.S. totaled \$348.1 million , \$295.1 million , and \$156.3 million in the years ended December 31, 2018 , 2017 , and 2016 , respectively.

See Item 1A "Risk Factors" for a discussion of certain risks related to our foreign operations.

Manufacturing

The manufacturing of our products is performed in Shenzhen, PRC; Ronkonkoma and Lockport, New York; Santa Clara, California; Littlehampton, United Kingdom; Frankfurt, Germany; Ballerup, Denmark; and Vancouver, Washington. Manufacturing in these locations, primarily the PRC, exposes us to risks, such as exchange controls and currency restrictions, changes in local economic conditions, changes in laws and regulations, government actions, political conditions, and an inability to meet customer demands if one of our facilities becomes impaired.

Manufacturing requires raw materials, including a wide variety of mechanical and electrical components, to be manufactured to our specifications. We use numerous companies, including contract manufacturers, to supply parts for the manufacture and support of our products. Although we make reasonable efforts to assure that parts are available from multiple qualified suppliers, some key parts may be obtained from a sole supplier or a limited group of suppliers. We seek to reduce costs and to lower the risks of production and service interruptions, as well as shortages of key parts by:

- selecting and qualifying alternate suppliers for key parts using rigorous technical and commercial evaluation of suppliers' products and business processes including testing their components' performance, quality, and reliability on our power conversion product at our customers' and their customer's processes. The qualification process for our process power products, particularly as it pertains to semiconductor customers, follows semiconductor industry standard practices, such as "copy exact";
- monitoring the financial condition and overall performance of key suppliers;
- maintaining appropriate inventories of key parts, including making last time purchases of key parts when notified by suppliers that they are ending the supply of those parts;
- qualifying new parts on a timely basis and in geographies that reduce costs without degradation in quality;
- locating certain manufacturing operations in areas that are closer to suppliers and customers; and
- competitively sourcing parts through electronic bidding tools to ensure the lowest total cost is achieved for the parts needed in our products.

Intellectual Property

We seek patent protection for inventions governing new products or technologies as part of our ongoing research and development. We currently hold 140 United States patents and 137 foreign-issued patents, and have 30 patent applications pending in the United States, Europe and Asia. A substantial majority of our patents are related to our process power products and solutions business. Generally, our efforts to obtain international patents have been concentrated in the industrialized countries within Europe and Asia because there are other manufacturers and developers of power conversion and control systems in those countries, as well as customers for those systems for which our intellectual property applies.

Litigation may, from time to time, be necessary to enforce patents issued to us, to protect trade secrets or know-how owned by us, to defend us against claimed infringement of the rights of others, or to determine the scope and validity of the proprietary rights of others. See " *We are highly dependent on our intellectual property*" in Item 1A "Risk Factors."

Competition

The markets we serve are highly competitive and characterized by rapid technological development and changing customer requirements. No single company dominates any of our markets. Significant competitive factors in our markets include product performance, compatibility with adjacent products, price, quality, reliability, and level of customer service and support.

We have seen an increase in global competition in the markets in which we compete, especially from Asian and European-based component suppliers. We encounter substantial competition from foreign and domestic companies for each of our product lines. Some of our competitors have greater financial and other resources than we do. In some cases, competitors are smaller than we are, but are well established in specific product niches. Adtec Plasma Tech. Co., Ltd., COMET Holding AG., Daihen Corp., Kyosan Electric Mfg. Co., Ltd., MKS Instruments, Inc., New Power Plasma Co., Ltd., and TRUMPF Hüttinger GmbH + Co. KG., compete with our power conversion products for semiconductor and thin

film processing. Crane Co., Matsusada Precision, Inc., and Spellman High Voltage Electronics Corp. offer products that compete with our high voltage products. CD Automation, Eurotherm, Control Concepts Inc., and Spang Power Electronics offer products that compete with our power control modules. Artesyn Embedded Technologies, Cosel Co., Ltd., Mean Well, TKD-Lambda Americas Inc., Vox Power and XP Power Ltd. compete with our low voltage products. BASF SE., Fluke Corp., LayTec AG., and Photon Control Inc., offer products that compete with our thermal measurement and instrumentation products. Honeywell International, Inc., Morgan Schaffer Ltd., Qualitrol Corp., and Williamson Corp. offer products that compete with our gas detection and monitoring products.

Additionally, a focus on local content is causing new competitors to emerge around the world, with strong support from local governments, industry leaders, and investors.

Our ability to continue to compete successfully in these markets depends on our ability to make timely introduction of new products and enhancements to existing products, to localize these development and production activities in key world regions, and to produce high quality products. We expect our competitors will continue to improve the design and performance of their products and introduce new products with competitive performance characteristics. We believe that we compete effectively with respect to these factors, although we cannot assure that we will be able to compete effectively in the future.

Research and Development

The market for our precision power conversion, thermal, and high voltage products is characterized by ongoing technological changes. We believe that continued and timely development of new highly-differentiated products and enhancements to existing products to support end user and OEM requirements is necessary for us to maintain a competitive position in the markets we serve. Accordingly, we continue to devote a significant portion of our personnel and financial resources to research and development projects and seek to maintain close relationships with our key customers and other industry leaders in order to remain responsive to their product requirements now and in the future.

Research and development expenses were \$76.0 million in 2018 , \$58.0 million in 2017 , and \$44.4 million in 2016 , representing 10.6% of our sales in 2018 , 8.6% of our sales in 2017 , and 9.2% of our sales in 2016 .

Employees

As of December 31, 2018 , we had a total of 2,259 employees. Our employees are not represented by unions, except for statutory organization rights applicable to our employees in the PRC and Germany. We believe that our continued success depends, in part, on our ability to attract and retain qualified personnel. We consider our relations with our employees to be good.

Effect of Environmental Laws

We are subject to federal, state, and local environmental laws and regulations, as well as the environmental laws and regulations of the foreign federal and local jurisdictions in which we have manufacturing and service facilities. We believe we are in material compliance with all such laws and regulations.

Compliance with federal, state, and local laws and regulations has not had, and is not expected to have, an adverse effect on our capital expenditures, competitive position, financial condition, or results of operations.

Website Access

Our website address is www.advancedenergy.com . We make available, free of charge on our website, our Annual Report on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K, and all amendments to these reports as soon as reasonably practicable after filing such reports with, or furnishing them to, the Securities and Exchange Commission (“SEC”). Such reports are also available at www.sec.gov . Information contained on our website is not incorporated by reference in, or otherwise part of, this Annual Report on Form 10-K nor any of our other filings with the SEC.

Special Note Regarding Forward-Looking Statements

This Annual Report on Form 10-K includes or incorporates by reference “forward-looking statements” within the meanings of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended. All statements contained or incorporated by reference in this Annual Report on Form 10-K, other than statements of historical fact, are “forward-looking statements.” For example, statements relating to our beliefs, expectations, plans, projections, forecasts, goals, and estimates are forward-looking statements, as are statements that

specified actions, conditions, or circumstances will continue or change. Forward-looking statements involve risks and uncertainties. In some cases, forward-looking statements can be identified by the inclusion of words such as "believe," "expect," "plan," "anticipate," "estimate," "may," "might," "could," "should," "will," "continue," "intend," "goal," and similar words.

Some of the forward-looking statements in this Annual Report on Form 10-K are, or reflect, our expectations or projections relating to:

- our future revenues;
- our future sales, including backlog orders;
- our ability to be successful in the design win process with our OEM customers;
- unanticipated costs in fulfilling our warranty obligations for solar inverters;
- our future gross profit;
- our competition;
- market acceptance of, and demand for, our products;
- the fair value of our assets and financial instruments;
- research and development expenses;
- selling, general, and administrative expenses;
- sufficiency and availability of capital resources;
- capital expenditures;
- our production and factory strategy;
- our share repurchase program;
- our tax assets and liabilities;
- our other commitments and contingent liabilities;
- adequacy of our reserve for excess and obsolete inventory;
- adequacy of our warranty reserves;
- restructuring activities and expenses;
- the integration of our acquisitions;
- general global political and economic conditions; and
- industry trends.

Our actual results could differ materially from those projected or assumed in our forward-looking statements because forward-looking statements by their nature are subject to risks and uncertainties. Factors that could contribute to these differences or prove our forward-looking statements, by hindsight, to be overly optimistic or unachievable include the factors described in Item 1A "Risk Factors." Other factors might also contribute to the differences between our forward-looking statements and our actual results. We assume no obligation to update any forward-looking statement or the reasons why our actual results might differ.

ITEM 1A. RISK FACTORS

Our business, financial condition, operating results and cash flows can be impacted by a number of factors, including, but not limited to, those set forth below, any of which could cause our results to be adversely impacted and could result in a decline in the value or loss of an investment in our common stock. Other factors may also exist that we cannot anticipate or that we currently do not consider to be significant based on information that is currently available. These risks and uncertainties have the potential to materially affect our business, financial condition, results of operations, cash flows and future results. Such risks and uncertainties may also impact the accuracy of forward-looking statements included in this Form 10-K and other reports we file with the Securities and Exchange Commission. Investors should carefully consider information in this Annual Report on Form 10-K in light of the risk factors described below.

The industries in which we compete are subject to volatile and unpredictable cycles.

As a supplier to the global semiconductor, flat panel display, solar, industrial and related industries, we are subject to business cycles, the timing, length, and volatility of which can be difficult to predict. These industries historically have been cyclical due to sudden changes in customers' manufacturing capacity requirements and spending, which depend in part on capacity utilization, demand for customers' products, inventory levels relative to demand, and access to affordable capital. These changes have affected the timing and amounts of customers' purchases and investments in technology, and continue to affect our orders, net sales, operating expenses, and net income. In addition, we may not be able to respond adequately or quickly to the declines in demand by reducing our costs. We may be required to record significant reserves for excess and obsolete inventory as demand for our products changes.

To meet rapidly changing demand in each of the industries we serve, we must effectively manage our resources and production capacity. During periods of decreasing demand for our products, we must be able to appropriately align our cost structure with prevailing market conditions, effectively manage our supply chain, and motivate and retain key employees. During periods of increasing demand, we must have sufficient manufacturing capacity and inventory to fulfill customer orders, effectively manage our supply chain, and attract, retain, and motivate a sufficient number of qualified individuals. If we are not able to timely and appropriately adapt to changes in our business environment or to accurately assess where we are positioned within a business cycle, our business, financial condition, or results of operations may be materially and adversely affected.

We conduct manufacturing at only a few sites and our sites are not generally interchangeable.

Our power products for the semiconductor industry are manufactured in Shenzhen, PRC. Our high voltage products are manufactured in Ronkonkoma and Lockport, New York, Littlehampton, United Kingdom and Shenzhen, PRC. Our thermal instrumentation products are manufactured in Vancouver, Washington, Santa Clara, California, Littlehampton, United Kingdom and Frankfurt, Germany. Our pyrometry solutions are manufactured in Ballerup, Denmark. Each facility is under operating lease and interruptions in operations could be caused by early termination of existing leases by landlords or failure by landlords to renew existing leases upon expiration, including the possibility that suitable operating locations may not be available in proximity to existing facilities which could result in labor or supply chain risks. Each facility manufactures different products, and therefore, is not interchangeable. Natural, uncontrollable occurrences or other operational issues at any of our manufacturing facilities could significantly reduce our productivity at such site and could prevent us from meeting our customers' requirements in a timely manner, or at all. Any potential losses from such occurrences could significantly affect our relationship with customers, operations and results of operations for a prolonged period of time. As a result, we have begun investing in the evaluation of additional production options in Southeast Asia. We believe this investment will help to mitigate our exposure to regional risks, improve our business continuity profile and lower costs over time.

Our restructuring and other cost reduction efforts have included transitioning manufacturing operations to our facility in Shenzhen from other manufacturing facilities, such as Fort Collins, Colorado and Littlehampton, United Kingdom, which renders us increasingly reliant upon our Shenzhen facility. We have been notified that we will be required to relocate our Shenzhen, PRC manufacturing facility by December 2021. A disruption in manufacturing at our Shenzhen facility, from whatever cause, could have a significantly adverse effect on our ability to fulfill customer orders, our ability to maintain customer relationships, our costs to manufacture our products and, as a result, our results of operations and financial condition.

Our evolving manufacturing footprint may increase our risk.

The nature of our manufacturing is evolving as we continue to grow by acquisition. Historically, our principal manufacturing location has been in Shenzhen, PRC; however, we have also added specialized manufacturing at our Littlehampton, United Kingdom, Ballerup, Denmark, Frankfurt, Germany, Ronkonkoma and Lockport, New York and Santa Clara, California facilities. From time to time we may be required to relocate manufacturing or migrate manufacturing of specific products between facilities or to third party manufacturers. We have been notified that we will be required to relocate our Shenzhen, PRC manufacturing facility by December 2021. If we do not successfully coordinate the timely manufacturing and distribution of our products during this time, we may have insufficient supply of products to meet customer demand, we could lose sales, we may experience a build-up in inventory, or we may incur additional costs.

Raw material, part, component, and subassembly shortages, exacerbated by our dependence on sole and limited source suppliers, could affect our ability to manufacture products and systems and could delay our shipments.

Our business depends on our ability to manufacture products that meet the rapidly changing demands of our customers. Our ability to timely manufacture our products depends in part on the timely delivery of raw materials, parts, components, and subassemblies from suppliers. We rely on sole and limited source suppliers for some of our raw materials, parts, components, and subassemblies that are critical to the manufacturing of our products.

This reliance involves several risks, including the following:

- the inability to obtain an adequate supply of required parts, components, or subassemblies;
- supply shortages, if a sole or limited source provider ceases operations;
- the need to fund the operating losses of a sole or limited source provider;
- reduced control over pricing and timing of delivery of raw materials and parts, components, or subassemblies;
- the need to qualify alternative suppliers;

- suppliers that may provide parts, components or subassemblies that are defective, contain counterfeit goods or are otherwise misrepresented to us in terms of form, fit or function;
- the inability of our suppliers to develop technologically advanced products to support our growth and development of new products; and
- the impact of geopolitical issues or tariffs that could affect the cost and availability of required parts, components, or subassemblies.

From time to time, our sole or limited source suppliers have given us notice that they are ending supply of critical parts, components, and subassemblies that are required for us to deliver product. If we cannot qualify alternative suppliers before ending supply of critical parts from the sole or limited source suppliers, we may be required to make a last-time-buy(s) and take possession of material amounts of inventory in advance of customer demand. In some instances, the last-time-buy materials required to be purchased may be for several years which in turn exposes us to additional excess and obsolescence risk. If we cannot qualify alternative suppliers before the last-time-buy materials are utilized in our products or legacy inverter warranty operations, we may be unable to deliver further product or legacy inverter warranty service to our customers.

Qualifying alternative suppliers could be time consuming and lead to delays in, or prevention of delivery of products to our customers, as well as increased costs. If we are unable to qualify additional suppliers and manage relationships with our existing and future suppliers successfully, if our suppliers experience financial difficulties including bankruptcy, or if our suppliers cannot meet our performance or quality specifications or timing requirements, we may experience shortages, delays, or increased costs of raw materials, parts, components, or subassemblies. This in turn could limit or prevent our ability to manufacture and ship our products, which could materially and adversely affect our relationships with our current and prospective customers and our business, financial condition, and results of operations.

Our orders of raw materials, parts, components, and subassemblies are based on demand forecasts.

We place orders with many of our suppliers based on our customers' quarterly forecasts and our annual forecasts. These forecasts are based on our customers' and our expectations as to demand for our products. As the quarter and the year progress, such demand can change rapidly or we may realize that our customers' expectations were overly optimistic or pessimistic, especially when industry or general economic conditions change. Orders with our suppliers cannot always be amended in response. In addition, in order to assure availability of certain components or to obtain priority pricing, we have entered into contracts with some of our suppliers that require us to purchase a specified amount of components and subassemblies each quarter, even if we are not able to use such components or subassemblies. Moreover, we have obligations to some of our customers to hold a minimum amount of finished goods in inventory, in order to fulfill just in time orders, regardless of whether the customers expect to place such orders. We currently have firm purchase commitments and agreements with various suppliers to ensure the availability of components. If demand for our products does not continue at current levels, we might not be able to use all of the components that we are required to purchase under these commitments and agreements, and our reserves for excess and obsolete inventory may increase, which could have a material adverse effect on our results of operations. If demand for our products exceeds our customers' and our forecasts, we may not be able to timely obtain sufficient raw materials, parts, components, or subassemblies, on favorable terms or at all, to fulfill the excess demand.

Newly enacted U.S. government tax reform could have a negative impact on the results of future operations.

On December 22, 2017, the U.S. Tax Cuts and Jobs Act (the "Tax Act") was enacted which contained substantial changes to the Internal Revenue Code, some of which could have an adverse effect on our business. The Tax Act significantly revises the U.S. corporate income tax by, among other things, lowering corporate income tax rates, implementing the territorial tax system and imposing a transition tax on deemed repatriated earnings of our foreign subsidiaries. In conjunction with the Tax Act, the SEC issued Staff Accounting Bulletin No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act ("SAB 118"), which allowed for the recording of provisional amounts related to the Tax Act and subsequent adjustments related to Tax Act during an up to one-year measurement period. The Company recorded what it believed to be reasonable estimates during the SAB 118 measurement period which lasted from December 2017 to December 2018. During the quarter ended December 31, 2018, the Company finalized the accounting treatment of the income tax effects of the Tax Act. Although the SAB 118 measurement period has ended, there may be some aspects of the Tax Act that remain subject to future regulations and/or notices which may further clarify certain provisions. The Company may need to adjust its previously recorded amounts to reflect the recognition and measurement of its tax accounting positions in accordance with ASC 740, "Income Taxes". These adjustments may have a material impact to our future results of operations.

Significant developments stemming from recent U.S. government actions and proposals concerning tariffs and other economic proposals could have a material adverse effect on us.

Recent U.S. government actions are imposing greater restrictions and economic disincentives on international trade, particularly imports. The U.S. government has adopted changes, and intends to adopt further changes, to trade policy and in some cases, to renegotiate, or potentially terminate, certain existing bilateral or multi-lateral trade agreements. It has also initiated the imposition of additional tariffs on certain foreign goods, including steel and aluminum, semiconductor manufacturing equipment and spare parts thereof.

Examples of recent actions are tariffs on steel and aluminum product imports announced by the U.S. Department of Commerce in March 2018 and a 25% tariff on certain products that originate in China announced by the United States Trade Representative (“USTR”) in June 2018. The USTR also announced in June and July 2018 two additional supplemental lists of products that are subject to tariffs if the goods imported into the United States originate in China, which would increase the cost of imported products. These supplemental lists issued by the USTR issued an additional 25% and 10% duty, respectively, on certain semiconductor equipment and parts originating in China that are sold by us or used in our business in the United States. In August, the second list was made effective with a 25% tariff and in September the third list was made effective with a 10% tariff, with a plan to increase to 25% in March 2019. In the fourth quarter of 2018, these tariffs had an approximate 60 basis point impact to our gross margins. Any increase in the cost of importing such goods and parts could decrease our margins, reduce the competitiveness of our products, or inhibit our ability to sell products or purchase necessary parts, which could have a material adverse effect on our business results, results of operations, or financial condition.

Changes in U.S. trade policy could result in one or more U.S. trading partners adopting responsive trade policy making it more difficult or costly for us to export our products to those countries. As indicated above, these measures could also result in increased costs for goods imported into the U.S. This in turn could require us to increase prices to our customers which may reduce demand, or, if we are unable to increase prices, result in lowering our margin on goods and services sold. To the extent that trade tariffs and other restrictions imposed by the U.S. increase the price of semiconductor equipment and related parts imported into the U.S., the cost of our materials may be adversely affected and the demand from customers for products and services may be diminished, which could adversely affect our revenues and profitability.

We cannot predict future trade policy, the terms of any renegotiated trade agreements or additional imposed tariffs and their impact on our business. The adoption and expansion of trade restrictions, the occurrence of a trade war, or other governmental action related to tariffs or trade agreements or policies has the potential to adversely impact demand for our products, our costs, our customers, our suppliers, and the U.S. economy, which in turn could adversely impact our business, financial condition and results of operations.

Changes in U.S. social, political, regulatory and economic conditions or in laws and policies governing foreign trade, manufacturing, development and investment in the territories and countries where we currently develop and sell products, and any negative sentiments towards the United States as a result of such changes, could adversely affect our business. In addition, negative sentiments towards the United States among non-U.S. customers and among non-U.S. employees or prospective employees could adversely affect sales or hiring and retention, respectively.

Increased governmental action on income tax regulations could negatively impact our business.

International governments have heightened their review and scrutiny of multinational businesses like ours which could increase our compliance costs and future tax liability to those governments. As governments continue to look for ways to increase their revenue streams they could increase audits of companies to accelerate the recovery of monies perceived as owed to them under current or past regulations. Such an increase in audit activity could have a negative impact on companies which operate internationally, as we do.

Activities necessary to integrate acquisitions may result in costs in excess of current expectations or be less successful than anticipated.

We have completed acquisitions in the past and we may acquire other businesses in the future. The success of such transactions will depend on, among other things, our ability to integrate assets and personnel acquired in these transactions and to apply our internal controls process to these acquired businesses. The integration of acquisitions may require significant attention from our management, and the diversion of management’s attention and resources could have a material adverse effect on our ability to manage our business. Furthermore, we may not realize the degree or timing of benefits we anticipated when we first entered into the acquisition transaction. If actual integration costs are higher than amounts originally anticipated, if we are unable to integrate the assets and personnel acquired in an acquisition as

anticipated, or if we are unable to fully benefit from anticipated synergies, our business, financial condition, results of operations, and cash flows could be materially adversely affected.

We have historically made acquisitions and divestitures. However, we may not find suitable acquisition candidates in the future and we may not be able to successfully integrate and manage acquired businesses. In either an acquisition or a divestiture, we may be required to make fundamental changes in our ERP, business processes and tools which could disrupt our core business and harm our financial condition.

In the past, we have made strategic acquisitions of other corporations and entities, as well as asset purchases, and we continue to evaluate potential strategic acquisitions of complementary companies, products, and technologies. We have also divested businesses. In the future, we could:

- issue stock that would dilute our current stockholders' percentage ownership;
- pay cash that would decrease our working capital;
- incur debt;
- assume liabilities; or
- incur expenses related to impairment of goodwill and amortization.

Acquisitions and divestitures also involve numerous risks, including:

- problems combining or separating the acquired/divested operations, systems, technologies, or products;
- an inability to realize expected sales forecasts, operating efficiencies or product integration benefits;
- difficulties in coordinating and integrating geographically separated personnel, organizations, systems, and facilities;
- difficulties integrating business cultures;
- unanticipated costs or liabilities;
- diversion of management's attention from our core business;
- adverse effects on existing business relationships with suppliers and customers;
- potential loss of key employees, particularly those of purchased organizations;
- incurring unforeseen obligations or liabilities in connection with either acquisitions or divestitures; and
- the failure to complete acquisitions even after signing definitive agreements which, among other things, would result in the expensing of potentially significant professional fees and other charges in the period in which the acquisition or negotiations are terminated.

We may not be able to successfully identify appropriate acquisition candidates, to integrate any businesses, products, technologies, or personnel that we might acquire in the future or achieve the anticipated benefits of such transactions, which may harm our business.

Our operations in the People's Republic of China are subject to significant political and economic uncertainties over which we have little or no control and we may be unable to alter our business practice in time to avoid reductions in revenues.

A significant portion of our operations outside the United States are located in the PRC, which exposes us to risks, such as exchange controls and currency restrictions, changes in local economic conditions, changes in customs regulations and tariffs, changes in tax policies, changes in PRC laws and regulations, possible expropriation or other PRC government actions, and unsettled political conditions including potential changes in U.S. policy regarding overseas manufacturing. These factors may have a material adverse effect on our operations, business, results of operations, and financial condition. See "We are exposed to risks associated with worldwide financial markets and the global economy" risk factor below.

The PRC's economy differs from the economies of most developed countries in many respects, including with respect to the amount of government involvement, level of development, rate of growth, control of foreign exchange and allocation of resources. While the economy of the PRC has experienced significant growth in the past 20 years, growth has been uneven across different regions and amongst various economic sectors of the PRC. The PRC government has implemented various measures to encourage economic development and guide the allocation of resources. Strikes by workers and picketing in front of the factory gates of certain companies in Shenzhen have caused unrest among some workers seeking higher wages, which could impact our manufacturing facility in Shenzhen. While some of the government's measures may benefit the overall economy of the PRC, they may have a negative effect on us. For example, our financial condition and results of operations may be materially and adversely affected by government control over capital investments or changes in tax regulations that are applicable to us as well as work stoppages.

Changes in tax laws, tax rates, or mix of earnings in tax jurisdictions in which we do business, could impact our future tax liabilities and related corporate profitability

We are subject to income taxes in the U.S. (federal and state) and numerous foreign jurisdictions. Tax laws, regulations, and administrative practices in various jurisdictions may be subject to significant change due to economic, political, and other conditions, and significant judgment is required in evaluating and estimating our provision and accruals for these taxes. There are many transactions that occur during the ordinary course of business for which the ultimate tax determination is uncertain. Our effective tax rates could be adversely affected by earnings being lower than anticipated in jurisdictions where we have lower statutory rates and earnings higher than anticipated in jurisdictions where we have higher statutory rates, losses incurred in jurisdictions for which we are not able to realize the related tax benefit, changes in foreign currency exchange rates, entry into new businesses and geographies and changes to our existing businesses, acquisitions (including integrations) and investments, changes in our deferred tax assets and liabilities and their valuation, and changes in the relevant tax, accounting, and other laws, regulations, administrative practices, principles, and interpretations, including fundamental changes to the tax laws applicable to corporate multinationals. The U.S., many countries in the European Union, and a number of other countries are actively considering changes in this regard.

For example, on October 5, 2015, the Organization for Economic Co-operation and Development (OECD) issued the final report on all 15 Base Erosion and Profit Shifting "BEPS" Action Plans. According to the OECD, the current rules have created opportunities for Base Erosion and Profit Shifting and suggest new rules whereby profits are taxed where economic activities take place and value is created. OECD comments include new or reinforced international standards as well as concrete measures to help countries tackle BEPS. Among the highlights of the OECD Final Reports are the new transfer pricing approach and reinforced international standards on tax treaties, the setting of minimum standards on harmful tax practices, treaty abuse, country-by-country reporting and dispute resolution, action items requiring national legislation particularly in hybrid mismatches and interest restriction, and analytical reports with recommendations concerning digital economy and multilateral instruments. If countries in which we operate adopt the OECD recommendations as outlined in the BEPS Action Plans, it is uncertain to what extent the changes could impact the Company.

We are exposed to risks associated with worldwide financial markets and the global economy.

Our business depends on the expansion of manufacturing capacity in our end markets and the installation base for the products we sell. In the past, severe tightening of credit markets, turmoil in the financial markets, and a weakening global economy have contributed to slowdowns in the industries in which we operate. Some of our key markets depend largely on consumer spending. Economic uncertainty, such as that recently experienced in the PRC, exacerbates negative trends in consumer spending and may cause our customers to push out, cancel, or refrain from placing orders.

Difficulties in obtaining capital and uncertain market conditions may also lead to a reduction of our sales and greater instances of nonpayment. These conditions may similarly affect our key suppliers, which could affect their ability to deliver parts and result in delays for our products. Further, these conditions and uncertainty about future economic conditions could make it challenging for us to forecast our operating results and evaluate the risks that may affect our business, financial condition, and results of operations. As discussed in "*Our orders of raw materials, parts, components, and subassemblies are based on demand forecasts*," a significant percentage of our expenses are relatively fixed and based, in part, on expectations of future net sales. If a sudden decrease in demand for our products from one or more customers were to occur, the inability to adjust spending quickly enough to compensate for any shortfall would magnify the adverse impact of a shortfall in net sales on our results of operations. Conversely, if market conditions were to unexpectedly improve and demand for our products were to increase suddenly, we might not be able to respond quickly enough, which could have a negative impact on our results of operations and customer relations.

Our results of operations could be affected by natural disasters and other events in the locations in which we or our customers or suppliers operate.

We have manufacturing and other operations in locations subject to natural occurrences such as severe weather and geological events including earthquakes or tsunamis that could disrupt operations. In addition, our suppliers and customers also have operations in such locations. A natural disaster, fire, explosion, or other event that results in a prolonged disruption to our operations, or the operations of our customers or suppliers, may materially adversely affect our business, results of operations, or financial condition.

We transitioned a significant amount of our supply base to Asian suppliers.

We transitioned the purchasing of a substantial portion of components for our thin film products to Asian suppliers to lower our materials costs and shipping expenses. These components might require us to incur higher than anticipated testing or repair costs, which would have an adverse effect on our operating results. Customers who have strict and extensive qualification requirements might not accept our products if these lower-cost components do not meet their requirements. A delay or refusal by our customers to accept such products, as well as an inability of our suppliers to meet our purchasing requirements, might require us to purchase higher-priced components from our existing suppliers or might cause us to lose sales to these customers, either of which could lead to decreased revenue and gross margins and have an adverse effect on our results of operations.

We must continually design and introduce new products into the markets we serve to respond to competition and rapid technological changes.

We operate in a highly competitive environment where innovation is critical, our future success depends on many factors, including the effective commercialization and customer acceptance of our products and services. The development, introduction and support of a broadening set of products is critical to our continued success. Our results of operations could be adversely affected if we do not continue to develop new products, improve and develop new applications for existing products, and differentiate our products from those of competitors resulting in their adoption by customers.

We must achieve design wins to retain our existing customers and to obtain new customers, although design wins achieved do not necessarily result in substantial sales.

Driven by continuing technology migration and changing customers demand the markets we serve are constantly changing in terms of advancement in applications, core technology and competitive pressures. New products we design for capital equipment manufacturers typically have a lifespan of five to ten years. Our success and future growth depends on our products being designed into our customers new generations of equipment as they develop new technologies and applications. We must work with these manufacturers early in their design cycles to modify, enhance and upgrade our products or design new products that meet the requirements of their new systems. The design win process is highly competitive and we may win or lose new design wins for our existing customers or new customers next generations of equipment. In case existing or new customers do not choose our products as a result of the development, evaluation and qualification efforts related to the design win process, our market share will be reduced, the potential revenues related to the lifespan of our customers' products, which can be 5-10 years, will not be realized, and our business, financial condition and results of operations would be materially and adversely impacted.

We generally have no long-term contracts with our customers requiring them to purchase any specified quantities from us.

Our sales are primarily made on a purchase order basis, and we generally have no long-term purchase commitments from our customers, which is typical in the industries we serve. As a result, we are limited in our ability to predict the level of future sales or commitments from our current customers, which may diminish our ability to allocate labor, materials, and equipment in the manufacturing process effectively. In addition, we may purchase inventory in anticipation of sales that do not materialize, resulting in excess and obsolete inventory write-offs.

If we are unable to adjust our business strategy successfully for some of our product lines to reflect the increasing price sensitivity on the part of our customers, our business and financial condition could be harmed.

Our business strategy for many of our product lines has been focused on product performance and technology innovation to provide enhanced efficiencies and productivity. As a result of recent economic conditions and changes in various markets that we serve, our customers have experienced significant cost pressures. We have observed increased price sensitivity on the part of our customers. If competition against any of our product lines should come to focus solely on price rather than on product performance and technology innovation, we will need to adjust our business strategy and product offerings accordingly, and if we are unable to do so, our business, financial condition, and results of operations could be materially and adversely affected.

Our competitive position could be weakened if we are unable to convince end users to specify that our products be used in the equipment sold by our customers.

The end users in our markets may direct equipment manufacturers to use a specified supplier's product in their equipment at a particular facility. This occurs with frequency because our products are critical in manufacturing process control for thin-film applications. Our success, therefore, depends in part on our ability to have end users specify that our

products be used at their facilities. In addition, we may encounter difficulties in changing established relationships of competitors that already have a large installed base of products within such facilities.

The markets we operate in are highly competitive.

We face substantial competition, primarily from established companies, some of which have greater financial, marketing, and technical resources than we do. We expect our competitors will continue to develop new products in direct competition with ours, improve the design and performance of their products, and introduce new products with enhanced performance characteristics. In order to remain competitive, we must improve and expand our products and product offerings. In addition, we may need to maintain a high level of investment in research and development and expand our sales and marketing efforts, particularly outside of the United States. We might not be able to make the technological advances and investments necessary to remain competitive. If we were unable to improve and expand our products and product offerings, our business, financial condition, and results of operations could be materially and adversely affected.

A significant portion of our sales and accounts receivable are concentrated among a few customers.

Our ten largest customers accounted for 62.5% , 70.4% and 67.7% of our sales for the years ended December 31, 2018 , 2017 and 2016 , respectively. During the year ended December 31, 2018 , sales to Applied Materials, Inc. and Lam Research were \$258.0 million and \$109.0 million or 35.9% and 15.2% , respectively, and accounts receivable were \$34.3 million and \$12.2 million , respectively. During the year ended December 31, 2017 , sales to Applied Materials, Inc., and Lam Research were \$224.8 million and \$155.3 million , or 33.5% and 23.1% , respectively, and accounts receivable were \$36.8 million and \$5.4 million , respectively. During the year ended December 31, 2016 , sales to Applied Materials, Inc. and Lam Research were \$170.2 million and \$100.3 million , or 35.2% and 20.7% , respectively, and accounts receivable were \$31.1 million and \$14.3 million , respectively. A significant decline in sales from either or both of these customers, or the Company's inability to collect on these sales, could materially and adversely impact our business, results of operations and financial condition.

We maintain significant amounts of cash in international locations.

Given the global nature of our business, we have both domestic and international concentrations of cash and investments. The value of our cash, cash equivalents, and marketable securities can be negatively affected by liquidity, credit deterioration, financial results, economic risk, political risk, sovereign risk or other factors. The Company intends to utilize its foreign cash to expand our international operations through internal growth and strategic acquisitions. If our intent changes or if these funds are needed for our U.S. operations, or we are negatively impacted by any of the factors above, our financial condition and results of operations could be materially adversely affected.

We are subject to risks inherent in international operations.

Sales to our customers outside the United States were approximately 48.4% and 44.0% of our total sales for the years ended December 31, 2018 and 2017 . The acquisitions of the power controls modules and high and low voltage product lines have increased our presence in international locations. Our success producing goods internationally and competing in international markets is subject to our ability to manage various risks and difficulties, including, but not limited to:

- our ability to effectively manage our employees at remote locations who are operating in different business environments from the United States;
- our ability to develop and maintain relationships with suppliers and other local businesses;
- compliance with product safety requirements and standards that are different from those of the United States;
- variations and changes in laws applicable to our operations in different jurisdictions, including enforceability of intellectual property and contract rights;
- trade restrictions, political instability, disruptions in financial markets, and deterioration of economic conditions;
- customs regulations and the import and export of goods (including customs audits in various countries that occur from time to time);
- the ability to provide sufficient levels of technical support in different locations;
- our ability to obtain business licenses that may be needed in international locations to support expanded operations;
- timely collecting accounts receivable from foreign customers including \$23.2 million in accounts receivable from foreign customers as of December 31, 2018 ; and
- changes in tariffs, taxes, and foreign currency exchange rates.

Our profitability and ability to implement our business strategies, maintain market share and compete successfully in international markets will be compromised if we are unable to manage these and other international risks successfully.

Globalization of sales increases risk of compliance with policy.

We operate in an increasingly complex sales environment around the world which places greater importance on our global control environment and imposes additional oversight risk. Such increased complexity could adversely affect our operating results by increasing compliance costs in the near-term and by increasing the risk of control failures in the event of non-compliance.

Market pressures and increased low-cost competition may reduce or eliminate our profitability.

Our customers continually exert pressure on us to reduce our prices and extend payment terms. Given the nature of our customer base and the highly competitive markets in which we compete, we may be required to reduce our prices or extend payment terms to remain competitive. We have recently seen pricing pressure from our largest customers due in part to low-cost competition and market consolidation. As a result of the competitive markets we serve, from time to time we may enter into long term pricing agreements with our largest customers that results in reduced product pricing. Such reduced product pricing may result in product margin declines unless we are successful in reducing our product costs ahead of such price reductions. We believe some of our Asian competitors benefit from local governmental funding incentives and purchasing preferences from end-user customers in their respective countries. Moreover, in order to be successful in the current competitive environment, we are required to accelerate our investment in research & development to meet time-to-market, performance and technology adoption cycle needs of our customers simply in order to compete for design wins, and if successful, receive potential purchase orders. Given such up-front investments we have to make and the competitive nature of our markets, we may not be able to reduce our expenses in an amount sufficient to offset potential margin declines or loss of business and may not be able to meet customer product time-line expectations. The potential decrease in cash flow could materially and adversely impact our financial condition.

We are highly dependent on our intellectual property.

Our success depends significantly on our proprietary technology. We attempt to protect our intellectual property rights through patents and non-disclosure agreements; however, we might not be able to protect our technology, and competitors might be able to develop similar technology independently. In addition, the laws of some foreign countries might not afford our intellectual property the same protections as do the laws of the United States. Our intellectual property is not protected by patents in several countries in which we do business, and we have limited patent protection in other countries, including the PRC. The cost of applying for patents in foreign countries and translating the applications into foreign languages requires us to select carefully the inventions for which we apply for patent protection and the countries in which we seek such protection. Generally, our efforts to obtain international patents have been concentrated in the European Union and certain industrialized countries in Asia, including Korea, Japan, and Taiwan. If we are unable to protect our intellectual property successfully, our business, financial condition, and results of operations could be materially and adversely affected.

The PRC commercial law is relatively undeveloped compared to the commercial law in the United States. Limited protection of intellectual property is available under PRC law. Consequently, manufacturing our products in the PRC may subject us to an increased risk that unauthorized parties may attempt to copy our products or otherwise obtain or use our intellectual property. We may not be able to protect our intellectual property rights effectively. Additionally, we may not have adequate legal recourse in the event that we encounter infringements of our intellectual property in the PRC.

Our legacy inverter products may suffer higher than anticipated litigation, damage or warranty claims.

Our legacy inverter products (of which we discontinued the manufacture, engineering, and sale in December 2015 and which are reflected as Discontinued Operations in this filing) contain components that may contain errors or defects and were sold with original product warranties ranging from one to ten years with an option to purchase additional warranty coverage for up to 20 years. If any of our products are defective or fail because of their design, we might be required to repair, redesign or recall those products or to pay damages (including liquidated damages) or warranty claims, and we could suffer significant harm to our reputation. We are experiencing claims from customers and suppliers and in some cases litigation related to the legacy inverter product line. We review such claims and vigorously defend against such lawsuits in the ordinary course of our business. We cannot assure you that any such claims or litigation brought against us will not have a material adverse effect on our business or financial statements. Our involvement in such litigation could result in significant expense to us and divert the efforts of our technical and management personnel. We also accrue a warranty reserve for estimated costs to provide warranty services including the cost of technical support, product repairs,

and product replacement for units that cannot be repaired. Our estimate of costs to fulfill our warranty obligations is based on historical experience and expectation of future conditions. To the extent we experience increased warranty claim activity or increased costs associated with servicing those claims, our warranty accrual will increase, resulting in additional expenses in the line "Income (loss) from discontinued operations, net of tax" on our Consolidated Statement of Operations in future periods. We plan to continue supporting inverter customers with service maintenance and repair operations. This includes performing service to fulfill obligations under existing service maintenance contracts. There is no certainty that these can be performed profitably and could be adversely affected by higher than anticipated product failure rates, loss of critical service technician skills, an inability to obtain service parts, customer demands and disputes and cost of repair parts, among other factors. See *Note 4. Discontinued Operations* in Item 8 "Financial Statements and Supplementary Data".

Our products may suffer from defects or errors leading to damage or warranty claims.

Our products use complex system designs and components that may contain errors or defects, particularly when we incorporate new technology into our products or release new versions. If any of our products are defective or fail because of their design, we might be required to repair, redesign or recall those products, pay damages (including liquidated damages) or warranty claims, and we could suffer significant harm to our reputation. We accrue a warranty reserve for estimated costs to provide warranty services including the cost of technical support, product repairs, and product replacement for units that cannot be repaired. Our estimate of costs to fulfill our warranty obligations is based on historical experience and expectation of future conditions. To the extent we experience increased warranty claim activity or increased costs associated with servicing those claims, our warranty accrual will increase, resulting in decreased gross profit. In recent years, we have experienced increased warranty costs for our legacy inverter product lines, which is reflected in "Income from discontinued operations, net of income taxes." See *Note 4. Discontinued Operations* in Item 8 "Financial Statements and Supplementary Data".

Unfavorable currency exchange rate fluctuations may lead to lower operating margins, or may cause us to raise prices, which could result in reduced sales.

Currency exchange rate fluctuations could have an adverse effect on our sales and results of operations and we could experience losses with respect to forward exchange contracts into which we may enter. Unfavorable currency fluctuations could require us to increase prices to foreign customers, which could result in lower net sales by us to such customers. Alternatively, if we do not adjust the prices for our products in response to unfavorable currency fluctuations, our results of operations could be materially and adversely affected. In addition, most sales made by our foreign subsidiaries are denominated in the currency of the country in which these products are sold and the currency in which they receive payment for such sales could be less valuable at the time of receipt as a result of exchange rate fluctuations. Given recent acquisitions in Europe, our exposure to fluctuations in the value of the Euro is becoming more significant. From time to time, we enter into forward exchange contracts and local currency purchased options to reduce currency exposures related to likely or pending transactions including those arising from intercompany sales of inventory. However, we cannot be certain that our efforts will be adequate to protect us against significant currency fluctuations or that such efforts will not expose us to additional exchange rate risks, which could materially and adversely affect our results of operations.

Recent developments relating to the United Kingdom's referendum vote in favor of leaving the European Union and related actions could adversely affect us.

On June 23, 2016, the United Kingdom (UK) held a referendum in which voters approved an exit from the European Union ("EU"). On March 29, 2017, the UK's ambassador to the EU delivered a letter to the president of the European Council that gave formal notice under Article 50 of the Lisbon Treaty of UK's withdrawal from the EU, commonly referred to as "Brexit". As a result, negotiations have commenced to determine the terms of the UK's withdrawal from the EU as well as its relationship with the EU going forward, including the terms of trade between the UK and the EU. Although it is unknown what those terms will be, it is possible that there will be greater restrictions on imports and exports between the UK and EU countries and increased regulatory complexities. These changes may adversely affect our sales, operations and financial results. In particular, our operations in the UK may be adversely affected by extreme fluctuations in the UK exchange rates. Moreover, the imposition of any import restrictions and duties levied on our UK products as imported for EU customers may make our products more expensive for such customers and less competitive from a pricing perspective.

Changes in the value of the Chinese yuan could impact the cost of our operation in Shenzhen, PRC and our sales growth in our PRC markets.

The PRC government is continually pressured by its trading partners to allow its currency to float in a manner similar to other major currencies. Any change in the value of the Chinese yuan may impact our ability to control the cost of our products in the world market. Specifically, the decision by the PRC government to allow the yuan to begin to float against the United States dollar could significantly increase the labor and other costs incurred in the operation of our Shenzhen facility and the cost of raw materials, parts, components, and subassemblies that we source in the PRC, thereby having a material and adverse effect on our financial condition and results of operations.

Difficulties with our enterprise resource planning ("ERP") system and other parts of our global information technology system could harm our business and results of operation.

Like many multinational corporations, we maintain a global information technology system, including software products licensed from third parties. Any system, network or Internet failures, misuse by system users, the hacking into or disruption caused by unauthorized access or loss of license rights could disrupt our ability to timely and accurately manufacture and ship products or to report our financial information in compliance with the timelines mandated by the SEC. Any such failure, misuse, hacking, disruptions or loss would likely cause a diversion of management's attention from the underlying business and could harm our operations. In addition, a significant failure of our global information technology system could adversely affect our ability to complete an evaluation of our internal controls and attestation activities pursuant to Section 404 of the Sarbanes-Oxley Act of 2002.

If our network security measures are breached and unauthorized access is obtained to a customer's data or our data or our information technology systems, we may incur significant legal and financial exposure and liabilities.

As part of our day-to-day business, we store our data and certain data about our customers in our global information technology system. Unauthorized access to our data, including any regarding our customers, could expose us to a risk of loss of this information, loss of business, litigation and possible liability. These security measures may be breached by intentional misconduct by computer hackers, as a result of third-party action, employee error, malfeasance or otherwise. Additionally, third parties may attempt to fraudulently induce employees or customers into disclosing sensitive information such as user names, passwords or other information in order to gain access to our customers' data or our data, including our intellectual property and other confidential business information, or our information technology systems. Because the techniques used to obtain unauthorized access, or to sabotage systems, change frequently and generally are not recognized until launched against a target, we may be unable to anticipate these techniques or to implement adequate preventative measures. Any security breach could result in a loss of confidence by our customers, damage our reputation, disrupt our business, lead to legal liability and negatively impact our future sales.

Our business is subject to complex and evolving U.S. and international laws and regulations regarding privacy and data protection. Many of these laws and regulations are subject to change and uncertain interpretation and could result in claims, changes to our business practices, penalties, increased cost of operations, or declines in user growth or engagement, or otherwise harm our business.

Regulatory authorities around the world are considering a number of legislative and regulatory proposals concerning data protection, including measures to ensure that encryption of users' data does not hinder law enforcement agencies' access to that data. In addition, the interpretation and application of consumer and data protection laws in the U.S., Europe and elsewhere are often uncertain and in flux. It is possible that these laws may be interpreted and applied in a manner that is inconsistent with our data practices. These legislative and regulatory proposals, if adopted, and such interpretations could, in addition to the possibility of fines, result in an order requiring that we change our data practices, which could have an adverse effect on our business and results of operations. Complying with these various laws could cause us to incur substantial costs or require us to change our business practices in a manner adverse to our business.

Recent legal developments in Europe have created compliance uncertainty regarding certain transfers of personal data from Europe to the United States. For example, the General Data Protection Regulation ("GDPR"), effective in the EU starting on May 25, 2018, applies to all of our activities conducted from an establishment in the EU or related to products and services that we offer to EU users. The GDPR creates a range of new compliance obligations, which could cause us to change our business practices, and will significantly increase financial penalties for noncompliance (including possible fines of up to 4% of global annual turnover for the preceding financial year or €20 million (whichever is higher) for the most serious infringements).

The loss of any of our key personnel could significantly harm our results of operations and competitive position.

Our success depends to a significant degree upon the continuing contributions of our key management, technical, marketing, and sales employees. We may not be successful in retaining our key employees or attracting or retaining additional skilled personnel as required. Failure to retain or attract key personnel could significantly harm our results of operations and competitive position. Our success in hiring and retaining employees depends on a variety of factors, including the attractiveness of our compensation and benefit programs, global economic or political and industry conditions, our organizational structure, our reputation, culture and working environment, competition for talent and the availability of qualified employees, the availability of career development opportunities, and our ability to offer a challenging and rewarding work environment. We must develop our personnel to provide succession plans capable of maintaining continuity in the midst of the inevitable unpredictability of personnel retention. While we have plans for key management succession and long-term compensation plans designed to retain our senior employees, if our succession plans do not operate effectively, our business could be adversely affected.

Deterioration of demand for our inverter services could negatively impact our business.

Our business may be adversely affected by changes in national or global demand for our inverter service repair capabilities. Any such changes could adversely affect the carrying amount of our inverter service inventories, thereby negatively affecting our financial results from Continuing Operations.

We have been, and in the future may again be, involved in litigation. Litigation is costly and could result in further restrictions on our ability to conduct business or make use of market relationships we have developed, or an inability to prevent others from using technology.

Litigation may be necessary to enforce our commercial or property rights, to defend ourselves against claimed violations of such rights of others, or to protect our interests in regulatory, tax, customs, commercial, and other disputes or similar matters. Litigation often requires a substantial amount of our management's time and attention, as well as financial and other resources, including:

- substantial costs in the form of legal fees, fines, and royalty payments;
- restrictions on our ability to sell certain products or in certain markets;
- an inability to prevent others from using technology we have developed; and
- a need to redesign products or seek alternative marketing strategies.

Any of these events could have a significant adverse effect on our business, financial condition, and results of operations.

Return on investments or interest rate declines on plan investments could result in additional unfunded pension obligations for the HiTek Power pension plan.

We currently have unfunded obligations in the HiTek Power pension plan. The extent of future contributions to the pension plan depends heavily on market factors such as the discount rate used to calculate our future obligations and the actual return on plan assets which enable future payments. We estimate future contributions to the plan using assumptions with respect to these and other items. Changes to those assumptions could have a significant effect on future contributions. Additionally, a material deterioration in the funded status of the plan could increase pension expenses and reduce our profitability. See *Note 16. Retirement Plans* in Item 8 "Financial Statements and Supplementary Data" contained herein.

Funds associated with our marketable securities that we have traditionally held as short-term investments may not be liquid or readily available.

In the past, certain of our investments have been affected by external market conditions that impacted the liquidity of the investment. We do not currently have investments with reduced liquidity, but external market conditions that we cannot anticipate or mitigate may impact the liquidity of our marketable securities. Any changes in the liquidity associated with these investments may require us to borrow funds at terms that are not favorable or repatriate cash from international locations at a significant cost. We cannot be certain that we will be able to borrow funds or continue to repatriate cash on favorable terms, or at all. If we are unable to do so, our available cash may be reduced until those investments can be liquidated. The lack of available cash may prevent us from taking advantage of business opportunities that arise and may prevent us from executing some of our business plans, either of which could cause our business, financial condition or results of operations to be materially and adversely affected.

Our intangible assets may become impaired.

As of December 31, 2018, we have \$101.9 million of goodwill and \$54.9 million in intangible assets. We periodically review the estimated useful lives of our goodwill and identifiable intangible assets, taking into consideration any events or circumstances that might result in either a diminished fair value, or for intangible assets, a revised useful life. The events and circumstances include significant changes in the business climate, legal factors, operating performance indicators, and competition. Any impairment or revised useful life could have a material and adverse effect on our financial position and results of operations, and could harm the trading price of our common stock.

We are subject to numerous governmental regulations.

We are subject to federal, state, local and foreign regulations, including environmental regulations and regulations relating to the design and operation of our products and control systems and regulations governing the import, export and customs duties related to our products. We might incur significant costs as we seek to ensure that our products meet safety and emissions standards, many of which vary across the states and countries in which our products are used. In the past, we have invested significant resources to redesign our products to comply with these directives. Compliance with future regulations, directives, and standards could require us to modify or redesign some products, make capital expenditures, or incur substantial costs. Also, we may incur significant costs in complying with the myriad of different import, export and customs regulations as we seek to sell our products internationally. If we do not comply with current or future regulations, directives, and standards:

- we could be subject to fines and penalties;
- our production or shipments could be suspended; and
- we could be prohibited from offering particular products in specified markets.

If we were unable to comply with current or future regulations, directives and standards, our business, financial condition and results of operations could be materially and adversely affected.

Financial reform legislation will result in new laws and regulations that may increase our costs of operations.

The Dodd-Frank Wall Street Reform and Consumer Protection Act (the "Dodd-Frank Act") requires various federal agencies to adopt a broad range of new implementing rules and regulations, and to prepare numerous studies and reports for Congress. On August 22, 2012, under the Dodd-Frank Act, the SEC adopted new requirements for companies that use certain minerals and metals, known as conflict minerals, in their products, whether or not these products are manufactured by third parties. These requirements require companies to perform due diligence, disclose and report whether or not such minerals originate from the Democratic Republic of Congo and adjoining countries. We have to perform sufficient due diligence to determine whether such minerals are used in the manufacture of our products. However, the implementation of these requirements could adversely affect the sourcing, availability and pricing of such minerals if they are found to be used in the manufacture of our products. In addition, we incur costs to comply with the disclosure requirements, including costs related to determining the source of any of the relevant minerals and metals used in our products. Since our supply chain is complex, we may not be able to sufficiently verify the origins for these minerals and metals used in our products through the due diligence procedures that we implement, which may harm our reputation. In such event, we may also face difficulties in satisfying customers who require that all of the components of our products are certified as conflict mineral free.

The market price of our common stock has fluctuated and may continue to fluctuate for reasons over which we have no control.

The stock market has from time to time experienced, and is likely to continue to experience, extreme price and volume fluctuations. Prices of securities of technology companies have been especially volatile and have often fluctuated for reasons that are unrelated to their operating performance. In the past, companies that have experienced volatility in the market price of their stock have been the subject of securities class action litigation. If we were the subject of securities class action litigation, it could result in substantial costs and a diversion of management's attention and resources.

Our operating results are subject to fluctuations, and if we fail to meet the expectations of securities analysts or investors, our share price may decrease significantly .

Our annual and quarterly results may vary significantly depending on various factors, many of which are beyond our control. Because our operating expenses are based on anticipated revenue levels, our sales cycle for development work is relatively long, and a high percentage of our expenses are fixed for the short term, a small variation in the timing of recognition of revenue can cause significant variations in operating results from period to period. If our earnings do not meet the expectations of securities analysts or investors, the price of our stock could decline.

Deterioration of economic conditions could negatively impact our business.

Our business may be adversely affected by changes in national or global economic conditions, including inflation, interest rates, availability of capital markets, consumer spending rates, energy availability and costs (including fuel surcharges) and the effects of governmental initiatives to manage economic conditions. Any such changes could adversely affect the demand for our products both in domestic and export markets, or the cost and availability of our needed raw materials and packaging materials, thereby negatively affecting our financial results.

A disruption in credit and other financial markets and deterioration of national and global economic conditions, could, among other things:

- negatively impact global demand for our products, which could result in a reduction of sales, operating income and cash flows;
- make it more difficult or costly for us to obtain financing for our operations or investments or to refinance our debt in the future;
- cause our lenders to depart from prior credit industry practice and make more difficult or expensive the granting of any technical or other waivers under our debt agreements to the extent we may seek them in the future;
- decrease the value of our investments; and
- impair the financial viability of our insurers.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

Information concerning our principal properties at December 31, 2018 is set forth below:

Location	Principal Activity	Ownership
Fort Collins, CO	Corporate headquarters, research and development, distribution, sales, and service	Leased
Lockport, NY	Manufacturing, distribution, service, and research and development	Leased
Milpitas, CA	Research and development, sales, and service	Leased
Santa Clara, CA	Research and development, manufacturing, distribution, sales, and service	Leased
Ronkonkoma, NY	Manufacturing, distribution, service, and research and development	Leased
Vancouver, WA	Research and development, manufacturing, distribution, sales, and service	Leased
Denver, CO	General and administrative	Leased
Georgetown, MA	Sales	Leased
Hancock, MI	Sales	Leased
Baton Rouge, LA	Sales	Leased
Beijing, China	Sales	Leased
Shanghai, China	Sales and distribution	Leased
Shenzhen, China	Manufacturing, distribution, service, and research and development	Leased
Xian, China	Service	Leased
Metzingen, Germany	Distribution, sales, and service	Leased
Warstein-Belecke, Germany	Research and development, distribution, sales, and service	Leased
Frankfurt, Germany	Manufacturing, distribution, sales, service, and research and development	Leased
Magdeburg, Germany	Manufacturing and distribution	Leased
Ballerup, Denmark	Manufacturing, distribution, sales, service, and research and development	Leased
Erstein, France	Sales	Leased
Pune, India	Sales and distribution	Leased
Mumbai, India	Sales	Leased
Cork, Ireland	Sales, service, and research and development	Leased
Caesarea, Israel	Research and development and service	Leased
Tokyo, Japan	Sales and distribution	Leased
Singapore, Singapore	Sales and service	Leased
Hwasung Kyunggi-do, South Korea	Distribution, sales, and service	Leased
Sungnam City, South Korea	Distribution, sales, service and research and development	Leased
Villaz-St-Pierre, Switzerland	Research and development	Leased
Taipei, Taiwan	Sales, distribution, and service	Leased
Littlehampton, United Kingdom	Manufacturing, distribution, sales, service, and research and development	Leased

We consider the properties that we own or lease as adequate to meet our current and future requirements. We regularly assess the size, capability, and location of our global infrastructure and periodically make adjustments based on these assessments.

ITEM 3. LEGAL PROCEEDINGS

We are presently involved in disputes and legal actions arising in the normal course of our business. While we currently believe that the amount of any ultimate loss would not be material to our financial position, the outcome of these actions is inherently difficult to predict. In the event of an adverse outcome, the ultimate loss could have a material adverse effect on our financial position or reported results of operations. An unfavorable decision in patent litigation could require material changes in production processes and products or result in our inability to ship products or components found to have violated third-party patent rights. An unfavorable decision in a collection action against a customer we sold products to, or a claim or counterclaim from a customer related to alleged product failures, could also have a material adverse effect on our financial position or reported results of operations. We are engaged presently in such disputes and legal actions with customers and supplier for the inverter product line. We accrue loss contingencies in connection with our commitments and contingencies, including litigation, when it is probable that a loss has occurred and the amount of the loss can be reasonably estimated.

ITEM 4. MINE SAFETY DISCLOSURES

None.

Executive Officers of the Registrant

Our executive officers, their positions and their ages as of December 31, 2018 were as follows:

Yuval Wasserman, 64, has served as President & Chief Executive Officer, and as a director since October 2014. Mr. Wasserman joined us in August 2007 as Senior Vice President, Sales, Marketing and Service. In October 2007, Mr. Wasserman was promoted to Executive Vice President, Sales, Marketing and Service. In April 2009, he was promoted to Executive Vice President and Chief Operating Officer of the Company, and then in August 2011, he was promoted to President of the Thin Films Business Unit. Prior to joining the Company, Mr. Wasserman served as the President, and later as Chief Executive Officer, of Tevet Process Control Technologies, Inc., a semiconductor metrology company, until July 2007. Prior to that, he held senior executive and general management positions at Boxer Cross (a metrology company acquired by Applied Materials, Inc.), Fusion Systems (a plasma strip company that is a division of Axcelis Technologies, Inc.), and AG Associates (a semiconductor capital equipment company focused on rapid thermal processing). Mr. Wasserman started his career at National Semiconductor, Inc., where he held various process engineering and management positions. Mr. Wasserman was on the Board of Directors of Synchroness, Inc., an outsourced engineering and product development company, from 2010 to 2017 when it was sold, and joined the Board of Directors of FARO Technologies, Inc., a publicly traded, manufacturer of three-dimensional (3D) measurement, imaging and realization systems, in December 2017. Mr. Wasserman is a National Association of Corporate Directors (NACD) Governance Fellow. Mr. Wasserman has a BSc degree in chemical engineering from Ben Gurion University in Israel.

Paul Oldham, 55, joined the Company in May 2018 as its Executive Vice President & Chief Financial Officer. Previously Mr. Oldham served as the Senior Vice President of Administration, Chief Financial Officer and Corporate Secretary of Electro Scientific Industries, Inc. ("ESI"), a developer and manufacturer of laser-based production equipment, from February 17, 2016 until December 4, 2017, and as the Vice President of Administration, Chief Financial Officer and Corporate Secretary of ESI from January 7, 2008 until February 16, 2016. Prior to joining ESI, Mr. Oldham was employed at Tektronix, Inc., a test, measurement, and monitoring company, since 1988, where he held several senior leadership positions, including Vice President Finance and Corporate Controller, Vice President - Treasurer and Investor Relations and European Operations Controller. Mr. Oldham has a Bachelor's Degree in Accounting and an MBA in accounting and finance from Brigham Young University.

Neil Brinker, 43, joined the Company in June 2018 as its Executive Vice President & Chief Operating Officer. Previously Mr. Brinker served as the Group President of the IDEX Corporation ("IDEX"), from July 2015, and was Platform President of IDEX's Material Processing Technologies from May 2014 to July 2015 and General Manager of IDEX's Fluid Management business from April 2012 to May 2014. Prior to IDEX, Mr. Brinker was a Director of Global Operations at Danaher Corporation ("Danaher") from July 2009 to April 2012 and held several other operations management leadership positions at Danaher from February 2007 to July 2009. Prior to Danaher, Mr. Brinker held various management positions at General Motors Company from 2001 to 2007. Mr. Brinker holds a B.S.M.E. degree from Michigan State University, a Master of Engineering from the University of Michigan and an MBA from Eastern Michigan University.

Thomas O. McGimpsey, 57, joined the Company in April 2009 and serves as its Executive Vice President, General Counsel, Government Affairs & Corporate Secretary. Mr. McGimpsey was the interim Chief Financial Officer from January to May 2018, the Corporate Development Officer from 2011 to 2015 and managed the IT Department from 2010 to 2013, all while serving as General Counsel. Prior to joining the Company, Mr. McGimpsey was a Vice President of Operations at First Data Corporation from February 2008 to April 2009. During 2007, Mr. McGimpsey was a consultant and legal advisor to various companies. Prior to that, Mr. McGimpsey was the Executive Vice President of Business Development & Chief Legal Officer for McDATA Corporation from July 2000 to January 2007 when the company was sold. From February 1998 until its sale in June 2000, Mr. McGimpsey held the position of Director and Senior Corporate Attorney at US WEST, Inc. From 1991 to 1998, Mr. McGimpsey was in private practice at national law firms. From 1984 to 1988, Mr. McGimpsey was a Senior Engineer for Software Technology, Inc. (a Harris company). Mr. McGimpsey has been on the Board of Directors of CPP, Inc., an international engineering services company since August 2015 and has been a Commissioner on the Colorado Commission on Higher Education since July 2015. Mr. McGimpsey received his Executive MBA (with honors) from Colorado State University, his Juris Doctor degree from the University of Colorado and his B.S. degree in Computer Science from Embry-Riddle Aeronautical University. Mr. McGimpsey is a National Association of Corporate Directors (NACD) Board Leadership Fellow and is licensed to practice law in New York, Colorado, Florida and before the U.S. Supreme Court.

PART II**ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES****Principal Market**

Our common stock is listed on the NASDAQ Global Select Market under the symbol "AEIS." At February 19, 2019, the number of common stockholders of record was 315, and the closing sale price of our common stock on the NASDAQ Global Select Market on that day was \$50.93 per share.

Dividend Policy

We have not declared or paid any cash dividends on our capital stock in our history as a public company. We currently intend to retain all future earnings to finance our business or make stock repurchases and do not anticipate paying cash or other dividends on our common stock in the foreseeable future.

Share Repurchase

In September 2015, our Board of Directors authorized a program to repurchase up to \$150.0 million of our stock over a thirty-month period. In November 2017, our Board of Directors approved an extension of the share repurchase program to December 2019 from its original maturity of March 2018. In May 2018, our Board of Directors approved a \$50 million increase in its authorization to repurchase shares of our common stock under this same program. As of December 31, 2018, we had \$24.9 million remaining for the future repurchase of shares of our common stock.

In order to execute the repurchase of shares of our common stock, the Company periodically enters into stock repurchase agreements. During the years ended December 31, 2018, 2017 and 2016 the Company has repurchased the following shares of common stock (in thousands, except per share amounts):

	Years Ended December 31,		
	2018	2017	2016 (1)
Amount paid to repurchase shares	\$ 95,125	\$ 29,993	\$ —
Number of shares repurchased	1,696	422	343
Average repurchase price per share	\$ 56.07	\$ 71.07	\$ —

(1) In November 2015 we entered into a Fixed Dollar Accelerated Share Repurchase Transaction to purchase \$50.0 million of shares of our common stock in the open market. A total of 1.7 million shares of our common stock was repurchased under the Fixed Dollar Accelerated Share Repurchase Agreement at an average price of \$28.99 per share. The final 0.3 million shares of our common stock was delivered in 2016.

All shares repurchased were executed in the open market, and no shares were repurchased from related parties. Repurchased shares were retired and assumed the status of authorized and unissued shares. Accordingly, the associated cost of the repurchased shares were recognized as a reduction to additional paid-in capital.

The following table summarizes information with respect to the Company's purchase of its common stock during the quarter ended December 31, 2018 (in thousands, except per share amounts):

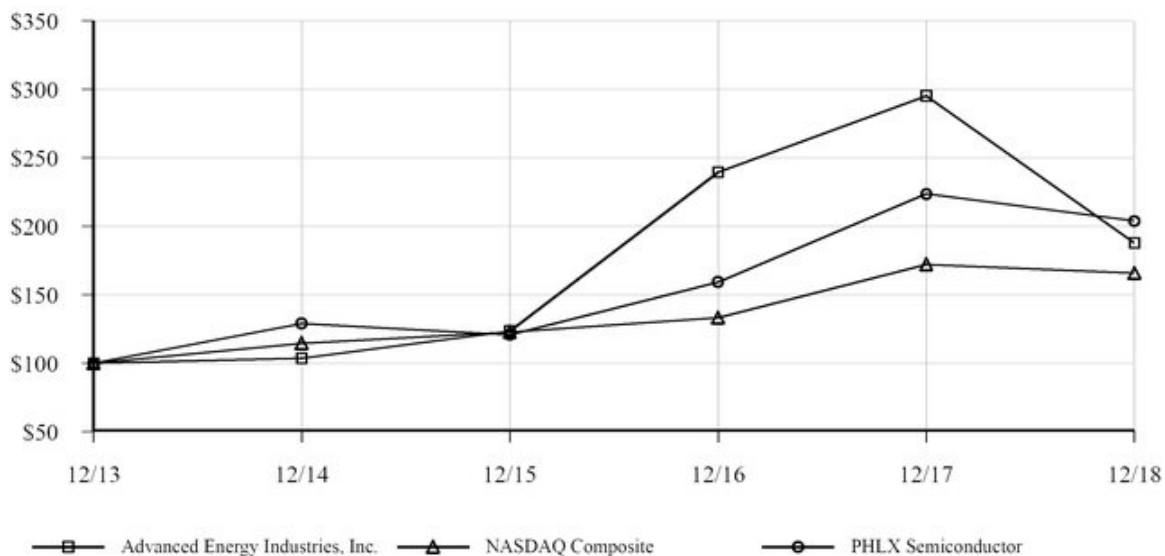
Period	Total Number of Shares Purchased	Average Price Paid per Share	Total Number of Shares Purchased as Part of Publicly Announced Program (1)	Approximate Dollar Value of Shares that May Yet Be Purchased Under the Program
October 1 - October 31, 2018	227	\$ 48.84	227	\$ 39,902
November 1 - November 30, 2018	190	43.75	190	31,577
December 1 - December 31, 2018	158	42.29	158	24,902
Total	575	45.36	575	24,902

(1) In September 2015, our Board of Directors authorized a program to repurchase up to \$150.0 million of our stock over a thirty-month period. In November 2017, our Board of Directors approved an extension of this program until December 31, 2019. In May, 2018, our Board of Directors approved a \$50 million increase in its authorization to repurchase shares of Company common stock under this same program.

Performance Graph

The performance graph below shows the five-year cumulative total stockholder return on our common stock during the period from December 31, 2013 through December 31, 2018. This is compared with the cumulative total return of the NASDAQ Composite Index and the Philadelphia Semiconductor Index (PHLX) over the same period. The comparison assumes \$100 was invested on December 31, 2013 in Advanced Energy common stock and in each of the foregoing indices and assumes reinvestment of dividends, if any. Dollar amounts in the graph are rounded to the nearest whole dollar. The performance shown in the graph represents past performance and should not be considered an indication of future performance.

COMPARISON OF 5 YEAR CUMULATIVE TOTAL RETURN(1)
Among Advanced Energy Industries, Inc., the NASDAQ Composite Index, and the PHLX Semiconductor Index



(1) \$100 invested on 12/31/2013 in our stock or index, including reinvestment of dividends. Indices and our stock performance are calculated on a calendar year-end basis.

	12/13	12/14	12/15	12/16	12/17	12/18
Advanced Energy Industries, Inc.	\$ 100.00	\$ 103.67	\$ 123.49	\$ 239.50	\$ 295.19	\$ 187.80
NASDAQ Composite	100.00	114.62	122.81	133.19	172.11	165.84
PHLX Semiconductor	100.00	129.03	120.80	159.29	223.53	203.91

Information relating to compensation plans under which our equity securities are authorized for issuance is set forth in Part III, Item 12 of this Annual Report on Form 10-K.

ITEM 6. SELECTED FINANCIAL DATA

The selected Consolidated Statements of Operations and related Consolidated Balance Sheets data were derived from our audited Consolidated Financial Statements. The information below is not necessarily indicative of results of future operations and should be read in conjunction with Item 7 “Management’s Discussion and Analysis of Financial Condition and Results of Operations” of this Form 10-K in order to understand more fully the factors that may affect the comparability of the information presented below (in thousands, except per share amounts):

	Years Ended December 31,				
	2018	2017	2016	2015	2014
Consolidated Statements of Operations Data:					
Sales, net ⁽¹⁾⁽²⁾	\$ 718,892	\$ 671,012	\$ 483,704	\$ 414,811	\$ 367,333
Operating income	171,553	200,770	126,857	106,656	86,091
Income from continuing operations before income taxes	172,376	198,191	128,076	105,442	86,005
Income from continuing operations, net of income taxes ⁽³⁾	147,149	136,101	116,948	83,482	69,495
Income (loss) from discontinued operations, net of income taxes ⁽⁴⁾	(38)	1,760	10,506	(241,968)	(22,513)
Net Income	147,111	137,861	127,454	(158,486)	46,982
Income from continuing operations attributable to noncontrolling interest	86	—	—	—	—
Net income attributable to Advanced Energy Industries, Inc.	147,025	137,861	127,454	(158,486)	46,982
Earnings per Share:					
Continuing Operations:					
Basic earnings per share	\$ 3.76	\$ 3.42	\$ 2.94	\$ 2.05	\$ 1.72
Diluted earnings per share	\$ 3.74	\$ 3.39	\$ 2.92	\$ 2.03	\$ 1.69
Discontinued Operations:					
Basic earnings (loss) per share	\$ —	\$ 0.04	\$ 0.26	\$ (5.94)	\$ (0.56)
Diluted earnings (loss) per share	\$ —	\$ 0.04	\$ 0.26	\$ (5.94)	\$ (0.56)
Net Income (Loss):					
Basic earnings (loss) per share	\$ 3.76	\$ 3.47	\$ 3.21	\$ (3.89)	\$ 1.16
Diluted earnings (loss) per share	\$ 3.74	\$ 3.43	\$ 3.18	\$ (3.89)	\$ 1.14
Basic weighted-average common shares outstanding	39,081	39,754	39,720	40,746	40,420
Diluted weighted-average common shares outstanding	39,352	40,176	40,031	41,077	41,034
Consolidated Balance Sheets Data:					
Total assets	\$ 816,484	\$ 733,308	\$ 571,529	\$ 462,503	\$ 684,409
Total long term liabilities	\$ 98,873	\$ 106,548	\$ 84,409	\$ 95,024	\$ 97,035

(1) Included in sales for 2018 is \$17.4 million related to the acquisition of all the outstanding shares of LumaSense Technologies Holdings, Inc. as of September 1, 2018 and \$21.3 million related to the acquisition of all the outstanding shares of Trek Holding Co. Ltd as of February 2, 2018 and the acquisition of the electrostatic technology and product line from Monroe Electronics, Inc as of May 1, 2018.

(2) Included in sales for 2017 is \$7.6 million related to the acquisition of all the outstanding shares of Excelsys Holding Ltd. as of July 1, 2017.

(3) We recognized tax expense of \$5.7 million, or \$0.14 per diluted share, and \$72.9 million, or \$1.81 per diluted share, for 2018 and 2017, respectively, associated with the impacts of the enactment of the U.S. Tax Cuts and Jobs Act legislation in December 2017. We recognized a tax benefit of \$33.8 million, or \$0.84 per diluted share, in 2017 related to the continued wind down of our solar inverter business which was discontinued in 2015.

(4) In 2015, we discontinued the development, sales and distribution of our solar inverter product line.

ITEM 7. MANAGEMENT’S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

Certain statements set forth below under this caption constitute forward-looking statements. See “ *Special Note Regarding Forward-Looking Statements* ” in Item 1 “Business” of this Annual Report on Form 10-K for additional factors relating to such statements, and see “ *Risk Factors* ” in Item 1A for a discussion of certain risks applicable to our business, financial condition and results of operations.

Overview

We design, manufacture, sell, and support power conversion products that transform power into various usable forms. Our products enable innovative, complex manufacturing processes that use thin film technology for various products, such as semiconductor devices, flat panel displays, thin film renewables, architectural glass, optical coating and consumer products decorative and functional coating. We also supply thermal instrumentation products for advanced temperature measurement and control, electrostatic instrumentation products in test and measurement applications, and gas sensing and monitoring solutions for multiple industrial markets. Our power control modules provide power control solutions for industrial applications where heat treatment and processing are used such as glass manufacturing, metal fabrication and treatment, material and chemical

processing. Our high voltage power supplies and modules are used in applications such as semiconductor ion implantation, semiconductor inspection, scanning electron microscopy, chemical analysis such as mass spectrometry and electrophoresis, and various medical applications including electroporation and MRI analytics. Our network of global service support centers provides a recurring revenue opportunity as we offer repair services, conversions, upgrades, and refurbishments and used equipment to companies using our products.

Driven by continuing technology migration and changing customer demands, the markets we serve are constantly changing in terms of advancement in applications, core technology and competitive pressures. New products we design for capital equipment manufacturers typically have a lifespan of five to ten years. Our success and future growth depends on our products being designed into our customers' new generations of equipment as they develop new technologies and applications. We must work with these manufacturers early in their design cycles to modify, enhance and upgrade our products or design new products that meet the requirements of their new systems. The design win process is highly competitive and we may win or lose new designs for our existing customers' or new customers' next generations of equipment. If existing or new customers do not choose our products as a result of the development, evaluation and qualification efforts related to the design win process, our market share may be reduced, the potential revenues related to the lifespan of our customers' products, which can be 5-10 years, may not be realized, and our business, financial condition and results of operations may be materially and adversely impacted.

CRITICAL ACCOUNTING ESTIMATES

The preparation of Consolidated Financial Statements and related disclosures in conformity with accounting principles generally accepted in the United States of America ("U.S. GAAP") requires management to make judgments, assumptions, and estimates that affect the amounts reported. *Note 1. Operations and Summary of Significant Accounting Policies and Estimates* in Item 8 "Financial Statements and Supplementary Data" describes the significant accounting policies used in the preparation of our Consolidated Financial Statements. The accounting positions described below are significantly affected by critical accounting estimates. Such accounting positions require significant judgments, assumptions, and estimates to be used in the preparation of the Consolidated Financial Statements, actual results could differ materially from the amounts reported based on variability in factors affecting these statements.

Revenue Recognition

We recognize revenue when we have satisfied our performance obligations which typically occurs when control of the products or completion of services have been transferred to our customers. The transaction price is based upon the standalone selling price. In most transactions, we have no obligations to our customers after the date products are shipped, other than pursuant to warranty obligations. Revenue is recognized net of any taxes collected from customers, which are subsequently remitted to governmental authorities. Shipping and handling fees, if any, are recognized as revenue. The related shipping and handling costs is recognized in cost of sales. Support services include warranty and non-warranty repair services, upgrades, and refurbishments on the products we sell. Repairs that are covered under our standard warranty do not generate revenue.

We maintain a credit approval process and we make significant judgments in connection with assessing our customers' ability to pay. Despite this assessment, from time to time, our customers are unable to meet their payment obligations. We continuously monitor our customers' credit worthiness and use our judgment in establishing a provision for estimated credit losses based upon our historical experience and any specific customer collection issues that we have identified. While such credit losses have historically been within our expectations and the provisions established, a significant change in the liquidity or financial position of our customers could have a material adverse impact on the collectability of accounts receivable and our future operating results. Additionally, if our credit loss rates prove to be greater than we currently estimate, we record additional reserves for doubtful accounts.

Inventory

We value our inventory at the lower of cost (first-in, first-out method) or net realizable value. We regularly review inventory quantities on hand and record a provision to write-down excess and obsolete inventory to its estimated net realizable value, if less than cost, based primarily on our estimated forecast of product demand. Demand for our products can fluctuate significantly. Our industry is subject to technological change, new product development, and product technological obsolescence that could result in an increase in the amount of obsolete inventory quantities on hand. Therefore, any significant unanticipated changes in demand or technological developments in excess of our current estimates could have a significant impact on the value of our inventory and our reported operating results.

Warranty Costs

We provide for the estimated costs to fulfill customer warranty obligations upon the recognition of the related revenue. We offer warranty coverage for a majority of our products for periods typically ranging from 12 to 24 months after shipment. We provided warranties on our inverter products for five to ten years and also provided the option to purchase additional warranty coverage up to 20 years. The product warranty expense accrued related to our standard inverter product warranties is now considered part of our discontinued operations and is recorded as such on our Consolidated Balance Sheets. See *Note 4. Discontinued Operations* in Item 8 "Financial Statements and Supplementary Data" for more information on our discontinued operations and *Note 15. Warranties* in Item 8 "Financial Statements and Supplementary Data" for more information on our warranties from continuing operations. We estimate the anticipated costs of repairing our products under such warranties based on the historical costs of the repairs. The assumptions we use to estimate warranty accruals are reevaluated periodically, in light of actual experience, and when appropriate, the accruals are adjusted. Should product failure rates differ from our estimates, actual costs could vary significantly from our expectations.

Goodwill, Intangible and Other Long-Lived Assets

As a result of our acquisitions, we recorded goodwill and intangible assets. Goodwill and indefinite-lived intangible assets are subject to annual impairment testing, as well as testing upon the occurrence of any event that indicates a potential impairment. The annual impairment test can be performed using an assessment of qualitative factors in determining if it is more likely than not that goodwill is impaired. If this assessment indicates that it is more likely than not that goodwill is impaired, then the next step of impairment testing compares the fair value of a reporting unit to its carrying value. Goodwill would be impaired if the resulting implied fair value of goodwill was less than the recorded carrying value of the goodwill.

Finite-lived intangible assets and other long-lived assets are subject to an impairment test if there is an indicator of impairment. When we determine that the carrying value of intangibles or other long-lived assets may not be recoverable based upon the existence of one or more indicators of impairment, we use the projected undiscounted cash flow method to determine whether an impairment exists, and then measure the impairment using discounted cash flows and other fair value measurements. The carrying value and ultimate realization of these assets is dependent upon our estimates of future earnings and benefits that we expect to generate from their use. If our expectations of future results and cash flows are significantly diminished, intangible assets, long-lived assets, and goodwill may be impaired and the resulting charge to operations may be material. Additionally, the estimation of useful lives and expected cash flows require us to make significant judgments regarding future periods that are subject to some factors outside of our control. Changes in these estimates could result in significant revisions to our carrying value of these assets and may result in material charges to our results of operations.

In 2018, we performed an assessment of qualitative factors for our annual impairment test of the goodwill. The factors reviewed included macroeconomic conditions, industry and market conditions, cost factors, and overall financial performance. This assessment resulted in the conclusion that there was no impairment of goodwill in 2018.

Income Taxes

We are subject to income taxes in the United States and numerous foreign jurisdictions. Significant judgment is required in determining our provision for income taxes and income tax assets and liabilities, including evaluating uncertainties in the application of accounting principles and complex tax laws. We record a provision for income taxes for the anticipated tax consequences of the reported results of operations using the asset and liability method. Under this method, we recognize deferred tax assets and liabilities for the expected future tax consequences of temporary differences between the financial reporting and tax bases of assets and liabilities, as well as for operating loss and tax credit carryforwards. Deferred tax assets and liabilities are measured using the tax rates that are expected to apply to taxable income for the years in which those tax assets and liabilities are expected to be realized or settled. We calculate tax expense consistent with intraperiod tax allocation methodology resulting in an allocation of current year tax expense/benefit between continuing operations and discontinued operations. We record a valuation allowance to reduce our deferred tax assets to the net amount that we believe is more likely than not to be realized. We recognize tax benefits from uncertain tax positions only if we believe that it is more likely than not that the tax position will be sustained on examination by the taxing authorities based on the technical merits of the position. Although we believe that we have adequately reserved for our uncertain tax positions, we can provide no assurance that the final tax outcome of these matters will not be materially different. We make adjustments to these reserves when facts and circumstances change, such as the closing of a tax audit or the refinement of an estimate. To the extent that the final tax outcome of these matters is different than the amounts recorded, such differences will affect the provision for income taxes in the period in which such determination is made and could have a material impact on our financial condition and operating results. The provision for income taxes includes the effects of any reserves that we believe are appropriate, as well as the related net interest and penalties. For more details see *Note. 5 Income Taxes* in Item 8 "Financial Statements and Supplementary Data."

On December 22, 2017, the U.S. enacted the Tax Act into law. Due to the complexity and scope of the Tax Act, the SEC issued SAB 118, which provided for a one-year measurement period from the date of enactment in which to complete the associated tax analysis. This analysis included finalization of the transition tax, re-measuring our U.S. deferred tax assets and liabilities based on the reduction of the corporate income tax rate to 21%, as well as reassessing our indefinite reinvestment position. The analysis of the impact of the Tax Act was completed within the SAB 118 measurement period and are included in the results of operations as of December 31, 2018.

Business Environment and Trends

SEMICONDUCTOR MARKET

The semiconductor market is being driven by the rapid adoption of solid-state drives (SSD) deploying the latest 3D-NAND memory devices and a ramp of advanced Logic devices at the 10nm technology node. The industry's transition to 3D memory devices and advanced Logic is generating increasing demand for RF power supplies, matches and accessories. The growing number of steps associated with the deposition and etch processes is driving an increase in the number of process chambers per fab and higher content of more advanced power solutions per chamber. As etching processes become more challenging due to increasing aspect ratios in advanced 3D devices, more advanced RF technology that includes pulsing and increased control and instrumentation is needed. We are capitalizing on these trends and providing a broader range of more complex combinations of RF power and frequencies and launching more capable matching networks to manage and control the delivered power. During the year, we acquired Trek and LumaSense, which increased our presence in the electrostatic chuck, electrostatic sensor, and temperature measurement applications for the semiconductor market.

Investment in semiconductor capital equipment remained strong during the first half of 2018, following 2017 where investment in semiconductor capital equipment increased approximately 30%. During the second half of 2018, we began to see a pause in the semiconductor capital equipment market that continued through the end of 2018. In the fourth quarter the decline accelerated as the semiconductor market was impacted by slowing growth in end market demand for semiconductor devices, digestion of equipment capacity, and uncertainty around trade policies and global economic growth. Our business is further impacted by inventory reductions in both semiconductor devices and finished goods inventory at our customers. It is difficult to determine when or if overall market investment in semiconductor capital equipment will return to 2017 levels.

INDUSTRIAL TECHNOLOGY MARKETS

Customers in the industrial capital equipment market incorporate our industrial process power and applied power products into a wide variety of equipment used in applications such as thin films, advanced material fabrication, and analytical instrumentation.

In industrial technology applications, we remain focused on taking our products into new applications and world regions, increasing our penetration into Asia, Europe and North America. In 2018, we made gains across an array of industries. Demand for our products used in many industrial thin film coating and specialty power markets increased, particularly in manufacturing areas for products such as solar panels, consumer device coatings, flat panel displays and analytical instrumentation. The flat panel display market showed continued strength with the ongoing ramp of OLED mobile screen capacity. Our thermal process control and measurement instruments are also making gains in North America, where we have focused for regional expansion. Our acquisition of LumaSense further expanded our presence in pyrometry and other temperature measurement applications and our acquisition of Trek added electrostatic measurement capability for industrial production and energy applications.

Results of Continuing Operations

Our analysis presented below is organized to provide the information we believe will facilitate an understanding of our historical performance and relevant trends going forward, and should be read in conjunction with our Consolidated Financial Statements, including the notes thereto, in Item 8 "Financial Statements and Supplementary Data" of this Annual Report on Form 10-K.

Advanced Energy is organized as a single business unit, which principally serves OEM and end customers in the semiconductor and industrial technologies capital equipment markets with power generation, conversion, measurement and control solutions. As of December 31, 2015 we discontinued our inverter products manufacturing and sales. All prior periods disclosed have been recast to reflect our continuing operations. Results of discontinued operations are reflected as "Income (loss) from discontinued operations, net of income taxes" in our Consolidated Statements of Operations. See *Note 4. Discontinued Operations* in Item 8 "Financial Statements and Supplementary Data."

The following table sets forth, for the periods indicated, certain data derived from our Consolidated Statements of Operations (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Sales, net	\$ 718,892	\$ 671,012	\$ 483,704
Gross profit	365,607	356,381	253,147
Operating expenses	194,054	155,611	126,290
Operating income	171,553	200,770	126,857
Other income (expense)	823	(2,579)	1,219
Income from continuing operations before income taxes	172,376	198,191	128,076
Provision for income taxes	25,227	62,090	11,128
Income from continuing operations, net of income taxes	\$ 147,149	\$ 136,101	\$ 116,948

The following table sets forth, for the periods indicated, the percentage of sales represented by certain items reflected in our Consolidated Statements of Operations (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Sales, net	100.0%	100.0 %	100.0%
Gross profit	50.9	53.1	52.3
Operating expenses	27.0	23.1	26.2
Operating income	23.9	30.0	26.1
Other income (expense)	0.1	(0.4)	0.3
Income from continuing operations before income taxes	24.0	29.6	26.4
Provision for income taxes	3.5	9.3	2.3
Income from continuing operations, net of income taxes	20.5%	20.3 %	24.1%

SALES, NET

The following tables summarize annual sales and percentages of sales, by product line, for each of the years ended 2018 , 2017 and 2016 (in thousands):

	Years Ended December 31,			Change			
	2018	2017	2016	2018 v. 2017		2017 v. 2016	
Semiconductor capital equipment	\$ 443,141	\$ 461,701	\$ 326,316	\$ (18,560)	(4.0)%	\$ 135,385	41.5%
Industrial technology capital equipment	167,185	116,949	84,263	50,236	43.0 %	32,686	38.8%
Global Support	108,566	92,362	73,125	16,204	17.5 %	19,237	26.3%
Total	\$ 718,892	\$ 671,012	\$ 483,704	\$ 47,880	7.1 %	\$ 187,308	38.7%

	Years Ended December 31,		
	2018	2017	2016
Semiconductor capital equipment	61.6%	68.8%	67.5%
Industrial technology capital equipment	23.3	17.4	17.4
Global Support	15.1	13.8	15.1
Total	100.0%	100.0%	100.0%

OPERATING EXPENSE

The following table summarizes our operating expense as a percentage of sales for the years ended December 31, 2018 , 2017 and 2016 (in thousands):

	Years Ended December 31,					
	2018		2017		2016	
Research and development	\$ 76,008	10.6%	\$ 57,999	8.6%	\$ 44,445	9.2%
Selling, general, and administrative	108,033	15.0	93,262	13.9	77,678	16.1
Amortization of intangible assets	5,774	0.8	4,350	0.6	4,167	0.9
Restructuring charges	4,239	0.6	—	—	—	—
Total operating expenses	\$ 194,054	27.0%	\$ 155,611	23.1%	\$ 126,290	26.2%

2018 Results Compared To 2017**SALES**

Total sales for the year ended December 31, 2018 increased 7.1% to \$718.9 million from \$671.0 million for the year ended December 31, 2017 . The increase in sales was primarily due to demand in the first half of the year for our products used in the semiconductor capital equipment market as well as growth in the industrial and service markets we serve. Total sales from acquisitions included \$38.7 million for the year ended December 31, 2018 compared to \$7.6 million for the year ended December 31, 2017.

In 2018 , sales to the semiconductor market decreased 4.0% to \$443.1 million , and 61.6% of sales, from \$461.7 million , and 68.8% of sales in 2017 . The decrease in growth in the semiconductor market is due to the overall decrease in market demand which occurred in the second half of 2018. We believe our position in the semiconductor market remains strong and is driven by our technology leadership in etch applications, specifically related to advanced memory and transition to 3DNAND, along with advances in logic technology.

Sales to the industrial technologies capital equipment markets increased 43% to \$167.2 million in 2018 from \$116.9 million in 2017 . The industrial technology markets we serve include solar panel, flat panel display, power control modules, data storage, architectural glass, high voltage and other industrial manufacturing markets. Our customers in these markets are primarily global and regional original equipment manufacturers. The increase in sales was primarily due to an expansion in advanced coating applications as well as the impact of our diversification strategy through acquisitions. Sales to the industrial capital equipment markets as a percentage of total sales increased to 23.3% in 2018 from 17.4% in 2017.

Global service sales increased 17.5% to \$108.6 million from \$92.4 million in 2017 and increased as a percentage of total sales to 15.1% in 2018 from 13.8% in 2017. Increased global service sales was due to share gains as well as growth in our installed product base.

Sales to Applied Materials Inc. and Lam Research, our two largest customers, decreased \$13.1 million to \$367.0 million , and 51.1% of sales, in 2018 from \$380.1 million , and 56.6% of sales in 2017 . Our sales to Applied Materials Inc. and Lam Research included sales for the semiconductor capital equipment market, as well as industrial capital equipment used in the solar and flat panel display markets.

Backlog

Our backlog was \$74.7 million at December 31, 2018 as compared to \$131.3 million at December 31, 2017 . Backlog declined primarily due to decreased demand in the semiconductor market.

GROSS PROFIT

Gross profit increased \$9.2 million to \$365.6 million in 2018 from \$356.4 million in 2017 and is attributed to increased sales volume. Gross profit as a percentage of sales in 2018 decreased to 50.9% from 53.1% in 2017 . The decreased gross profit percentage is attributable to decreased volume as the semiconductor capital equipment market demand declined in the second half of 2018. Gross profit was also impacted by the new tariffs, higher freight and warranty costs, as well as the addition of fixed manufacturing costs associated with our acquisitions. Gross profit from acquisitions made during 2018 was \$17.4 million , which included \$0.6 million related to purchased gross profit, compared to \$3.1 million gross profit made from our acquisition in 2017, which included \$0.1 million related to purchased gross profit.

OPERATING EXPENSE

Research and Development

We perform research and development of products for new or emerging applications, technological changes to provide higher performance, lower cost, or other attributes that we may expect to advance our customers' products. We believe that continued development of technological applications, as well as enhancements to existing products to support customer requirements, are critical for us to compete in the markets we serve. Accordingly, we devote significant personnel and financial resources to the development of new products and the enhancement of existing products, and we expect these investments to continue.

Research and development expenses in 2018 increased \$18.0 million to \$76.0 million, from \$58.0 million in 2017, and increased as a percentage of total revenue to 10.6% in 2018 from 8.6% in 2017. The increase in research and development expenses is primarily due to our investment in new technology programs to maintain and increase our technological leadership and provide solutions to our customers' evolving needs. Research and development expense from our acquisitions made during 2018 was \$4.7 million compared to \$1.1 million from our acquisition in 2017.

Selling, General and Administrative

Our selling expenses support domestic and international sales and marketing activities that include personnel, trade shows, advertising, third-party sales representative commissions, and other selling and marketing activities. Our general and administrative expenses support our worldwide corporate, legal, tax, financial, governance, administrative, information systems, and human resource functions in addition to our general management, including acquisition-related activities.

Selling general and administrative ("SG&A") expenses increased \$14.8 million to \$108.0 million in 2018 as compared to \$93.3 million in 2017, primarily from our acquisitions. SG&A expense from our acquisitions made during 2018 was \$10.2 million compared to \$1.8 million from our acquisition in 2017. In addition, SG&A expense increased due to higher employee compensation and facility costs, as we have invested in organizational structure and additional facilities to support future growth.

Amortization Expense

Amortization expense increased \$1.4 million to \$5.8 million in 2018 from \$4.4 million in 2017. The increase of \$1.4 million in 2018 is primarily due to the amortization of intangibles recognized on acquisitions made during 2018.

Restructuring Expense

Restructuring expense for 2018 predominately reflects estimated termination costs related to manufacturing footprint consolidation and optimization, acquisition integration, and reorganization and business efficiency improvement.

OTHER INCOME (EXPENSE)

Other income (expense), net consists primarily of interest income and expense, foreign exchange gains and losses, gains and losses on sales of fixed assets, and other miscellaneous items. Other income (expense) was \$0.8 million in 2018, as compared to \$(2.6) million in 2017. Other income in 2018 was primarily due to increased interest income as we leveraged our investment of available cash. Other expense in 2017 reflects the cost of a foreign currency exchange rate forward contract that we entered into for a potential offshore acquisition that we decided not to consummate. See *Note 8. Derivative Financial Instruments* in Item 8 "Financial Statements and Supplementary Data." Other income (expense), net includes interest expense, net of \$0.5 million and \$0.1 million in 2018 and 2017, respectively.

PROVISION FOR INCOME TAXES FROM CONTINUING OPERATIONS

In 2018, we recorded income tax expense for our continuing operations of \$25.2 million or an effective tax rate of 14.6%. Included in our 2018 tax expense is \$5.7 million of expense associated with finalization of the Tax Act items within the SAB 118 measurement period. After giving consideration to the above item, tax expense for our continuing operations would have been \$19.5 million or an effective tax rate of 11.3%. Income tax expense in 2017 was \$62.1 million or an effective tax rate of 31.3%. Included in our 2017 tax expense is \$72.9 million for the estimated impact of the Tax Act, offset partially by a tax benefit of \$33.8 million associated with the wind down of our solar inverter business, which was discontinued in 2015. After giving consideration to the above items, tax expense for our continuing operations in 2017 would have been \$23.0 million, or 11.6%. The 2018 effective tax rate differs from the federal statutory rate of 21% primarily due to the benefits of earnings in foreign jurisdictions, which are subject to lower tax rates and tax credits, but negatively impacted by the Global Intangible Low-taxed Income ("GILTI") tax introduced by the Tax Act.

2017 Results Compared To 2016

SALES, NET

Total sales for the year ended December 31, 2017 increased 38.7% to \$671.0 million from \$483.7 million for the year ended December 31, 2016. The increase in sales was primarily due to demand in the semiconductor market driven by accelerated demand and strength in etch and CVD applications. We also experienced continued growth within our industrial products and global services. Total sales from Excelsys, which was acquired July 3, 2017, was \$7.6 million for the year ended December 31, 2017.

In 2017, sales in our semiconductor market increased 41.5% to \$461.7 million, and 68.8% of sales, from \$326.3 million, and 67.5% of sales in 2016. Our growth in the semiconductor market has been fueled by our leadership in etch applications, specifically related to advanced memory and transition to 3DNAND, along with advances in logic technology. Sales growth was driven primarily by recent program wins, which have moved into production and delivery.

Sales to the industrial capital equipment markets increased 38.8% to \$116.9 million in 2017 from \$84.3 million in 2016. The industrial markets we serve include solar panels, flat panel display, architectural glass, analytical instrumentation and other industrial manufacturing markets. Our customers in these markets are primarily global and regional original equipment manufacturers. The increase in sales was primarily due to the expansion in advanced coating applications. Sales to the industrial capital equipment markets as a percentage of total sales remained flat at 17.4% in 2017 and 2016, due primarily to the strong growth in sales in our semiconductor market. Sales from the acquisition of Excelsys for the year ended December 31, 2017 was \$7.6 million.

Global service sales increased 26.3% to \$92.4 million from \$73.1 million in 2016. Increased global service sales was due to share gains as well as growth in our installed product base. Despite this growth, global support revenue as a percentage of total sales decreased to 13.8% in 2017 from 15.1% in 2016, due to the strong growth in sales in our semiconductor market.

Sales to Applied Materials Inc. and Lam Research, our two largest customers, increased \$109.6 million to \$380.1 million, and 56.6% of sales, in 2017 from \$270.5 million, and 55.9% of sales in 2016. Our sales to Applied Materials Inc. and Lam Research included sales for the semiconductor capital equipment market, as well as industrial capital equipment used in the solar and flat panel display markets.

GROSS PROFIT

Gross profit increased \$103.2 million to \$356.4 million in 2017 from \$253.1 million in 2016 and is primarily attributed to increased sales volume. Gross profit as a percentage of sales in 2017 increased to 53.1% from 52.3% in 2016, due to increased volume as the semiconductor capital equipment market remains strong and favorable product mix. Gross profit from our 2017 acquisition of Excelsys was \$3.1 million, which included \$0.1 million related to purchased gross profit.

OPERATING EXPENSE

Research and Development

We perform research and development of products for new or emerging applications, technological changes to provide higher performance, lower cost, or other attributes that we expect to advance our customers' products. We believe that continued development of technological applications, as well as enhancements to existing products to support customer requirements, are critical for us to compete in the markets we serve. Accordingly, we devote significant personnel and financial resources to the development of new products and the enhancement of existing products, and we expect these investments to continue.

Research and development expenses in 2017 increased \$13.6 million to \$58.0 million from \$44.4 million in 2016 primarily due to our investment in new programs to maintain and increase our technological leadership and provide solutions to our customers' evolving needs. Research and development expense from our 2017 acquisition of Excelsys was \$1.1 million.

Research and development expenses as a percentage of total revenue decreased to 8.6% in 2017 from 9.2% in 2016 as successful adoption of our products has driven increased sales.

Selling, General and Administrative

Our selling expenses support domestic and international sales and marketing activities that include personnel, trade shows, advertising, third-party sales representative commissions, and other selling and marketing activities. Our general and administrative expenses support our worldwide corporate, legal, tax, financial, governance, administrative, information systems, and human resource functions in addition to our general management, including acquisition-related activities.

Selling, general and administrative ("SG&A") expenses increased \$15.6 million to \$93.3 million in 2017 as compared to \$77.7 million in 2016 . The increase in SG&A expense is primarily driven by higher stock-based compensation and performance bonus, investment in organizational structure to support business volumes and future growth, and costs associated with business development. SG&A expense from our 2017 acquisition of Excelsys was \$1.8 million.

Amortization Expense

Amortization expense increased \$0.2 million to \$4.4 million in 2017 from \$4.2 million in 2016 . The increase of \$0.2 million in 2017 is primarily due to the amortization of intangibles recognized upon the acquisition of Excelsys, which was completed July 3, 2017, partially offset by the effect of foreign exchange rates.

OTHER INCOME (EXPENSE)

Other income (expense), net consists primarily of interest income and expense, foreign exchange gains and losses, gains and losses on sales of fixed assets, and other miscellaneous items. Other income (expense), net was \$(2.6) million in 2017 , as compared to \$1.2 million in 2016 . The loss in 2017 was primarily the cost of a foreign currency exchange rate forward contract that we entered into for a potential offshore acquisition that we decided not to consummate. See *Note 8. Derivative Financial Instruments* in Item 8 "Financial Statements and Supplementary Data". The gain in 2016 is principally related to gains recognized due to fluctuation in foreign exchange rates and our assets in different countries. Other income (expense), net includes interest expense, net of \$0.1 million and \$(0.1) million in 2017 and 2016 , respectively.

PROVISION FOR INCOME TAXES FROM CONTINUING OPERATIONS

In 2017, we recorded income tax expense for our continuing operations of \$62.1 million or an effective tax rate of 31.3%. Included in our 2017 tax expense is the estimated impact of the Tax Act which was passed December 22, 2017. Among other provisions, the Tax Act imposes a mandatory one-time transition tax on the accumulated earnings of our foreign subsidiaries. The Company estimates the 2017 financial statement expense related to the transition tax will approximate \$61.8 million. Additionally, the Tax Act reduced the U.S. corporate income tax rate to 21%, effective January 1, 2018, from the previous 35% rate. The reduction in the U.S. corporate tax rate required the Company to re-value its net U.S. deferred tax assets and liabilities effective December 31, 2017. The Company estimates the 2017 financial statement expense related to the reduction of the U.S. tax rate to be \$11.1 million. Additionally, in 2017, we recorded a tax benefit of \$33.8 million associated with the wind down of our solar inverter business, which was discontinued in 2015. After giving consideration to the above items, tax expense for our continuing operations would have been \$23.0 million or an effective tax rate of 11.6%, as compared to tax expense of \$11.1 million, or 8.7%, for 2016. The increase in the 2017 tax rate of 11.6% compared to the 2016 tax rate of 8.7% is primarily due to favorable settlements of tax audits in 2016. The 2017 effective tax rate differs from the federal statutory rate of 35% primarily due to the benefit of earnings in foreign jurisdictions which are subject to lower tax rates, benefits related to stock-based compensation and tax amortization.

Discontinued Operations

In December 2015, we completed the wind down of engineering, manufacturing and sales of our solar inverter product line (the "inverter business"). Accordingly, the results of our inverter business has been reflected as "Income (loss) from discontinued operations, net of income taxes" on our Condensed Consolidated Statements of Operations for all periods presented herein.

The effect of our sales of extended inverter warranties to our customers continues to be reflected in deferred revenue in our Consolidated Balance Sheets. Deferred revenue for extended inverter warranties and the associated costs of warranty service will be reflected in Sales and Cost of goods sold, respectively, from continuing operations in future periods in our Consolidated Statement of Operations, as the deferred revenue is earned and the associated services are rendered. Extended warranties related to the inverter product line are no longer offered.

The significant items included in Income (loss) from discontinued operations, net of income taxes (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Sales, net	\$ —	\$ —	\$ —
Cost of sales	(88)	234	154
Total operating (income) expenses	96	(1,576)	(3,894)
Operating income (loss) from discontinued operations	(8)	1,342	3,740
Other income (expense)	(24)	337	2,636
Income (loss) discontinued operations before income taxes	(32)	1,679	6,376
Income tax expense (benefit)	6	(81)	(4,130)
Income (loss) from discontinued operations, net of income taxes	\$ (38)	\$ 1,760	\$ 10,506

Operating income (loss) from discontinued operations for years ended December 31, 2018, 2017 and 2016 includes the impacts of changes in our estimated product warranty liability, the recovery of accounts receivable and foreign exchange gains or (losses).

Non-GAAP Results

Management uses non-GAAP operating income and non-GAAP EPS to evaluate business performance without the impacts of certain non-cash charges and other charges which are not part of our usual operations. We use these non-GAAP measures to assess performance against business objectives, make business decisions, including developing budgets and forecasting future periods. In addition, management's incentive plans include these non-GAAP measures as criteria for achievements. These non-GAAP measures are not in accordance with U.S. GAAP and may differ from non-GAAP methods of accounting and reporting used by other companies. However, we believe these non-GAAP measures provide additional information that enables readers to evaluate our business from the perspective of management. The presentation of this additional information should not be considered a substitute for results prepared in accordance with U.S. GAAP.

The non-GAAP results presented below exclude the impact of non-cash related charges, such as stock based compensation and amortization of intangible assets. In addition, they exclude discontinued operations and other non-recurring items such as acquisition-related costs and restructuring expenses, as they are not indicative of future performance. The tax effect of our non-GAAP adjustments represents the anticipated annual tax rate applied to each non-GAAP adjustment after consideration of their respective book and tax treatments and effect of adoption of the Tax Act.

Reconciliation of Non-GAAP measure - operating expenses and operating income from continuing operations, excluding certain items

	Years Ended December 31,		
	2018	2017	2016
Gross profit from continuing operations, as reported	\$ 365,607	\$ 356,381	\$ 253,147
Adjustments to gross profit:			
Stock-based compensation	742	1,394	351
Facility expansion and relocation costs	1,328	—	—
Acquisition-related costs	569	—	—
Non-GAAP gross profit	368,246	357,775	253,498
Operating expenses from continuing operations, as reported	194,054	155,611	126,290
Adjustments:			
Amortization of intangible assets	(5,774)	(4,350)	(4,167)
Stock-based compensation	(8,961)	(11,155)	(5,981)
Acquisition-related costs	(1,726)	(150)	—
Facility expansion and relocation costs	(518)	—	—
Restructuring charges	(4,239)	—	—
Non-GAAP operating expenses	172,836	139,956	116,142
Non-GAAP operating income	\$ 195,410	\$ 217,819	\$ 137,356

Reconciliation of Non-GAAP measure - operating expenses and operating income from continuing operations, excluding certain items

	Years Ended December 31,		
	2018	2017	2016
Gross profit from continuing operations, as reported	50.9 %	53.1 %	52.3 %
Adjustments to gross profit:			
Stock-based compensation	0.1	0.2	0.1
Facility expansion and relocation costs	0.1	—	—
Acquisition-related costs	0.1	—	—
Non-GAAP gross profit	51.2	53.3	52.4
Operating expenses from continuing operations, as reported	27.0	23.2	26.1
Adjustments:			
Amortization of intangible assets	(0.8)	(0.6)	(0.9)
Stock-based compensation	(1.3)	(1.8)	(1.2)
Acquisition-related costs	(0.2)	—	—
Facility expansion and relocation costs	(0.1)	—	—
Restructuring charges	(0.6)	—	—
Non-GAAP operating expenses	24.0	20.8	24.0
Non-GAAP operating income	27.2 %	32.5 %	28.4 %

Reconciliation of Non-GAAP measure - income from continuing operations, excluding certain items

	Years Ended December 31,		
	2018	2017	2016
Income from continuing operations, less noncontrolling interest, net of income taxes	\$ 147,063	\$ 136,101	\$ 116,948
Adjustments:			
Amortization of intangible assets	5,774	4,350	4,167
Stock-based compensation	9,703	12,549	6,332
Acquisition-related costs	2,295	150	—
Facility expansion and relocation costs	1,846	—	—
Restructuring charges	4,239	—	—
Nonrecurring tax (benefit) expense associated with inverter business	—	(33,837)	—
Loss on foreign exchange hedge	—	3,489	—
Incremental expense associated with start-up of the Asia regional headquarters	—	1,133	—
Tax Cuts and Jobs Act Impact	5,703	72,867	—
Tax effect of non-GAAP adjustments	(4,626)	(5,264)	(2,854)
Non-GAAP income from continuing operations, net of income taxes	\$ 171,997	\$ 191,538	\$ 124,593
Non-GAAP diluted earnings per share	\$4.37	\$4.77	\$3.11

Impact of Inflation

In recent years, inflation has not had a significant impact on our operations. However, we continuously monitor operating price increases, particularly in connection with the supply of component parts used in our manufacturing process. To the extent permitted by competition, we pass increased costs on to our customers by increasing sales prices over time. Sales price increases, however, were not significant in any of the years presented herein.

Liquidity and Capital Resources*LIQUIDITY*

We believe that adequate liquidity and cash generation is important to the execution of our strategic initiatives. Our ability to fund our operations, acquisitions, capital expenditures, and product development efforts may depend on our ability to generate cash from operating activities which is subject to future operating performance, as well as general economic, financial, competitive, legislative, regulatory, and other conditions, some of which may be beyond our control. Our primary sources of liquidity are our available cash, investments and, cash generated from current operations.

At December 31, 2018, we had \$351.8 million in cash, cash equivalents, and marketable securities. We believe that adequate liquidity and cash generation will be important to the execution of our strategic initiatives. We believe that our current cash levels and our cash flows from future operations will be adequate to meet anticipated working capital needs, anticipated levels of capital expenditures, and contractual obligations for the next twelve months.

At December 31, 2018, we had \$194.4 million in cash, cash equivalents, and marketable securities held by foreign subsidiaries. As a result of the recent Tax Act, we have provided for U.S. tax on all foreign unremitted earnings. Accordingly, cash related to these unremitted earnings could be repatriated to the U.S. with minimal additional taxes. Additional taxes would include foreign withholding taxes and U.S. state income taxes. At this time, the Company has no additional plans to repatriate foreign cash and intends to invest such unremitted earnings indefinitely outside of the U.S. Consistent with the Company's capital deployment initiatives, the Company intends to utilize foreign cash to expand our international operations through internal growth and strategic acquisitions. If our intent changes or if these funds are needed for our U.S. operations, we would be required to accrue any associated taxes on some or all of these undistributed earnings and our effective tax rate would be adversely affected.

Credit Facility

In addition to available cash, cash equivalents, and marketable securities, we have an available revolving line of credit ("LOC") with a bank, which provides up to \$150.0 million, subject to certain funding conditions, which expires in July 2022. At December 31, 2018, we had \$150.0 million in available funding under the LOC. See "Note 21. Credit Facility" in Item 8 "Financial Statements and Supplemental Data."

Share Repurchase

In September 2015, our Board of Directors authorized a program to repurchase up to \$150.0 million of our stock over a thirty-month period. In November 2017, our Board of Directors approved an extension of the share repurchase program to December 2019 from its original maturity of March 2018. In May 2018, our Board of Directors approved a \$50.0 million increase in its authorization to repurchase shares of our common stock under this same program. As of December 31, 2018, we had \$24.9 million remaining for the future repurchase of shares of our common stock.

In order to execute the repurchase of shares of our common stock, the Company periodically enters into stock repurchase agreements. During the years ended December 31, 2018, 2017 and 2016 the Company has repurchased the following shares of our common stock (in thousands, except per share amounts):

	Years Ended December 31,		
	2018	2017	2016 (1)
Amount paid to repurchase shares	\$ 95,125	\$ 29,993	\$ —
Number of shares repurchased	1,696	422	343
Average repurchase price per share	\$ 56.07	\$ 71.07	\$ —

(1) In November 2015 we entered into a Fixed Dollar Accelerated Share Repurchase Transaction to purchase \$50.0 million of shares of our common stock in the open market. A total of 1.7 million shares of our common stock was repurchased under the Fixed Dollar Accelerated Share Repurchase Agreement at an average price of \$28.99 per share. The final 0.3 million shares of our common stock was delivered in 2016.

CASH FLOWS

A summary of our cash provided by and used in operating, investing, and financing activities is as follows (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Net cash provided by operating activities from continuing operations	\$ 151,427	\$ 189,956	\$ 127,144
Net cash used in operating activities from discontinued operations	(156)	(7,255)	(7,857)
Net cash provided by operating activities	151,271	182,701	119,287
Net cash (used in) provided by investing activities from continuing operations	(113,592)	(28,082)	300
Net cash used in investing activities from discontinued operations	—	—	—
Net cash (used in) provided by investing activities	(113,592)	(28,082)	300
Net cash (used in) provided by financing activities from continuing operations	(97,134)	(31,307)	2,171
Net cash used in financing activities from discontinued operations	—	—	(29)
Net cash (used in) provided by financing activities	(97,134)	(31,307)	2,142
EFFECT OF CURRENCY TRANSLATION ON CASH	(1,030)	2,208	(1,932)
INCREASE (DECREASE) IN CASH AND CASH EQUIVALENTS	(60,485)	125,520	119,797
CASH AND CASH EQUIVALENTS, beginning of period	415,037	289,517	169,720
CASH AND CASH EQUIVALENTS, end of period	354,552	415,037	289,517
Less cash and cash equivalents from discontinued operations	5,251	7,754	7,564
CASH AND CASH EQUIVALENTS FROM CONTINUING OPERATIONS, end of period	\$ 349,301	\$ 407,283	\$ 281,953

2018 Compared To 2017*Net cash provided by operating activities*

Net cash provided by operating activities in 2018 was \$151.3 million , a decrease of \$31.4 million , or 17.2% compared to \$182.7 million for the same period in 2017 . The decrease in net cash flows from operating activities was primarily due lower earnings adjusted for non-cash items and by cash required to support increases in accounts receivable and inventory and decreases to our accounts payable.

Net cash used in investing activities

Net cash used in investing activities in 2018 was \$113.6 million , compared to \$28.1 million in 2017 . In 2018, we used \$93.8 million for acquisitions compared to \$17.3 million in 2017. Capital expenditures increased \$11.3 million from \$9.0 million in 2017 to \$20.3 million in 2018 to support new facilities and manufacturing operations.

Net cash used in financing activities

Net cash used in financing activities was \$97.1 million in 2018 as compared to \$31.3 million in 2017 and is primarily due to increased deployment of capital under the Company's share repurchase program.

2017 Compared To 2016*Net cash provided by operating activities*

Net cash provided by operating activities in 2017 was \$182.7 million , an increase of \$63.4 million , or 53.2% compared to \$119.3 million for the same period in 2016 . The increase in net cash flows from operating activities was primarily due to improved earnings from continuing operations and timing of taxes, partially offset by increased cash required for accounts receivable and inventory to support current business volume.

Net cash (used in) provided by investing activities

Net cash (used in) provided by investing activities in 2017 was \$(28.1) million , compared to \$0.3 million in 2016 . Included in cash used in investing activities for 2017 was \$17.3 million for the acquisition of Excelsys and \$3.5 million for the purchase of a foreign currency exchange hedge for an anticipated transaction which was not completed. Capital expenditures in 2017 increased \$2.2 million from \$6.8 million in 2016 to \$9.0 million in 2017 to support new facilities and manufacturing operations.

Net cash (used in) provided by financing activities

Net cash (used in) provided by financing activities in 2017 was \$(31.3) million, a \$(33.4) million change from \$2.1 million cash provided by financing activities in 2016. The increase in cash used in financing activities is due to the repurchase of \$30.0 million in company stock in 2017.

Effect of currency translation on cash

The effect of foreign currency translations on cash had a \$1.0 million unfavorable impact for the year ended December 31, 2018 compared to a \$2.2 million favorable impact for the year ended December 31, 2017. Our foreign operations primarily sell product and incur expenses in the related local currency. Exchange rate fluctuations could require us to increase prices to foreign customers, which could result in lower net sales by us to such customers. Alternatively, if we do not adjust the prices for our products in response to unfavorable currency fluctuations, our results of operations could be adversely impacted. The functional currencies of our worldwide operations include U.S. dollar ("USD"), Canadian Dollar ("CAD"), Swiss Franc ("CHF"), Chinese Yuan ("CNY"), Danish Krone ("DKK"), Euro ("EUR"), Pound Sterling ("GBP"), Israeli New Shekel ("ILS"), Indian Rupee ("INR"), Japanese Yen ("JPY"), South Korean Won ("KRW"), Singapore Dollar ("SGD") and New Taiwan Dollar ("TWD"). Our purchasing and sales activities are primarily denominated in USD, CNY, EUR, and JPY. The change in these key currency rates during the years ended December 31, 2018, 2017, and 2016 are as follows:

From	To	Years Ended December 31,		
		2018	2017	2016
CAD	USD	(7.9)%	7.1%	2.9%
CHF	USD	(0.8)%	4.4%	(1.6)%
CNY	USD	(5.4)%	6.7%	(6.5)%
DKK	USD	(4.7)%	N/A	N/A
EUR	USD	(4.5)%	13.9%	(3.1)%
GBP	USD	(5.6)%	9.3%	(16.2)%
ILS	USD	(7.2)%	N/A	N/A
INR	USD	(8.2)%	6.5%	(2.5)%
JPY	USD	2.4%	3.9%	2.8%
KRW	USD	(4.2)%	13.0%	(2.5)%
SGD	USD	(2.0)%	8.2%	(2.0)%
TWD	USD	(2.9)%	8.8%	1.8%

Off Balance Sheet Arrangements

We have no off-balance sheet arrangements or variable interest entities.

Contractual Obligations

The following table sets forth our future payments due under contractual obligations as of December 31, 2018:

	Total	Less than 1 year	1-3 years	3-5 years	More than 5 years
Operating lease obligations	\$ 49,251	\$ 9,093	\$ 14,499	\$ 7,310	\$ 18,349
Purchase obligations	121,918	121,918	—	—	—
Income tax obligations	12,677	953	2,234	3,211	6,279
Pension funding commitment	21,036	828	1,656	1,656	16,896
Total	\$ 204,882	\$ 132,792	\$ 18,389	\$ 12,177	\$ 41,524

Purchase obligations include firm commitments and agreements with various suppliers to ensure the availability of components. For more information, see *Note 18. Commitments and Contingencies* in Item 8 "Financial Statements and Supplementary Data." Income tax obligations are a result of the Tax Act and includes a transition tax on unremitted foreign earnings and profits, of which we have elected to pay the estimated amount over an eight-year period. For more information see *Note 5. Income Taxes* in Item 8 "Financial Statements and Supplementary Data."

Recent Accounting Pronouncements

From time to time, the Financial Accounting Standards Board (“FASB”) or other standards setting bodies issue new accounting pronouncements. Updates to the FASB Accounting Standards Codification (“ASC”) are communicated through issuance of an Accounting Standards Update (“ASU”). Unless otherwise discussed, we believe that the impact of recently issued guidance, whether adopted or to be adopted in the future, is not expected to have a material impact on our Consolidated Financial Statements upon adoption.

To understand the impact of recently issued guidance, whether adopted or to be adopted, please review the information provided in *Note 1. Operations and Summary of Significant Accounting Policies and Estimates* in Item 8 "Financial Statements and Supplementary Data."

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Market Risk and Risk Management

In the normal course of business, we have exposures to interest rate risk from our investments, credit facility, and foreign exchange rate risk related to our foreign operations and foreign currency transactions.

Interest Rate Risk

Our market risk exposure relates to changes in interest rates in our investment portfolio and credit facility. We generally place our investments with high-credit quality issuers and by policy are averse to principal loss and seek to protect and preserve our invested funds by limiting default risk, market risk, and reinvestment risk.

As of December 31, 2018, our investments consisted primarily of certificates of deposit with maturity of less than 1 years. As a measurement of the sensitivity of our portfolio and assuming that our investment portfolio balances remain constant, a hypothetical decrease of 100 basis points (1%) in interest rates would decrease annual pre-tax earnings by a nominal amount.

Foreign Currency Exchange Rate Risk

We are impacted by changes in foreign currency exchange rates through sales and purchasing transactions when we sell products and purchase materials in currencies different from the currency in which product and manufacturing costs were incurred. The functional currencies of our worldwide facilities primarily include the USD, EUR, KRW, TWD, ILS, GBP, and CNY. Our purchasing and sales activities are primarily denominated in the USD, JPY, EUR and CNY. We may be impacted by changes in the relative buying power of our customers, which may impact sales volumes either positively or negatively. As these currencies fluctuate against each other, and other currencies, we are exposed to foreign currency exchange rate risk on sales, purchasing transactions and labor.

Acquisitions are a large component of our capital deployment strategy. A significant number of acquisition target opportunities are located outside the U.S. and their value may be denominated in foreign currency. Changes in exchange rates therefore may have a material impact on their valuation in USD and therefore may impact our view of their attractiveness.

From time to time, we may enter into foreign currency exchange rate contracts to hedge against changes in foreign currency exchange rates on assets and liabilities expected to be settled at a future date, including foreign currency, which may be required for a potential foreign acquisition. Market risk arises from the potential adverse effects on the value of derivative instruments that result from a change in foreign currency exchange rates. We may enter into foreign currency forward contracts to manage the exchange rate risk associated with intercompany debt denominated in nonfunctional currencies. We minimize our market risk applicable to foreign currency exchange rate contracts by establishing and monitoring parameters that limit the types and degree of our derivative contract instruments. We enter into derivative contract instruments for risk management purposes only. We do not enter into or issue derivatives for trading or speculative purposes.

Our reported financial results of operations, including the reported value of our assets and liabilities, are also impacted by changes in foreign currency exchange rates. Assets and liabilities of substantially all of our subsidiaries outside the U.S. are translated at period end rates of exchange for each reporting period. Operating results and cash flow statements are translated at weighted-average rates of exchange during each reporting period. Although these translation changes have no immediate cash impact, the translation changes may impact future borrowing capacity, and overall value of our net assets.

Currency exchange rates vary daily and often one currency strengthens against the USD while another currency weakens. Because of the complex interrelationship of the worldwide supply chains and distribution channels, it is difficult to quantify the impact of a change in one or more particular exchange rates.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

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REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Board of Directors and Stockholders
Advanced Energy Industries, Inc.

Opinion on the financial statements

We have audited the accompanying consolidated balance sheets of Advanced Energy Industries, Inc. (a Delaware corporation) and subsidiaries (the “Company”) as of December 31, 2018 and 2017, the related consolidated statements of operations, comprehensive income, stockholders’ equity, and cash flows for each of the three years in the period ended December 31, 2018, and the related notes (collectively referred to as the “financial statements”). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2018, in conformity with accounting principles generally accepted in the United States of America.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (“PCAOB”), the Company’s internal control over financial reporting as of December 31, 2018, based on criteria established in the 2013 *Internal Control-Integrated Framework* issued by the Committee of Sponsoring Organizations of the Treadway Commission (“COSO”), and our report dated February 21, 2019 expressed an unqualified opinion.

Changes in accounting principles

As discussed in Note 1 to the consolidated financial statements, in the first quarter of 2018, the Company changed its method of accounting for revenue due to the adoption of Accounting Standards Codification Topic 606, Revenue from Contracts with Customers.

As discussed in Note 1 to the consolidated financial statements, in the first quarter of 2018, the Company changed its method of accounting for income taxes due to the adoption of Accounting Standards Update 2016-16, Accounting for Income Taxes: Intra-Entity Asset Transfers of Assets Other than Inventory.

Basis for opinion

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

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ GRANT THORNTON LLP

We have served as the Company’s auditor since 2004.

Denver, CO

February 21, 2019

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Board of Directors and Stockholders
Advanced Energy Industries, Inc.

Opinion on internal control over financial reporting

We have audited the internal control over financial reporting of Advanced Energy Industries, Inc. (a Delaware corporation) and subsidiaries (the “Company”) as of December 31, 2018 , based on criteria established in the 2013 *Internal Control-Integrated Framework* issued by the Committee of Sponsoring Organizations of the Treadway Commission (“COSO”). In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018 , based on criteria established in the 2013 *Internal Control-Integrated Framework* issued by COSO.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (“PCAOB”), the consolidated financial statements of the Company as of and for the year ended December 31, 2018 , and our report dated February 21, 2019 expressed an unqualified opinion on those financial statements.

Basis for opinion

The Company’s management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management’s Annual Report on Internal Control over Financial Reporting (“Management’s Report”). Our responsibility is to express an opinion on the Company’s internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Our audit of, and opinion on, the Company’s internal control over financial reporting does not include the internal control over financial reporting of Trek Holdings Co., LTD, and LumaSense Technologies Holdings, Inc., two wholly-owned subsidiaries, whose aggregate financial statements reflect total assets and revenues constituting 14 and 5 percent, respectively, of the related consolidated financial statement amounts as of and for the year ended December 31, 2018. As indicated in Management’s Report, Trek Holdings Co., LTD, and LumaSense Technologies Holdings, Inc. were acquired during 2018. Management’s assertion on the effectiveness of the Company’s internal control over financial reporting excluded internal control over financial reporting of Trek Holdings Co., LTD, and LumaSense Technologies Holdings, Inc.

Definition and limitations of internal control over financial reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

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

/s/ GRANT THORNTON LLP

Denver, CO

February 21, 2019

ADVANCED ENERGY INDUSTRIES, INC.
Consolidated Balance Sheets
(In thousands, except per share amounts)

	December 31,	
	2018	2017
ASSETS		
Current assets:		
Cash and cash equivalents	\$ 349,301	\$ 407,283
Marketable securities	2,470	3,104
Accounts and other receivable, net of allowances of \$1,856 and \$1,748 respectively	100,442	87,429
Inventories	97,987	78,450
Income taxes receivable	2,220	1,295
Other current assets	10,173	8,129
Current assets from discontinued operations	5,855	9,535
Total current assets	568,448	595,225
Property and equipment, net	31,269	17,795
Deposits and other assets	6,874	3,051
Goodwill	101,900	53,812
Intangible assets, net	54,910	33,499
Deferred income tax assets	47,099	18,841
Non-current assets from discontinued operations	5,984	11,085
TOTAL ASSETS	\$ 816,484	\$ 733,308
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	\$ 39,646	\$ 48,177
Income taxes payable	13,258	5,365
Accrued payroll and employee benefits	21,775	18,412
Other accrued expenses	22,999	19,913
Customer deposits and other	7,345	6,402
Current liabilities from discontinued operations	5,286	7,850
Total current liabilities	110,309	106,119
Deferred income tax liabilities	6,988	4,556
Uncertain tax positions	14,318	17,031
Long-term deferred revenue	29,108	33,402
Other long-term liabilities	37,744	36,282
Non-current liabilities from discontinued operations	10,715	15,277
Total liabilities	209,182	212,667
Commitments and contingencies (Note 18)		
Stockholders' equity:		
Preferred stock, \$0.001 par value, 1,000 shares authorized, none issued and outstanding	—	—
Common stock, \$0.001 par value, 70,000 shares authorized; 38,164 and 39,604 issued and outstanding, respectively	38	40
Additional paid-in capital	97,418	184,843
Accumulated other comprehensive income (loss)	(3,449)	2,533
Retained earnings	512,783	333,225
Advanced Energy stockholders' equity	606,790	520,641
Noncontrolling interest	512	—
Total stockholders' equity	607,302	520,641
TOTAL LIABILITIES AND STOCKHOLDERS' EQUITY	\$ 816,484	\$ 733,308

The accompanying notes are an integral part of these Consolidated Financial Statements.

ADVANCED ENERGY INDUSTRIES, INC.
Consolidated Statements of Operations
(In thousands, except per share amounts)

	Years Ended December 31,		
	2018	2017	2016
Sales, net:			
Product	\$ 610,326	\$ 578,650	\$ 410,580
Services	108,566	92,362	73,124
Total sales, net	718,892	671,012	483,704
Cost of sales:			
Product	298,597	267,587	192,694
Services	54,688	47,044	37,863
Total cost of sales	353,285	314,631	230,557
Gross profit	365,607	356,381	253,147
Operating expenses:			
Research and development	76,008	57,999	44,445
Selling, general and administrative	108,033	93,262	77,678
Amortization of intangible assets	5,774	4,350	4,167
Restructuring expense	4,239	—	—
Total operating expenses	194,054	155,611	126,290
Operating income	171,553	200,770	126,857
Other income (expense), net	823	(2,579)	1,219
Income from continuing operations before income taxes	172,376	198,191	128,076
Provision for income taxes	25,227	62,090	11,128
Income from continuing operations	147,149	136,101	116,948
Income (loss) from discontinued operations, net of income taxes	(38)	1,760	10,506
Net Income	\$ 147,111	\$ 137,861	\$ 127,454
Income from continuing operations attributable to noncontrolling interest	86	—	—
Net income attributable to Advanced Energy Industries, Inc.	\$ 147,025	\$ 137,861	\$ 127,454
Basic weighted-average common shares outstanding	39,081	39,754	39,720
Diluted weighted-average common shares outstanding	39,352	40,176	40,031
Earnings per share:			
Continuing operations:			
Basic earnings per share	\$ 3.76	\$ 3.42	\$ 2.94
Diluted earnings per share	\$ 3.74	\$ 3.39	\$ 2.92
Discontinued operations:			
Basic earnings per share	\$ —	\$ 0.04	\$ 0.26
Diluted earnings per share	\$ —	\$ 0.04	\$ 0.26
Net income:			
Basic earnings per share	\$ 3.76	\$ 3.47	\$ 3.21
Diluted earnings per share	\$ 3.74	\$ 3.43	\$ 3.18

The accompanying notes are an integral part of these Consolidated Financial Statements.

ADVANCED ENERGY INDUSTRIES, INC.
Consolidated Statements of Comprehensive Income
(In thousands)

	Years Ended December 31,		
	2018	2017	2016
Net income	\$ 147,111	\$ 137,861	\$ 127,454
Other comprehensive income:			
Foreign currency translation	(5,285)	8,305	(3,631)
Unrealized gain (loss) on marketable securities	—	(2)	5
Minimum benefit retirement liability	(697)	1,163	(3,841)
Comprehensive income	\$ 141,129	\$ 147,327	\$ 119,987
Comprehensive income attributable to noncontrolling interest	86	—	—
Comprehensive income attributable to Advanced Energy Industries, Inc.	\$ 141,043	\$ 147,327	\$ 119,987

The accompanying notes are an integral part of these Consolidated Financial Statements.

ADVANCED ENERGY INDUSTRIES, INC.
Consolidated Statements of Stockholders' Equity
(In thousands, except share amounts)

	Common Stock			Accumulated Other Comprehensive Income (Loss)					Total Stockholders' Equity
	Shares	Amount	Additional Paid-in Capital	Foreign Currency Translation	Unrealized Gain (Loss) on Marketable Securities	Minimum Benefit Retirement Liability	Retained Earnings	Non-controlling Interest	
Balances, January 1, 2016	39,756	\$ 40	\$ 195,096	\$ 21	\$ (3)	\$ 516	\$ 67,910	\$ —	\$ 263,580
Stock issued from equity plans	299	—	2,175	—	—	—	—	—	2,175
Stock-based compensation	—	—	6,332	—	—	—	—	—	6,332
Stock buyback	(343)	—	—	—	—	—	—	—	—
Comprehensive income (loss):									
Foreign currency translation	—	—	—	(3,631)	—	—	—	—	(3,631)
Unrealized gain on marketable securities	—	—	—	—	5	—	—	—	5
Minimum benefit retirement liability	—	—	—	—	—	(3,841)	—	—	(3,841)
Net income	—	—	—	—	—	—	127,454	—	127,454
Total comprehensive income (loss)	—	—	—	(3,631)	5	(3,841)	127,454	—	119,987
Balances, December 31, 2016	39,712	\$ 40	\$ 203,603	\$ (3,610)	\$ 2	\$ (3,325)	\$ 195,364	\$ —	\$ 392,074
Stock issued from equity plans	314	—	(1,316)	—	—	—	—	—	(1,316)
Stock-based compensation	—	—	12,549	—	—	—	—	—	12,549
Stock buyback	(422)	—	(29,993)	—	—	—	—	—	(29,993)
Comprehensive income (loss):									
Foreign currency translation	—	—	—	8,305	—	—	—	—	8,305
Unrealized loss on marketable securities	—	—	—	—	(2)	—	—	—	(2)
Minimum benefit retirement liability	—	—	—	—	—	1,163	—	—	1,163
Net income	—	—	—	—	—	—	137,861	—	137,861
Total comprehensive income (loss)	—	—	—	8,305	(2)	1,163	137,861	—	147,327
Balances, December 31, 2017	39,604	\$ 40	\$ 184,843	\$ 4,695	\$ —	\$ (2,162)	\$ 333,225	\$ —	\$ 520,641
Adoption of new accounting standards	—	—	—	—	—	—	32,533	—	32,533
Non-controlling interest from acquisition	—	—	—	—	—	—	—	426	426
Stock issued from equity plans	256	—	(2,005)	—	—	—	—	—	(2,005)
Stock-based compensation	—	—	9,703	—	—	—	—	—	9,703
Stock buyback	(1,696)	(2)	(95,123)	—	—	—	—	—	(95,125)
Comprehensive income (loss):									
Foreign currency translation	—	—	—	(5,285)	—	—	—	—	(5,285)
Minimum benefit retirement liability	—	—	—	—	—	(697)	—	—	(697)
Net income	—	—	—	—	—	—	147,025	86	147,111
Total comprehensive income (loss)	—	—	—	(5,285)	—	(697)	147,025	86	141,129
Balances at December 31, 2018	38,164	\$ 38	\$ 97,418	\$ (590)	\$ —	\$ (2,859)	\$ 512,783	\$ 512	\$ 607,302

The accompanying notes are an integral part of these Consolidated Financial Statements.

ADVANCED ENERGY INDUSTRIES, INC.
Consolidated Statements of Cash Flows
(In thousands)

	Years Ended December 31,		
	2018	2017	2016
CASH FLOWS FROM OPERATING ACTIVITIES:			
Net income	\$ 147,111	\$ 137,861	\$ 127,454
Income (loss) from discontinued operations, net of income taxes	(38)	1,760	10,506
Income from continuing operations, net of income taxes	147,149	136,101	116,948
Adjustments to reconcile net income to net cash provided by operating activities:			
Depreciation and amortization	13,592	9,424	7,813
Stock-based compensation expense	9,703	12,549	6,332
Provision for deferred income taxes	5,618	28,765	3,570
Loss on foreign exchange hedge	—	3,489	—
Net loss on disposal of assets	481	122	319
Changes in operating assets and liabilities, net of assets acquired:			
Accounts and other receivable, net	3,445	(7,497)	(21,603)
Inventories	(11,276)	(19,261)	(6,359)
Other current assets	(2,975)	(1,030)	(1,358)
Accounts payable	(12,618)	1,812	18,957
Other liabilities and accrued expenses	(3,239)	7,159	2,169
Income taxes	1,547	18,323	356
Net cash provided by operating activities from continuing operations	151,427	189,956	127,144
Net cash used in operating activities from discontinued operations	(156)	(7,255)	(7,857)
Net cash provided by operating activities	151,271	182,701	119,287
CASH FLOWS FROM INVESTING ACTIVITIES:			
Purchases of marketable securities	(95)	(107)	(763)
Proceeds from sale of marketable securities	589	1,903	7,884
Acquisitions, net of cash acquired	(93,756)	(17,347)	—
Purchase of foreign exchange hedge	—	(3,489)	—
Purchases of property and equipment	(20,330)	(9,042)	(6,821)
Net cash (used in) provided by investing activities from continuing operations	(113,592)	(28,082)	300
Net cash used in investing activities from discontinued operations	—	—	—
Net cash (used in) provided by investing activities	(113,592)	(28,082)	300
CASH FLOWS FROM FINANCING ACTIVITIES:			
Purchase and retirement of common stock	(95,125)	(29,993)	—
Net (payments) proceeds related to stock-based award activities	(2,009)	(1,314)	2,171
Net cash (used in) provided by financing activities from continuing operations	(97,134)	(31,307)	2,171
Net cash used in financing activities from discontinued operations	—	—	(29)
Net cash (used in) provided by financing activities	(97,134)	(31,307)	2,142
EFFECT OF CURRENCY TRANSLATION ON CASH	(1,030)	2,208	(1,932)
INCREASE (DECREASE) IN CASH AND CASH EQUIVALENTS	(60,485)	125,520	119,797
CASH AND CASH EQUIVALENTS, beginning of period	415,037	289,517	169,720
CASH AND CASH EQUIVALENTS, end of period	354,552	415,037	289,517
Less cash and cash equivalents from discontinued operations	5,251	7,754	7,564
CASH AND CASH EQUIVALENTS FROM CONTINUING OPERATIONS, end of period	\$ 349,301	\$ 407,283	\$ 281,953
SUPPLEMENTAL DISCLOSURE OF CASH FLOW INFORMATION:			
Cash paid for interest	\$ 228	\$ 66	\$ 173
Cash paid for income taxes	16,190	5,314	5,647
Cash received for refunds of income taxes	1,135	1,448	2,232
Cash held in banks outside the United States	192,441	285,686	230,168

The accompanying notes are an integral part of these Consolidated Financial Statements.

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
(in thousands, except per share amounts)

In this Annual Report on Form 10-K, we use the terms “Advanced Energy”, “the Company”, “we”, “us” or “our” to refer to Advanced Energy Industries, Inc. and its subsidiaries.

NOTE 1. OPERATIONS AND SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES AND ESTIMATES

We design, manufacture, sell and support precision power products that transform, refine, and modify the raw electrical power from the utility and convert it into various types of highly-controllable usable power that is predictable, repeatable and customizable. Our power solutions enable innovation in complex semiconductor and thin film plasma processes such as dry etch, strip, chemical and physical deposition, high and low voltage applications such as process control, analytical instrumentation and medical equipment, and in temperature-critical thermal applications such as material and chemical processing. We also supply related instrumentation products for advanced temperature measurement and control, electrostatic instrumentation products for test and measurement applications, and gas sensing and monitoring solutions for multiple industrial markets. Our network of global service support centers provides local repair and field service capability in key regions as well as provide upgrades and refurbishment services, and sales of used equipment to businesses that use our products. As of December 31, 2015, we discontinued our Inverter production, engineering, and sales product line. As such, all Inverter revenues, costs, assets and liabilities are reported in Discontinued Operations for all periods presented herein and we currently report as a single unit. See *Note 4. Discontinued Operations* for more information.

Principles of Consolidation — Our Consolidated Financial Statements include our accounts and the accounts of our wholly-owned subsidiaries. All intercompany accounts and transactions have been eliminated. Our Consolidated Financial Statements are stated in United States dollars and have been prepared in accordance with accounting principles generally accepted in the United States (“U.S. GAAP”).

Use of Estimates in the Preparation of the Consolidated Financial Statements — The preparation of our Consolidated Financial Statements in conformity with U.S. GAAP requires us to make estimates, assumptions and judgments that affect the reported amounts of assets and liabilities, and disclosure of contingent liabilities at the date of the financial statements and the reported amounts of revenue and expenses during the reporting period. We believe that the significant estimates, assumptions, and judgments when accounting for items and matters such as allowances for doubtful accounts, excess and obsolete inventory, warranty reserves, acquisitions, asset valuations, asset life, depreciation, amortization, recoverability of assets, impairments, deferred revenue, stock option and restricted stock grants, taxes, and other provisions are reasonable, based upon information available at the time they are made. Actual results may differ from these estimates, making it possible that a change in these estimates could occur in the near term.

Foreign Currency Translation — The functional currency of our foreign subsidiaries is their local currency, with the exception of our manufacturing facility in Shenzhen, The People's Republic of China (“PRC”) and our regional headquarters in Singapore, where the United States dollar is the functional currency. Assets and liabilities of foreign subsidiaries are translated to United States dollars at period-end exchange rates, and our Consolidated Statements of Operations and Cash Flows are translated at average exchange rates during the period. Resulting translation adjustments are recorded as a component of accumulated other comprehensive income.

Transactions denominated in currencies other than the local currency are recorded based on exchange rates at the time such transactions arise. Subsequent changes in exchange rates result in foreign currency transaction gains and losses which are reflected as unrealized (based on period end translation) or realized (upon settlement of the transactions) in other income, net in our Consolidated Statements of Operations.

Fair Value of Financial Instruments — We value our financial assets and liabilities using fair value measurements. Fair value is based on the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. The carrying amount of cash and cash equivalents, marketable securities, accounts receivable, other current assets, accounts payable, accrued liabilities, and other current liabilities in our Consolidated Financial Statements approximates fair value because of the short-term nature of the instruments.

Cash and Cash Equivalents — We consider all amounts on deposit with financial institutions and highly liquid investments with an original maturity of three months or less to be cash equivalents. Cash and cash equivalents are highly liquid investments that consist primarily of short-term money market instruments and demand deposits with insignificant interest rate risk and original maturities of three months or less at the time of purchase.

Sometimes we invest excess cash in money market funds not insured by the Federal Deposit Insurance Corporation. We believe that the investments in money market funds are on deposit with credit-worthy financial institutions and that the funds are highly liquid. The investments in money market funds are reported at fair value, with interest income recorded in

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
(in thousands, except per share amounts)

earnings and are included in “Cash and cash equivalents.” The fair values of our investments in money market funds are based on the quoted market prices.

At December 31, 2018 we had \$0.7 million and at December 31, 2017 we had \$1.2 million, of cash included in cash and cash equivalents that is used to collateralize certain tax, custom and purchasing card programs and is restricted from immediate withdrawal.

Marketable Securities — All of our investments in marketable securities are classified as available-for-sale at the respective balance sheet dates. Marketable securities classified as available-for-sale are recorded at fair value based upon quoted market prices, and any temporary difference between the cost and fair value of the investment is presented as a separate component of accumulated other comprehensive income (loss). We recognize gains and losses on the date our investments mature or are sold and record these gains and losses in other income, net. The specific identification method is used to determine the gains and losses on investments in marketable securities.

Concentrations of Credit Risk — Financial instruments, which potentially subject us to credit risk, include cash and cash equivalents, marketable securities, and trade accounts receivable. To preserve capital and maintain liquidity, we invest with financial institutions we deem to be of high quality and sound financial condition. Our investments are in low-risk instruments and we limit our credit exposure in any one institution or type of investment instrument based upon criteria including creditworthiness.

At December 31, 2018, our accounts receivable from Applied Materials and Lam Research were \$34.3 million, or 34.2% and \$12.2 million, or 12.1% of our total accounts receivable, respectively. At December 31, 2017, our accounts receivable from Applied Materials and Lam Research were \$36.8 million, or 42.0% and \$5.4 million, or 6.2% of our total accounts receivable, respectively. No other customer balance exceeded 10% of our total accounts receivable balance at December 31, 2018 or December 31, 2017. We have established an allowance for doubtful accounts based upon factors surrounding the credit risk of specific customers, historical trends, and other information.

Accounts Receivable and Allowance for Doubtful Accounts — Accounts receivable are recorded at net realizable value. We maintain a credit approval process and we make significant judgments in connection with assessing our customers’ ability to pay. Despite this assessment, from time to time, our customers are unable to meet their payment obligations. We continuously monitor our customers’ credit worthiness and use our judgment in establishing a provision for estimated credit losses based upon our historical experience and any specific customer collection issues that we have identified. While such credit losses have historically been within our expectations and the provisions established, there is no assurance that we will continue to experience the same credit loss rates that we have in the past. A significant change in the liquidity or financial position of our customers could have a material adverse impact on the collectability of accounts receivable and our future operating results.

Changes in allowance for doubtful accounts are summarized as follows:

	Years Ended December 31,		
	2018	2017	2016
Balances at beginning of period	\$ 1,748	\$ 1,943	\$ 8,739
Additions from acquisition	416	—	—
Additions - charged to expense	109	—	1,332
Deductions - write-offs, net of recoveries	(417)	(195)	(8,128)
Balances at end of period	<u>\$ 1,856</u>	<u>\$ 1,748</u>	<u>\$ 1,943</u>

Inventories — Inventories include costs of materials, direct labor, manufacturing overhead, in-bound freight, and duty. Inventories are valued at the lower of cost (first-in, first-out method) or net realizable value and are presented net of reserves for excess and obsolete inventory.

We regularly review inventory quantities on hand and record a provision to write-down excess and obsolete inventory to its estimated net realizable value, if less than cost, based primarily on historical usage and our estimated forecast of product demand. Demand for our products can fluctuate significantly. A significant decrease in demand could result in an increase in the charges for excess inventory quantities on hand.

In addition, our industry is subject to technological change, new product development, and product technological obsolescence that could result in an increase in the amount of obsolete inventory quantities on hand. Therefore, any significant

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
(in thousands, except per share amounts)

unanticipated changes in demand or technological developments could have a significant impact on the value of our inventory and our reported operating results.

Property and Equipment — Property and equipment is stated at cost or estimated fair value if acquired in a business combination. Depreciation is computed over the estimated useful lives using the straight-line method. Estimated useful lives for financial reporting purposes are as follows: buildings, 20 to 40 years; machinery, equipment, furniture and fixtures and vehicles, three to 15 years; and computer and communication equipment, three years.

Amortization of leasehold improvements is calculated using the straight-line method over the lease term or the estimated useful life of the assets, whichever period is shorter. Leasehold additions and improvements are capitalized, while maintenance and repairs are expensed as incurred.

When depreciable assets are retired, or otherwise disposed of, the cost and related accumulated depreciation are removed from the accounts and any related gains or losses are included in other income, net, in our Consolidated Statements of Operations.

Intangible Assets, Goodwill and Other Long-Lived Assets — As a result of our acquisitions, we identified and recorded intangible assets and goodwill. Intangible assets are valued based on estimates of future cash flows and amortized over their estimated useful lives. Goodwill is subject to annual impairment testing, as well as testing upon the occurrence of any event that indicates a potential impairment. Intangible assets and other long-lived assets are subject to an impairment test if there is an indicator of impairment. The carrying value and ultimate realization of these assets is dependent upon our estimates of future earnings and benefits that we expect to generate from their use. If our expectations of future results and cash flows are significantly diminished, intangible assets and goodwill may be impaired and the resulting charge to operations may be material. When we determine that the carrying value of intangibles or other long-lived assets may not be recoverable based upon the existence of one or more indicators of impairment, we use the projected undiscounted cash flow method to determine whether an impairment exists, and then measure the impairment using discounted cash flows.

The estimation of useful lives and expected cash flows requires us to make significant judgments regarding future periods that are subject to some factors outside of our control. Changes in these estimates can result in significant revisions to our carrying value of these assets and may result in material charges to our results of operations.

The annual impairment test for goodwill can be performed using an assessment of qualitative factors in determining if it is more likely than not that goodwill is impaired. If this assessment indicates that it is more likely than not that goodwill is impaired, the next step of impairment testing compares the fair value of a reporting unit to its carrying value. Goodwill would be impaired if the resulting implied fair value of goodwill was less than the recorded carrying value of the goodwill.

Revenue Recognition — We recognize revenue when we have satisfied our performance obligations which typically occurs when control of the products or services have been transferred to our customers. The transaction price is based upon the standalone selling price. In most transactions, we have no obligations to our customers after the date products are shipped, other than pursuant to warranty obligations. Revenue is recognized net of any taxes collected from customers, which are subsequently remitted to governmental authorities. Shipping and handling fees, if any, are recognized as revenue. The related shipping and handling costs is recognized in cost of sales. We expense incremental costs of obtaining contracts when the amortization period of the costs is less than 1 year. These costs are included in selling, general, and administrative expenses. Repairs that are covered under our standard warranty do not generate revenue.

We maintain a worldwide support organization in 10 countries, including the United States, the PRC, Japan, Korea, Taiwan, Germany, Ireland, Singapore, Israel and Great Britain. Support services include warranty and non-warranty repair services, upgrades, and refurbishments on the products we sell. Repairs that are covered under our standard warranty do not generate revenue.

As part of our ongoing service business, we satisfy our service obligations under extended warranties and preventive maintenance contracts. Extended warranties had previously been offered on our discontinued inverter products. Any up-front fees received for extended warranties or maintenance plans are deferred and recognized ratably over the service periods, as defined in the agreements. We have deferred revenue related to our extended warranties and service contracts totaling \$33.4 million as of December 31, 2018 and \$37.5 million as of December 31, 2017 .

Research and Development Expenses — Costs incurred to advance, test or otherwise modify our proprietary technology or develop new technologies are considered research and development costs and are expensed when incurred. These costs are primarily comprised of costs associated with the operation of our laboratories and research facilities, including internal labor, materials, and overhead.

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
(in thousands, except per share amounts)

Warranty Costs — We provide for the estimated costs to fulfill customer warranty obligations upon the recognition of the related revenue. We offer warranty coverage for a majority of our Precision Power products for periods typically ranging from 12 to 24 months after shipment. We warranted our inverter products for five to ten years and provided the option to purchase additional warranty coverage for up to 20 years. The warranty expense accrued related to our standard inverter product warranties is now considered part of our discontinued operations and is recorded as such on our Consolidated Balance Sheets. See *Note 4. Discontinued Operations* for more information. See *Note 15. Warranties* for more information on our warranties from continuing operations. We estimate the anticipated costs of repairing our products under such warranties based on the historical costs of the repairs. The assumptions we use to estimate warranty accruals are reevaluated periodically, in light of actual experience, and when appropriate, the accruals are adjusted. Should product failure rates differ from our estimates, actual costs could vary significantly from our expectations.

Stock-Based Compensation — Accounting for stock-based compensation requires the measurement and recognition of compensation expense for all share-based payment awards made to employees and directors based on estimated fair values. We have estimated the fair value of all stock options and awards on the date of grant using the Black-Scholes-Merton pricing model, which is affected by our stock price, as well as assumptions regarding a number of complex and subjective variables. These variables include our expected stock price volatility over the term of the awards, actual and projected employee option exercise behaviors, risk-free interest rates and expected dividends. We also estimate forfeitures at the time of grant and revise those estimates in subsequent periods if actual forfeitures differ from our estimates. Our expected volatility assumption is based on the historical daily closing price of our stock over a period equivalent to the expected life of the options.

Income Taxes — We follow the liability method of accounting for income taxes under which deferred tax assets and liabilities are recognized for future tax consequences. A deferred tax asset or liability is computed for both the expected future impact of differences between the financial statement and tax basis of assets and liabilities and for the expected future tax benefit to be derived from tax loss and tax credit carry-forwards. Tax rate changes are reflected in the period such changes are enacted.

We assess the recoverability of our net deferred tax assets and the need for a valuation allowance on a quarterly basis. Our assessment includes a number of factors including historical results and taxable income projections for each jurisdiction. The ultimate realization of deferred income tax assets is dependent on the generation of taxable income in appropriate jurisdictions during the periods in which those temporary differences are deductible. We consider the scheduled reversal of deferred income tax liabilities, projected future taxable income, and tax planning strategies in determining the amount of the valuation allowance. Based on the level of historical taxable income and projections for future taxable income over the periods in which the deferred income tax assets are deductible, we determine if we will realize the benefits of these deductible differences.

Accounting for income taxes requires a two-step approach to recognize and measure uncertain tax positions. In general, we are subject to regular examination of our income tax returns by the Internal Revenue Service and other tax authorities. The first step is to evaluate the tax position for recognition by determining, if based on the technical merits, it is more likely than not that the position will be sustained upon audit, including resolutions of related appeals or litigation processes, if any. The second step is to measure the tax benefit as the largest amount that is more than 50% likely of being realized upon ultimate settlement. We regularly assess the likelihood of favorable or unfavorable outcomes resulting from these examinations to determine the adequacy of our provision for income taxes. This evaluation is based on factors including, but not limited to, changes in facts or circumstances, changes in tax law, effectively settled issues under audit, and new audit activity.

On December 22, 2017, the Tax Act was enacted into law and the new legislation contains several key tax provisions that affected us, including a one-time mandatory transition tax on accumulated foreign earnings and a reduction of the corporate income tax rate to 21%, among others. In conjunction with the Tax Act enactment, the SEC issued Staff Accounting Bulletin No. 118, *Income Tax Accounting Implications of the Tax Cuts and Jobs Act* ("SAB 118"), which allowed for the recording of provisional amounts related to the Tax Act and subsequent adjustments related to the Tax Act during an up to one-year measurement period. The Company recorded what it believed to be reasonable estimates during the SAB 118 measurement period which lasted from December 2017 to December 2018. During the quarter ended December 31, 2018, the Company finalized the accounting treatment of the income tax effects of the Tax Act. Although the SAB 118 measurement period has ended, there may be some aspects of the Tax Act that remain subject to future regulations and/or notices which may further clarify certain provisions of the Tax Act. Accordingly, the Company may need to adjust its previously recorded amounts to reflect the recognition and measurement of its tax accounting positions in accordance with Accounting Standards Codification Topic-740, "Income Taxes" which could be material.

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
(in thousands, except per share amounts)

Commitments and Contingencies — From time to time we are involved in disputes and legal actions arising in the normal course of our business. While we currently believe that the amount of any ultimate loss would not be material to our financial position, the outcome of these actions is inherently difficult to predict. In the event of an adverse outcome, the ultimate loss could have a material adverse effect on our financial position or reported results of operations in a particular period. An unfavorable decision, particularly in patent litigation, could require material changes in production processes and products or result in our inability to ship products or components found to have violated third-party patent rights. We accrue loss contingencies when it is probable that a loss has occurred or will occur and the amount of the loss can be reasonably estimated. Our estimates of probability of losses are subjective, involve significant judgment and uncertainties, and are based on the best information we have at any given point in time. Resolution of these uncertainties in a manner inconsistent with our expectations could have a significant impact on our results of operations and financial condition

NEW ACCOUNTING STANDARDS

From time to time, the Financial Accounting Standards Board ("FASB") or other standards setting bodies issue new accounting pronouncements. Updates to the FASB Accounting Standards Codification ("ASC") are communicated through issuance of an Accounting Standards Update ("ASU"). Unless otherwise discussed, we believe that the impact of recently issued guidance, whether adopted or to be adopted in the future, is not expected to have a material impact on the Consolidated Financial Statements upon adoption.

Recently issued accounting pronouncements not yet adopted

In February 2016, the FASB issued ASU 2016-02, "Leases (Topic 842)," to increase transparency and comparability among organizations by recognizing lease assets and lease liabilities on the balance sheet and disclosing key information about leasing arrangements. ASU 2016-02 is effective for fiscal years beginning after December 15, 2018, including interim periods within the year of adoption. Early adoption is permitted.

Advanced Energy has established a cross-functional implementation team to analyze its current portfolio of lease contracts. We are currently in the process of aggregating lease agreements and completing the individual lease analysis in accordance with ASU 2016-02. The implementation team is also responsible for identifying and implementing changes to existing business processes, controls, and systems in order to support lease accounting and disclosure under the new standard. The standard permits the use of either the retrospective or cumulative effect transition method. We will adopt the new lease guidance effective January 1, 2019 with a cumulative adjustment to the opening balance of Retained earnings as opposed to retrospectively adjusting our prior periods. While Advanced Energy has not yet completed its evaluation we anticipate that the adoption of ASU 2016-02 will have a significant impact on our Consolidated Balance Sheets values for right of use assets and the related lease liabilities, mainly driven by building and facility leases. The current estimate of right of use assets and related capital lease liabilities to be recorded upon adoption of ASC 842 is \$40.0 million to \$60.0 million.

In February 2018, the FASB issued ASU 2018-02, "Income Statement—Reporting Comprehensive Income" to give companies the option to reclassify the income tax effects on items within accumulated other comprehensive income resulting from the Tax Act to retained earnings. ASU 2018-02 is effective for fiscal years beginning after December 15, 2018, including interim periods within those years. Early adoption is permitted. Advanced Energy is currently assessing the impact of adopting ASU 2018-02 and does not expect its adoption to have a significant impact on its Consolidated Financial Statements.

In June 2018, the FASB issued ASU 2018-07, "Compensation—Stock Compensation (Topic 718)", Improvements to Non-employee Share-based Payments ("ASU 2018-07"). This ASU expands the scope of Topic 718 to include share-based payment transactions for acquiring goods and services from non-employees. ASU 2018-07 is effective for fiscal years beginning after December 15, 2018. Early adoption is permitted. The new guidance is required to be applied retrospectively with the cumulative effect recognized at the date of initial application. Advanced Energy is currently assessing and does not believe ASU 2018-07 will have a significant impact on its Consolidated Financial Statements.

In August 2018, the FASB issued ASU 2018-13, "Fair Value Measurement (Topic 820)" ("ASU 2018-13"). ASU 2018-13 modifies the disclosure requirements on fair value measurements in Topic 820, Fair Value Measurement, based on the concepts in the Concepts Statement, including the consideration of costs and benefits. ASU 2018-13 is effective for fiscal years ending after December 15, 2019 and shall be applied to all periods presented on a retrospective basis. Early adoption is permitted. Advanced Energy is currently assessing and does not believe ASU 2018-13 will have a significant impact on its fair value measurements disclosure requirement.

In August 2018, the FASB issued ASU 2018-14, "Compensation—Retirement Benefits—Defined Benefit Plans—General (Subtopic 715-20)" ("ASU 2018-14"). ASU 2018-14 eliminates requirements for certain disclosures and requires additional disclosures under defined benefit pension plans and other post-retirement plans. ASU 2018-14 is effective for fiscal years ending after December 15, 2020 and shall be applied to all periods presented on a retrospective basis. Early adoption is

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
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permitted. Advanced Energy is currently assessing the impact ASU 2018-14 may have on its Consolidated Financial Statements disclosures.

Recently adopted accounting pronouncements

In May 2014, the FASB issued ASU 2014-09, "Revenue from Contracts with Customers" and has subsequently issued several supplemental and/or clarifying ASUs (collectively known as "ASC 606"). ASC 606 implements a five-step model for how an entity should recognize revenue in order to depict the transfer of promised goods or services to customers in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services. ASC 606 is effective for fiscal periods beginning after December 15, 2017 and for the interim periods within that year. We adopted ASC 606 during the first quarter of fiscal year 2018 using the modified retrospective approach and recorded an adjustment to reflect the cumulative-effect of its adoption on all contracts with customers. See *Note 3. Revenue* for further details.

In October 2016, the FASB issued ASU 2016-16, "Accounting for Income Taxes: Intra-Entity Asset Transfers of Assets Other than Inventory." ASU 2016-16 changes the timing of income tax recognition for an intercompany sale of assets. ASU 2016-16 requires the seller's tax effects and the buyer's deferred taxes to be recognized immediately upon the sale instead of deferring accounting for the income tax implications until the assets are sold to a third party or recovered through use. ASU 2016-16 is effective for fiscal years beginning after December 15, 2017 including interim periods within the year of adoption. We adopted ASU 2016-16 using the modified retrospective approach. To reflect the cumulative-effect of adopting ASU 2016-16, in 2018 we recorded adjustments that increased deferred income tax assets and retained earnings. During the first quarter of 2018 we recorded an adjustment of \$17.1 million and during the fourth quarter of 2018 we recorded an out of period adjustment for an additional \$12.8 million to reflect a revised assessment of the adoption of this standard. We determined that the adjustment did not have a material impact to our current or previously issued consolidated financial statements.

Cumulative-effect of recently adopted accounting pronouncements

The following table reflects the cumulative-effect of the adoption of ASC 606 and ASU 2016-16 using the modified retrospective approach for:

	December 31, 2017 as reported	Impact of ASC 606	Impact of ASU 2016-16	January 1, 2018 as adjusted
Accounts and other receivable, net	\$ 87,429	\$ 8,251	\$ —	\$ 95,680
Inventories	78,450	(3,561)	—	74,889
Total current assets	595,225	4,690	—	599,915
Deferred income tax assets	18,841	—	29,907	48,748
Total assets	733,308	4,690	29,907	767,905
Income taxes payable	5,365	—	921	6,286
Deferred income tax liabilities	4,556	1,143	—	5,699
Total liabilities	212,667	1,143	921	214,731
Retained earnings	333,225	3,547	28,986	365,758
Total stockholders' equity	520,641	3,547	28,986	553,174
Total liabilities and stockholders' equity	733,308	4,690	29,907	767,905

NOTE 2. BUSINESS ACQUISITIONS

LumaSense Technologies Holdings, Inc.

In September 2018, Advanced Energy acquired LumaSense Technologies Holdings, Inc. ("LumaSense"), a privately held company with primary operations in Santa Clara, California, Frankfurt, Germany, and Ballerup, Denmark for a purchase price of \$94.9 million in cash.

Electrostatic Technology and Product Line

In May 2018, Advanced Energy acquired the electrostatic technology and product line from Monroe Electronics, Inc. ("Monroe") a privately held electronics manufacturer in Lyndonville, New York for \$3.0 million in cash.

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
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Trek Holding Co., LTD

In February 2018, Advanced Energy acquired Trek Holding Co., LTD ("Trek"), a privately held company with operations in Tokyo, Japan and Lockport, New York for \$11.7 million in cash. Trek has a 95% ownership interest in its U.S. subsidiary which is also its primary operation.

Excelsys Holdings Limited

In July 2017, Advanced Energy acquired all of the issued and outstanding shares of capital stock of Excelsys Holdings Limited ("Excelsys"), an electronics manufacturer in Cork, Ireland for \$18.5 million in cash.

The components of the fair value of the total consideration transferred for our acquisitions are as follows:

	2018				2017
	Trek	Electrostatic Product Line	LumaSense	Total	Excelsys
Cash paid for acquisition	\$ 11,723	\$ 3,000	\$ 94,946	\$ 109,669	\$ 18,512
Cash acquired	(5,651)	—	(10,262)	(15,913)	(1,165)
Total fair value of consideration transferred	\$ 6,072	\$ 3,000	\$ 84,684	\$ 93,756	\$ 17,347

The following table summarizes estimated fair values of the assets acquired and liabilities assumed from our acquisitions:

	2018				2017
	Trek	Electrostatic Product Line	LumaSense	Total	Excelsys
Accounts and other receivable, net	\$ 2,818	\$ 77	\$ 7,167	\$ 10,062	\$ 1,930
Inventories	3,941	292	9,372	13,605	1,048
Property and equipment	594	50	1,353	1,997	256
Goodwill	—	1,220	48,032	49,252	8,929
Intangible assets	788	1,400	26,000	28,188	7,585
Deferred income tax assets	606	—	8,116	8,722	35
Other assets	854	—	5,126	5,980	605
Total assets acquired	9,601	3,039	105,166	117,806	20,388
Accounts payable	747	39	5,734	6,520	1,342
Deferred income tax liabilities	—	—	7,984	7,984	946
Other liabilities	2,782	—	6,764	9,546	753
Total liabilities assumed	3,529	39	20,482	24,050	3,041
Total fair value of net assets acquired	\$ 6,072	\$ 3,000	\$ 84,684	\$ 93,756	\$ 17,347

A summary of the intangible assets acquired, amortization method and estimated useful lives are as follows:

	2018			2017	Method and Useful life	
	Trek	Electrostatic Product Line	LumaSense	Excelsys	Amortization Method	Useful Life
Technology	\$ 671	\$ 1,200	\$ 20,000	\$ 5,808	Straight-line	10
Customer relationships	117	200	6,000	1,595	Straight-line	10
Tradenname	—	—	—	182	Straight-line	5
Total	\$ 788	\$ 1,400	\$ 26,000	\$ 7,585		

Goodwill and intangible assets are recorded in the functional currency of the entity and are subject to changes due to translation at each balance sheet date. The goodwill represents expected operating synergies from combining operations with the acquired companies and the estimated value associated with the enhancements to our comprehensive product lines.

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
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Advanced Energy is in the process of finalizing the assessment of fair value for the assets acquired and liabilities assumed related to the LumaSense acquisition.

Pro forma results for Advanced Energy Inc. giving effect to the LumaSense Technologies Holdings, Inc. and Trek Holding Co., LTD acquisitions

The following unaudited pro forma financial information presents the combined results of operations of Advanced Energy Inc., Trek and LumaSense as if the acquisitions had been completed as of the beginning of the prior fiscal year, or January 1, 2017. The unaudited pro forma financial information is presented for informational purposes and is not indicative of the results of operations that would have been achieved if the acquisitions had taken place on January 1, 2017, nor are they indicative of future results.

The unaudited pro forma financial information for the year ended December 31, 2018 includes Advanced Energy's results, including the post-acquisition results of Trek, since February 1, 2018, and the pre-acquisition results of Trek for that period, and including the post-acquisition results of LumaSense, since September 1, 2018, and the pre-acquisition results of LumaSense for that period. The unaudited pro forma financial information for the year ended December 31, 2017 combines Advanced Energy's results with the pre-acquisition results of Trek and the pre-acquisition results of LumaSense for that period. The unaudited pro forma results for the years ended :

	December 31, 2018		December 31, 2017	
	As reported	Pro forma	As reported	Pro forma
Total sales	718,892	758,934	671,012	752,091
Net income attributable to Advanced Energy Industries, Inc.	147,025	148,456	137,861	141,907
Earnings per share:				
Basic earnings per share	\$ 3.76	\$ 3.80	\$ 3.47	\$ 3.57
Diluted earnings per share	\$ 3.74	\$ 3.77	\$ 3.43	\$ 3.53

The unaudited pro forma results for all periods presented include adjustments made to account for certain costs and transactions that would have been incurred had the acquisitions been completed as of January 1, 2017. These adjustments including amortization charges for acquired intangible assets, adjustments for acquisition transaction costs and amortization of purchased gross profit. These adjustments are net of any applicable tax impact and were included to arrive at the pro forma results above.

Trek's operating results have been included in the Advanced Energy's operating results for the periods subsequent to the completion of the acquisition on February 1, 2018. Trek contributed total sales of \$21.3 million for the year ended December 31, 2018 and a net income of \$2.2 million for the year ended December 31, 2018.

LumaSense's operating results have been included in the Advanced Energy's operating results for the periods subsequent to the completion of the acquisition on September 1, 2018. LumaSense contributed total sales of \$17.4 million for the year ended December 31, 2018 and a net (loss) of \$(1.1) million for the year ended December 31, 2018.

Advanced Energy incurred transaction-related costs of \$2.3 million for the year ended December 31, 2018. These cost include \$1.7 million included in "Selling, general and administrative" and \$0.6 million included in "Cost of sales" in the Consolidated Statements of Operations. These transaction-related costs consisted of the LumaSense acquisition transaction and integration costs, warranty and indemnity insurance costs and the amortization of purchased gross profit.

NOTE 3. REVENUE

Adoption of ASC 606, "Revenue from Contract with Customers"

Advanced Energy adopted ASC 606 using the modified retrospective method by recognizing the cumulative effect of the adoption of ASC 606, for all contracts with customers, to the opening balance of equity at January 1, 2018. Therefore, our comparative financial information for the years ended December 31, 2017 and 2016 has not been adjusted and continues to be reported under ASC Topic 605. The cumulative effect adjustment was based on the timing difference of revenue recognition between ASC Topic 605 and ASC 606 related to our inventory stocking agreements. Under ASC 606, revenue related to our inventory stocking agreements are recognized when inventory is shipped to our customers. Under ASC Topic 605, revenue was

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(in thousands, except per share amounts)

recognized when the inventory was consumed by our customers. The tables below show the quantitative impact of ASC 606 on our consolidated financial statements.

	December 31, 2018		
	As Reported	Adjustments	Balances without adoption of ASC 606
	\$	\$	\$
Accounts and other receivable, net	100,442	(19,733)	80,709
Inventories	97,987	8,218	106,205
Total current assets	568,448	(11,515)	556,933
TOTAL ASSETS	816,484	(11,515)	804,969
Income taxes payable	13,258	(1,606)	11,652
Total current liabilities	110,309	(1,606)	108,703
Deferred income tax liabilities	6,988	(1,143)	5,845
Total liabilities	209,182	(2,749)	206,433
Retained earnings	512,783	(8,766)	504,017
Advanced Energy stockholders' equity	606,790	(8,766)	598,024
Total stockholders' equity	607,302	(8,766)	598,536
TOTAL LIABILITIES AND STOCKHOLDERS' EQUITY	816,484	(11,515)	804,969

	Year Ended December 31, 2018		
	As Reported	Adjustments	Balances without adoption of ASC 606
	\$	\$	\$
Product sales	610,326	(11,482)	598,844
Total sales, net	718,892	(11,482)	707,410
Product cost of sales	298,597	(4,657)	293,940
Total cost of sales	353,285	(4,657)	348,628
Gross profit	365,607	(6,825)	358,782
Operating income	171,553	(6,825)	164,728
Income from continuing operations, before income taxes	172,376	(6,825)	165,551
Provision (benefit) for income taxes	25,227	(1,606)	23,621
Income from continuing operations	147,149	(5,219)	141,930
Net income	147,111	(5,219)	141,892
Net income attributable to Advanced Energy Industries, Inc.	147,025	(5,219)	141,806

	Year Ended December 31, 2018		
	As Reported	Adjustments	Balances without adoption of ASC 606
	\$	\$	\$
Net income	147,111	(5,219)	141,892
Income from continuing operations, net of income taxes	147,149	(5,219)	141,930
Adjustments to reconcile net income to net cash provided by operating activities:			
Provision for deferred income taxes	5,618	(1,606)	4,012
Changes in operating assets and liabilities, net of assets acquired:			
Accounts and other receivable, net	3,445	11,482	14,927
Inventories	(11,276)	(4,657)	(15,933)
Net cash provided by operating activities from continuing operations	151,427	—	151,427

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
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Revenue Recognition

We recognize revenue when we have satisfied our performance obligations which typically occurs when control of the products or services have been transferred to our customers. The transaction price is based upon the standalone selling price. In most transactions, we have no obligations to our customers after the date products are shipped, other than pursuant to warranty obligations. Shipping and handling fees billed to customers, if any, are recognized as revenue. The related shipping and handling costs are recognized in cost of sales. Support services include warranty and non-warranty repair services, upgrades, and refurbishments on the products we sell. Repairs that are covered under our standard warranty do not generate revenue.

Practical Expedients

We expense incremental costs of obtaining contracts when the amortization period of the costs is less than 1 year. These costs are included in selling, general, and administrative expenses.

Nature of goods and services

Products

Advanced Energy provides highly-engineered, mission-critical, precision power conversion, measurement and control solutions to our global customers. We design, manufacture, sell and support precision power products that transform electrical power into various usable forms. Our power conversion products refine, modify and control the raw electrical power from a utility and convert it into power that is predictable, repeatable and customizable. Our products enable thin film manufacturing processes such as plasma enhanced chemical and physical deposition and etch for various semiconductor and industrial products, industrial thermal applications for material and chemical processes, and specialty power for critical industrial technology applications. We also supply thermal instrumentation products for advanced temperature measurement and control in these markets.

Our products are designed to enable new process technologies, improve productivity, and lower the cost of ownership for our customers. We also provide repair and maintenance services for all of our products. We principally serve original equipment manufacturers ("OEM") and end customers in the semiconductor, flat panel display, high voltage, solar panel, and other industrial capital equipment markets. Our products are used in diverse markets, applications, and processes including the manufacture of capital equipment for semiconductor device manufacturing, thin film applications for thin film renewables and architectural glass, and for other thin film applications including flat panel displays, and industrial coatings.

Services

Our global support services group offers warranty and after-market repair services in the regions in which we operate, providing us with preventive maintenance opportunities. Our customers continue to pursue low cost of ownership of their capital equipment and are increasingly sensitive to the costs of system downtime. They expect that suppliers offer comprehensive local repair service and customer support. To meet these market requirements, we maintain a worldwide support organization comprising of both direct and indirect activities, through partnership with local distributors, primarily in the United States ("U.S."), the People's Republic of China ("PRC"), Japan, South Korea, Taiwan, Germany, Singapore and United Kingdom.

As part of our ongoing service business, we satisfy our service obligations under preventative maintenance contracts and extended warranties which had previously been offered on our discontinued inverter products. Any up-front fees received for extended warranties or maintenance plans are deferred. Revenue under these arrangements is recognized ratably over the underlying terms as we do not have historical information which would allow us to project the estimated service usage pattern at this time. We have deferred revenue related to our extended warranties and service contracts totaling \$33.4 million as of December 31, 2018 and \$37.5 million as of December 31, 2017. We are expected to recognize between \$0.1 million and \$3.7 million per year through 2034.

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
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Disaggregation of Revenue

The following table presents our sales by product line:

	Years Ended December 31,		
	2018	2017	2016
Semiconductor capital market	\$ 443,141	\$ 461,701	\$ 326,316
Industrial technology capital market	167,185	116,949	84,263
Global support	108,566	92,362	73,125
Total	<u>\$ 718,892</u>	<u>\$ 671,012</u>	<u>\$ 483,704</u>

The following table presents our sales by geographic region, which includes a reclassification in prior periods to conform to the current presentation:

	Years Ended December 31,					
	2018		2017		2016	
Sales to external customers:						
United States	\$ 370,839	51.5%	\$ 375,907	56.0%	\$ 327,397	67.7%
Other North American countries	1,995	0.3	1,440	0.2	161	—
North America	<u>372,834</u>	<u>51.8</u>	<u>377,347</u>	<u>56.2</u>	<u>327,558</u>	<u>67.7</u>
Republic of Korea	74,542	10.4	83,899	12.5	43,359	9.0
People's Republic of China	61,927	8.6	46,099	6.9	16,207	3.4
Other Asian countries	114,105	15.9	91,692	13.7	34,279	7.1
Asia	<u>250,574</u>	<u>34.9</u>	<u>221,690</u>	<u>33.1</u>	<u>93,845</u>	<u>19.5</u>
Germany	39,710	5.5	30,517	4.6	48,589	10.0
Other European countries	55,083	7.7	41,279	6.1	13,712	2.8
Europe	<u>94,793</u>	<u>13.2</u>	<u>71,796</u>	<u>10.7</u>	<u>62,301</u>	<u>12.8</u>
Other countries	691	0.1	179	—	—	—
Total	<u>\$ 718,892</u>	<u>100.0%</u>	<u>\$ 671,012</u>	<u>100.0%</u>	<u>\$ 483,704</u>	<u>100.0%</u>

The following table presents our net sales by extended warranty and service contracts recognized over time and our product and service revenue recognized at a point in time:

	Years Ended December 31,		
	2018	2017	2016
Product and service revenue recognized at point in time	\$ 715,055	\$ 667,440	\$ 480,696
Extended warranty and service contracts recognized over time	3,837	3,572	3,008
Total	<u>\$ 718,892</u>	<u>\$ 671,012</u>	<u>\$ 483,704</u>

NOTE 4. DISCONTINUED OPERATIONS

In December 2015, we completed the wind down of engineering, manufacturing and sales of our solar inverter product line (the "inverter business"). Accordingly, the results of our inverter business have been reflected as "Income (loss) from discontinued operations, net of income taxes" on our Consolidated Statements of Operations for all periods presented herein.

The effect of our sales of extended inverter warranties to our customers continues to be reflected in deferred revenue in our Consolidated Balance Sheets. Deferred revenue for extended inverter warranties and the associated costs of warranty service will be reflected in Sales and Cost of goods sold, respectively, from continuing operations in future periods in our Consolidated Statement of Operations, as the deferred revenue, is earned and the associated services are rendered. Extended warranties related to the inverter product line are no longer offered.

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
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The significant items included in "Income (loss) from discontinued operations, net of income taxes" are as follows:

	Years Ended December 31,		
	2018	2017	2016
Sales, net	\$ —	\$ —	\$ —
Cost of sales	(88)	234	154
Total operating expense (benefit)	96	(1,576)	(3,894)
Operating income (loss) from discontinued operations	(8)	1,342	3,740
Other income (expense)	(24)	337	2,636
Income (loss) from discontinued operations before income taxes	(32)	1,679	6,376
Provision (benefit) for income taxes	6	(81)	(4,130)
Income (loss) from discontinued operations, net of income taxes	\$ (38)	\$ 1,760	\$ 10,506

Assets and Liabilities of discontinued operations within the Consolidated Balance Sheets are comprised of the following:

	December 31,	
	2018	2017
Cash and cash equivalents	\$ 5,251	\$ 7,754
Accounts and other receivables, net	406	1,363
Inventories	198	418
Current assets of discontinued operations	\$ 5,855	\$ 9,535
Other assets	\$ 67	\$ 72
Deferred income tax assets	5,917	11,013
Non-current assets of discontinued operations	\$ 5,984	\$ 11,085
Accounts payable and other accrued expenses	\$ 350	\$ 545
Accrued warranty	4,936	7,305
Current liabilities of discontinued operations	\$ 5,286	\$ 7,850
Accrued warranty	\$ 10,429	\$ 15,112
Other liabilities	286	165
Non-current liabilities of discontinued operations	\$ 10,715	\$ 15,277

NOTE 5. INCOME TAXES

The geographic distribution of pretax income from continuing operations is as follows:

	Years Ended December 31,		
	2018	2017	2016
Domestic	\$ 22,325	\$ 29,088	\$ 13,776
Foreign	150,051	169,103	114,300
	\$ 172,376	\$ 198,191	\$ 128,076

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
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The provision for income taxes from continuing operations is summarized as follows:

	Years Ended December 31,		
	2018	2017	2016
Current:			
Federal	\$ 1,423	\$ 26,550	\$ 3,187
State	12	601	351
Foreign	13,772	9,621	3,081
Total current provision	\$ 15,207	\$ 36,772	\$ 6,619
Deferred:			
Federal	\$ 4,021	\$ 28,297	\$ 3,110
State	2,363	(1,000)	1,564
Foreign	3,636	(1,979)	(165)
Total deferred provision	10,020	25,318	4,509
Total provision for income taxes	\$ 25,227	\$ 62,090	\$ 11,128

The Company's effective tax rates differ from the U.S. federal statutory rate of 21% for the year ended December 31, 2018, primarily due to the benefit of earnings in foreign jurisdictions which are subject to lower tax rates. Our effective tax rate for the year ended December 31, 2018 was also impacted by the effect of the recently enacted Tax Act, with the benefit from the corporate income tax rate reduction to 21% offset by additional GILTI tax. Under U.S. GAAP, an accounting policy election can be made to either recognize deferred taxes for temporary basis differences expected to reverse as GILTI in future years, or to provide for the tax expense related to GILTI in the year the tax is incurred as a period expense only. We have elected to account for GILTI in the year the tax is incurred.

The Company's effective tax rates differ from the U.S. federal statutory rate of 35% for the years ended December 31, 2017 and 2016, primarily because of benefits from lower-taxed global operations. In 2017, our effective tax rate was also impacted by the effect of the recently enacted Tax Act, offset partially by a benefit related to the continued wind down of our solar inverter business.

The following reconciles our effective tax rate on income from continuing operations to the federal statutory rate of 21% for the year ended December 31, 2018 and 35% for the years ended December 31, 2017 and 2016:

	Years Ended December 31,		
	2018	2017	2016
Income taxes per federal statutory rate	\$ 36,199	\$ 69,348	\$ 44,826
State income taxes, net of federal deduction	2,372	1,794	963
Transition tax - U.S. Tax Reform	1,174	61,690	—
Corporate tax rate change - U.S. Tax Reform	(652)	11,177	—
Tax benefit associated with inverter business wind down	—	(33,837)	—
Stock based compensation	(974)	(5,263)	1,117
GILTI Tax	13,064	—	—
Tax effect of foreign operations	(19,162)	(47,482)	(31,651)
Uncertain tax position	(3,088)	4,948	1,636
Unremitted earnings	2,564	—	—
Tax credits	(9,844)	(658)	(4,495)
Other permanent items, net	3,574	373	(1,268)
	\$ 25,227	\$ 62,090	\$ 11,128

Deferred tax assets and liabilities are recognized for the future tax consequences of differences between the carrying amounts of assets and liabilities and their respective tax bases using enacted tax rates in effect for the year in which the differences are expected to be reversed. Significant deferred tax assets and liabilities consist of the following:

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
(in thousands, except per share amounts)

	Years Ended December 31,	
	2018	2017
Deferred tax assets		
Stock based compensation	\$ 1,337	\$ 1,295
Net operating loss and tax credit carryforwards	38,622	40,572
Pension obligation	3,302	3,363
Excess and obsolete inventory	2,161	841
Deferred revenue	6,903	4,519
Employee bonuses and commissions	1,874	1,112
Depreciation and Amortization	29,525	—
Other	9,961	2,118
Deferred tax assets	93,685	53,820
Less: Valuation allowance	(30,924)	(32,267)
Net deferred tax assets	62,761	21,553
Deferred tax liabilities		
Depreciation and amortization	17,723	2,605
Foreign other	—	3,448
Unremitted earnings	3,529	—
Other	1,267	62
Deferred tax liabilities	22,519	6,115
Net deferred tax assets	\$ 40,242	\$ 15,438

As of December 31, 2018, the Company has recorded a valuation allowance on a portion of its U.S. domestic deferred tax assets of approximately \$1.6 million related to state net operating losses and \$2.7 million related to acquired NOL and Foreign Tax Credit attributes from LumaSense that are subject to Internal Revenue Code Section 382 limitations and will expire if unused due to the limitation. The remaining valuation allowance on deferred tax assets approximates \$26.6 million and is associated primarily with operations in Germany, Japan, and India including losses that are both operating and capital in nature. As of December 31, 2018, there is not sufficient positive evidence to conclude that such deferred tax assets will be recognized. The December 31, 2018 valuation allowance balance reflects a decrease of \$1.3 million during the year. The change in the valuation allowance is primarily due to increases from acquired LumaSense positions, and final analysis of the Tax Act corporate tax rate reduction, offset by decreases due to the dissolution of fully valued UK entities and foreign exchange movements.

As of December 31, 2018, the Company had U.S., foreign and state tax loss carryforwards of \$23.5 million, \$91.4 million, and \$89.6 million, respectively. Additionally, the Company had U.S. and state tax credit carryforwards of \$2.8 million and \$0.2 million, respectively. The U.S. and state net operating losses and tax credits are subject to various limitations under Section 382 of the Internal Revenue Code and applicable state laws, and have various expiration periods through 2025. The majority of the foreign jurisdiction net operating loss carry forwards have no expiration period.

We operate under a tax holiday in one of our foreign jurisdictions. This tax holiday is in effect through June 30, 2027. The tax holiday is conditional upon our meeting certain employment and investment thresholds. The impact of the tax holiday increased/(decreased) foreign taxes by \$(17.8) million and \$6.0 million for 2018 and 2017, respectively. The (expense)/benefit of the tax holidays on earnings per diluted share was \$0.47 and \$(0.15) for 2018 and 2017, respectively.

Prior to the third quarter of 2018, we asserted that the undistributed earnings of all our foreign subsidiaries were permanently reinvested. In the third quarter of 2018, following a review of our operations, liquidity and funding, tax implications of cash repatriation, and investment opportunities, we determined that the ability to access certain amounts of foreign earnings would provide greater investment returns, treasury controls, and other working capital needs. Accordingly, in the third quarter of 2018, we withdrew the permanent reinvestment assertion on \$487.4 million of earnings generated by certain of our operations through December 2017. Resulting from this change in permanent reinvestment assertion, the Company recorded a deferred tax liability of \$2.6 million related to withholding and state income taxes.

There is no certainty as to the timing of when such foreign earnings will be distributed to the United States in whole or in part.

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
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Certain foreign subsidiary earnings are subject to U.S. taxation under the U.S. Tax Act, which also repeals U.S. taxation on the subsequent repatriation of those earnings. We have not provided for U.S. state or foreign income taxes on \$138.1 million of our subsidiaries' undistributed earnings as of December 31, 2018. The \$138.1 million of undistributed foreign earnings continue to be reinvested in our foreign operations, as we have determined that these earnings are necessary to support our planned growth and strategic acquisitions in our foreign operations, and as a result, these earnings remain indefinitely reinvested in those operations. In making this decision, we considered cash needs for investing in our existing businesses, currency controls, and the tax cost of cash repatriation. Determination of the amount of unrecognized deferred income tax liability related to these earnings is not practicable.

We account for uncertain tax positions by applying a minimum recognition threshold to tax positions before recognizing these positions in the financial statements. The reconciliation of our total gross unrecognized tax benefits is as follows:

	Years Ended December 31,		
	2018	2017	2016
Balance at beginning of period	\$ 15,990	\$ 11,401	\$ 10,049
Additions based on tax positions taken during a prior period	94	1,258	104
Additions based on tax positions taken during a prior period - LumaSense	757	—	—
Additions based on tax positions taken during the current period	—	4,433	2,318
Reductions based on tax positions taken during a prior period	(153)	—	—
Reductions related to a lapse of applicable statute of limitations	(3,144)	(1,102)	(1,070)
Reductions related to a settlement with taxing authorities	(382)	—	—
Balance at end of period	<u>\$ 13,162</u>	<u>\$ 15,990</u>	<u>\$ 11,401</u>

The unrecognized tax benefits of \$13.2 million, if recognized, will impact the Company's effective tax rate. In accordance with our accounting policy, we recognize accrued interest and penalties related to unrecognized tax benefits as a component of tax expense. We had \$1.2 million and \$1.0 million of accrued interest and penalties at December 31, 2018 and 2017, respectively. We expect the total amount of tax contingencies will decrease by approximately \$8.3 million in 2019 based on statute of limitation expiration and completion of additional procedures to support a change in facts with respect to a specific prior period position.

With few exceptions, the Company is no longer subject to federal state or foreign income tax examinations by tax authorities for years before 2015.

NOTE 6. EARNINGS PER SHARE

Basic earnings per share ("EPS") is computed by dividing income available to common stockholders by the weighted-average number of common shares outstanding during the period. The computation of diluted EPS is similar to the computation of basic EPS except that the denominator is increased to include the number of additional common shares that would have been outstanding (using the if-converted and treasury stock methods), if our outstanding stock options and restricted stock units had been converted to common shares, and if such assumed conversion is dilutive.

The following is a reconciliation of the weighted-average shares outstanding used in the calculation of basic and diluted earnings per share for the years ended December 31, 2018, 2017 and 2016:

	Years Ended December 31,		
	2018	2017	2016
Income from continuing operations	\$ 147,149	\$ 136,101	\$ 116,948
Income from continuing operations attributable to noncontrolling interest	86	—	—
Income from continuing operations attributable to Advanced Energy Industries, Inc.	<u>\$ 147,063</u>	<u>\$ 136,101</u>	<u>\$ 116,948</u>
Basic weighted-average common shares outstanding	39,081	39,754	39,720
Assumed exercise of dilutive stock options and restricted stock units	271	422	311
Diluted weighted-average common shares outstanding	<u>39,352</u>	<u>40,176</u>	<u>40,031</u>
Continuing operations:			
Basic earnings per share	\$ 3.76	\$ 3.42	\$ 2.94
Diluted earnings per share	\$ 3.74	\$ 3.39	\$ 2.92

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
(in thousands, except per share amounts)

The following stock options and restricted units were excluded in the computation of diluted earnings per share because they were anti-dilutive:

	Years Ended December 31,		
	2018	2017	2016
Restricted stock units	2	—	1

Share Repurchase

In September 2015, our Board of Directors authorized a program to repurchase up to \$150.0 million of our stock over a thirty-month period. In November 2017, our Board of Directors approved an extension of the share repurchase program to December 2019 from its original maturity of March 2018. In May 2018 our Board of Directors approved a \$50 million increase in its authorization to repurchase shares of Company common stock under this same program. As of December 31, 2018, we had \$24.9 million remaining for the future repurchase of shares of our common stock.

In order to execute the repurchase of shares of our common stock, the Company periodically enters into stock repurchase agreements. During the years ended December 31, 2018, 2017 and 2016 the Company has repurchased the following shares of common stock:

	Years Ended December 31,		
	2018	2017	2016 (1)
Amount paid to repurchase shares	\$ 95,125	\$ 29,993	\$ —
Number of shares repurchased	1,696	422	343
Average repurchase price per share	\$ 56.07	\$ 71.07	\$ —

(1) In November 2015 we entered into a Fixed Dollar Accelerated Share Repurchase Transaction to purchase \$50.0 million of shares of our common stock in the open market. A total of 1.7 million shares of our common stock was repurchased under the Fixed Dollar Accelerated Share Repurchase Agreement at an average price of \$28.99 per share. The final 0.3 million shares of our common stock was delivered in 2016.

NOTE 7. MARKETABLE SECURITIES AND ASSETS MEASURED AT FAIR VALUE

Our investments with original maturities of more than three months at time of purchase and that are intended to be held for no more than 12 months, are considered marketable securities available for sale.

Our marketable securities consist of certificates of deposit as follows:

	December 31, 2018		December 31, 2017	
	Cost	Fair Value	Cost	Fair Value
Certificates of deposit	\$ 2,463	\$ 2,470	\$ 3,103	\$ 3,104

The maturities of our marketable securities available for sale as of December 31, 2018 are as follows:

	Earliest		Latest
Certificates of deposit	3/18/2019	to	10/17/2019

The value and liquidity of the marketable securities we hold are affected by market conditions, as well as the ability of the issuers of such securities to make principal and interest payments when due, and the functioning of the markets in which these securities are traded. As of December 31, 2018, we do not believe any of the underlying issuers of our marketable securities are at risk of default.

The following tables present information about our marketable securities measured at fair value, on a recurring basis, as of December 31, 2018 and December 31, 2017. The tables indicate the fair value hierarchy of the valuation techniques utilized to determine fair value. We did not have any financial liabilities measured at fair value, on a recurring basis, as of December 31, 2018 or December 31, 2017.

December 31, 2018	Level 1	Level 2	Level 3	Total
Certificates of deposit	\$ —	\$ 2,470	\$ —	\$ 2,470

December 31, 2017	Level 1	Level 2	Level 3	Total
Certificates of deposit	\$ —	\$ 3,104	\$ —	\$ 3,104

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
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There were no transfers in or out of Level 1, 2, or 3 fair value measurements during the year ended December 31, 2018 .

NOTE 8. DERIVATIVE FINANCIAL INSTRUMENTS

We are impacted by changes in foreign currency exchange rates. We manage these risks through the use of derivative financial instruments, primarily forward contracts with banks. During the years ended December 31, 2018 , 2017 and 2016 , we entered into foreign currency exchange forward contracts to manage the exchange rate risk associated with intercompany debt denominated in nonfunctional currencies. These derivative instruments are not designated as hedges; however, they do offset the fluctuations of our intercompany debt due to foreign exchange rate changes. These forward contracts are typically for one-month periods. We did not have any currency exchange rate contracts outstanding as of December 31, 2018 . At December 31, 2017 we had outstanding Euro and Pound Sterling forward contracts. We did not have any currency exchange rate contracts outstanding as of December 31, 2016 .

The notional amount of foreign currency exchange contracts outstanding at December 31, 2017 was \$16.3 million and the fair value of these contracts was not significant at December 31, 2017.

During the years ended December 31, 2018 , 2017 , and 2016 , the gains and losses recorded related to the foreign currency exchange contracts are as follows:

	Years Ended December 31,		
	2018	2017	2016
Foreign currency loss from foreign currency exchange contracts	\$ (750)	\$ (1,438)	\$ (569)

These gains and losses were offset by corresponding gains and losses on the related intercompany debt and both are included as a component of other income, net, in our Consolidated Statements of Operations.

During the first quarter of 2017 we entered into a foreign currency exchange rate forward contract at a cost of \$3.5 million , to mitigate the exchange rate risk associated with a planned offshore acquisition which was not consummated. The hedge expired upon maturity in the first quarter of 2017. The cost of the forward contract is recorded as a component of Other income (expense), net in our Condensed Consolidated Statement of Operations.

NOTE 9. ACCOUNTS AND OTHER RECEIVABLE

Accounts and other receivable are recorded at net realizable value. Components of accounts and other receivable, net of reserves, are as follows:

	December 31,	December 31,
	2018	2017
Invoiced receivables, net	\$ 80,709	\$ 87,429
Uninvoiced receivables	19,733	—
Total receivables, net	\$ 100,442	\$ 87,429

Invoiced receivables, net consist of amounts that have been invoiced to our customers in accordance with terms and conditions, and are shown net of an allowance for doubtful accounts. These receivables are all short term in nature and do not include any financing components.

Uninvoiced receivables consist of amounts where we have satisfied our contractual obligations related to inventory stocking contracts with customers. Such amounts are typically invoiced to the customer upon their consumption of the inventory managed under the stocking contracts. We anticipate that substantially all uninvoiced receivables will be invoiced and collected over the next twelve months. These contracts do not include any financing components.

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
(in thousands, except per share amounts)

NOTE 10. INVENTORIES

Our inventories are valued at the lower of cost or net realizable value and computed on a first-in, first-out (FIFO) basis. Components of inventories, net of reserves, are as follows:

	December 31,	
	2018	2017
Parts and raw materials	\$ 76,647	\$ 58,567
Work in process	6,644	7,986
Finished goods	14,696	11,897
Total	<u>\$ 97,987</u>	<u>\$ 78,450</u>

NOTE 11. PROPERTY AND EQUIPMENT, NET

Property and equipment, net is comprised of the following:

	December 31,	
	2018	2017
Buildings and land	\$ 1,737	\$ 1,788
Machinery and equipment	41,330	36,579
Computer and communication equipment	24,051	26,819
Furniture and fixtures	3,203	1,568
Vehicles	282	341
Leasehold improvements	20,593	17,286
Construction in process	867	802
	<u>92,063</u>	<u>85,183</u>
Less: Accumulated depreciation	<u>(60,794)</u>	<u>(67,388)</u>
Total property and equipment, net	<u>\$ 31,269</u>	<u>\$ 17,795</u>

Depreciation expense recorded in continuing operations and included in selling, general and administrative expense is as follows:

	Years Ended December 31,		
	2018	2017	2016
Depreciation expense	\$ 7,818	\$ 5,074	\$ 3,646

NOTE 12. GOODWILL

The following summarizes the changes in goodwill during the years ended December 31, 2018 and 2017 :

Goodwill	Beginning Balance	Additions	Effect of Changes in Exchange Rates	Ending Balance
December 31, 2018	<u>\$ 53,812</u>	<u>\$ 49,252</u>	<u>\$ (1,164)</u>	<u>\$ 101,900</u>
December 31, 2017	<u>\$ 42,125</u>	<u>\$ 8,929</u>	<u>\$ 2,758</u>	<u>\$ 53,812</u>

Additions are the result of our acquisitions of LumaSense and Monroe's electrostatic technology and product line during the year ended December 31, 2018 and our acquisition of Excelsys during the year ended December 31, 2017 as described in *Note 2. Business Acquisitions*.

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
(in thousands, except per share amounts)

NOTE 13. INTANGIBLE ASSETS

Intangible assets consisted of the following as of December 31, 2018 and 2017 :

	December 31, 2018		
	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount
Technology	\$ 39,879	\$ (7,927)	\$ 31,952
Customer relationships	35,509	(13,484)	22,025
Trademarks and other	2,501	(1,568)	933
Total	<u>\$ 77,889</u>	<u>\$ (22,979)</u>	<u>\$ 54,910</u>

	December 31, 2017		
	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount
Technology	\$ 18,702	\$ (5,559)	\$ 13,143
Customer relationships	30,034	(10,787)	19,247
Trademarks and other	2,623	(1,514)	1,109
Total	<u>\$ 51,359</u>	<u>\$ (17,860)</u>	<u>\$ 33,499</u>

Amortization expense related to intangible assets is as follows:

	Years Ended December 31,		
	2018	2017	2016
Amortization expense	\$ 5,774	\$ 4,350	\$ 4,167

Estimated amortization expense related to intangibles is as follows:

Year Ending December 31,		
2019		\$ 7,589
2020		6,863
2021		6,763
2022		6,503
2023		6,484
Thereafter		20,708
Total		<u>\$ 54,910</u>

NOTE 14. RESTRUCTURING COSTS

During the year ended December 31, 2018, we recorded a total pre-tax charge of \$4.2 million for severance and related costs associated with our manufacturing footprint consolidation and optimization, acquisition integration, and reorganization for business efficiency improvement. For the year ended December 31, 2018, we recorded total severance and related costs of \$4.2 million, which also represents the cumulative costs recognized under this restructuring plan.

The following table summarizes our restructuring liabilities at December 31, 2018:

	Balance at December 31, 2017	Cost incurred and charged to expense	Cost paid or otherwise settled	Effect of change in exchange rates	Balance at December 31, 2018
Severance and related charges	—	4,239	433	—	3,806

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
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NOTE 15. WARRANTIES

Provisions of our sales agreements include customary product warranties, ranging from 12 months to 24 months following installation. The estimated cost of our warranty obligation is recorded when revenue is recognized and is based upon our historical experience by product, configuration and geographic region.

Our estimated warranty obligation is included in Other accrued expenses in our Consolidated Balance Sheets. Changes in our product warranty obligation are as follows:

	Years Ended December 31,		
	2018	2017	2016
Balances at beginning of period	\$ 2,312	\$ 2,329	\$ 1,633
Warranty liabilities acquired	305	118	—
Increases to accruals	1,606	2,029	1,802
Warranty expenditures	(2,127)	(2,184)	(1,058)
Effect of changes in exchange rates	(12)	20	(48)
Balances at end of period	<u>\$ 2,084</u>	<u>\$ 2,312</u>	<u>\$ 2,329</u>

NOTE 16. PENSION LIABILITY*Defined contribution plans*

We have a 401(k) profit sharing and retirement savings plan covering substantially all full-time U.S. employees. Participants may defer up to the maximum amount allowed as determined by law. Participants are immediately vested in their contributions. Profit sharing contributions to the plan, which are discretionary, are approved by the Board of Directors. Vesting in the profit sharing contribution account is based on years of service, with most participants fully vested after four years of credited service. For the years ended December 31, 2018, 2017, and 2016 our contribution for participants in our 401(k) plan was based on matching 50% of contributions made by employees up to 6% of the employee's compensation. During the years ended December 31, 2018, 2017, and 2016 we recognized total defined contribution plan costs of \$ 1.4 million, \$ 1.1 million, and \$ 1.2 million, respectively.

Defined benefit plans

In connection with the acquisition of LumaSense, in September 2018, we acquired the LumaSense Technologies GmbH pension obligation (the "LumaSense Plan"). In order to measure the expense and related benefit obligation, various assumptions are made including discount rates used to value the obligation, expected return on plan assets used to fund these expenses and estimated future inflation rates. These assumptions are based on historical experience as well as facts and circumstances. An actuarial analysis is used to measure the expense and liability associated with pension benefits. The net amount of pension liability recorded as of December 31, 2018 was \$0.1 million and is included in Other long-term liabilities in our Consolidated Balance Sheets. Anticipated payments to pensioners covered by the LumaSense Plan are expected to be around \$0.1 million for each of the next ten years. We are not currently committed to future payments to the LumaSense Plan.

In connection with the acquisition of HiTek Power Group, a privately-held provider of high voltage power solutions, in 2014, we acquired the HiTek Power Limited Pension Scheme ("the HiTek Plan"). The HiTek Plan has been closed to new participants since April 1, 2002 and to additional accruals since April 5, 2005. In order to measure the expense and related benefit obligation, various assumptions are made including discount rates used to value the obligation, expected return on plan assets used to fund these expenses and estimated future inflation rates. These assumptions are based on historical experience as well as facts and circumstances. An actuarial analysis is used to measure the expense and liability associated with pension benefits. The net amount of pension liability recorded as of December 31, 2018 and December 31, 2017 was \$19.2 million and \$19.8 million, respectively, and is included in Other long-term liabilities in our Consolidated Balance Sheets. Anticipated payments to pensioners covered by the HiTek Plan are expected to be between \$0.8 million and \$1.5 million for each of the next ten years. We are committed to make annual fixed payments of \$0.8 million into the Hitek Plan through April 30, 2024, and then \$1.7 million from May 1, 2024 through November 30, 2033.

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
(in thousands, except per share amounts)

The following table sets forth the components of net periodic pension cost for the years ended December 31, 2018, 2017, and 2016:

	Years Ended December 31,		
	2018	2017	2016
Interest cost	\$ 793	\$ 809	\$ 993
Expected return on plan assets	(670)	(597)	(527)
Amortization of actuarial gains and losses	478	503	264
Net periodic pension cost	<u>\$ 601</u>	<u>\$ 715</u>	<u>\$ 730</u>

Assumptions used in the determination of the net periodic pension cost are:

	Years Ended December 31,		
	2018	2017	2016
Discount rate	2.8%	2.6%	2.8%
Expected long-term return on plan assets	4.8%	4.8%	4.7%

The status of our plans as reflected in "Other long-term liabilities" on our Consolidated Balance Sheets is summarized as follows:

	Years Ended December 31,	
	2018	2017
Projected benefit obligation, beginning of year	\$ 33,907	\$ 31,110
Acquisition	1,063	—
Service cost	839	—
Interest cost	793	809
Actuarial loss	(992)	35
Benefits paid	(1,086)	(944)
Translation adjustment	(1,898)	2,897
Projected benefit obligation, end of year	<u>\$ 32,626</u>	<u>\$ 33,907</u>
Plan assets, beginning of year	\$ 14,110	\$ 12,274
Acquisitions	981	—
Actual return on plan assets	670	597
Contributions	828	877
Benefits paid	(1,086)	(944)
Actuarial gain	(1,357)	179
Translation adjustment	(786)	1,127
Plan assets, end of year	<u>\$ 13,360</u>	<u>\$ 14,110</u>
Funded status of plan	<u>\$ (19,266)</u>	<u>\$ (19,797)</u>

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
(in thousands, except per share amounts)

The fair value of the Company's qualified pension plan assets by category for the years ended December 31, are as follows:

	December 31, 2018			
	Level 1	Level 2	Level 3	Total
Multi-Asset Fund	\$ —	\$ 4,570	\$ —	\$ 4,570
Diversified Growth Fund	—	4,649	—	4,649
Index-Linked Gilts	—	2,044	—	2,044
Corporate Bonds	—	2,044	—	2,044
Cash	53	—	—	53
Total	\$ 53	\$ 13,307	\$ —	\$ 13,360

	December 31, 2017			
	Level 1	Level 2	Level 3	Total
Multi-Asset Fund	\$ —	\$ 4,784	\$ —	\$ 4,784
Diversified Growth Fund	—	5,009	—	5,009
Index-Linked Gilts	—	2,102	—	2,102
Corporate Bonds	—	2,173	—	2,173
Cash	42	—	—	42
Total	\$ 42	\$ 14,068	\$ —	\$ 14,110

At December 31, 2018 our plan's assets of \$13.4 million were invested in four separate funds including a multi-asset fund (34.2%), a diversified growth fund (34.8%), an Investment grade long-term bond fund (15.3%) and an index-linked gilt fund (15.3%). The asset and growth funds aim to generate an 'equity-like' return over an economic cycle with significantly reduced volatility relative to equity markets and have scope to use a diverse range of asset classes, including equities, bonds, cash and alternatives, e.g. property, infrastructure, high yield bonds, floating rate debt, private, equity, hedge funds and currency. The bond fund and gilt fund are invested in index-linked gilts and corporate bonds. These investments are intended to provide a degree of protection against changes in the value of our plan's liabilities related to changes in long-term expectations for interest rates and inflation expectations.

NOTE 17. STOCK-BASED COMPENSATION

As of December 31, 2018, we had two active stock-based incentive compensation plans; the 2017 Omnibus Incentive Plan and the Employee Stock Purchase Plan ("ESPP"). All new equity compensation grants are issued under these two plans; however, outstanding awards previously issued under inactive plans will continue to vest and remain exercisable in accordance with the terms of the respective plans. Our stock plans are administered by the Board of Directors Compensation Committee. At December 31, 2018, there were 3.5 million shares reserved and 2.9 million shares available for future grant under our stock-based incentive plans.

On May 4, 2017, the stockholders approved the Company's 2017 Omnibus Incentive Plan ("the 2017 Plan") and reserved 5.2 million shares under the plan. The 2017 Plan replaced the 2008 Omnibus Incentive Plan ("the 2008 Plan"), and all awards previously granted under the 2008 Plan continue to vest and/or are exercisable under the 2017 Plan in accordance with their original terms and conditions. The 2017 Plan and 2008 Plan provide for the grant of stock options, stock appreciation rights, restricted stock, stock units (including deferred stock units), unrestricted stock, and dividend equivalent rights. Additionally, awards issued may be issued as performance based awards to align stock compensation awards to the attainment of annual or long-term performance goals. As of December 31, 2018, there were 2.6 million shares available for grant under the 2017 Plan.

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
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Stock-based Compensation Expense

We recognize stock-based compensation expense based on the fair value of the awards issued and the functional area of the employee receiving the award. Stock-based compensation for the three years ended December 31, is as follows:

	Years Ended December 31,		
	2018	2017	2016
Stock-based compensation expense	\$ 9,703	\$ 12,549	\$ 6,332

Our stock-based compensation expense is based on the value of the portion of share-based payment awards that are ultimately expected to vest, assuming estimated forfeitures at the time of grant. Estimated forfeiture rates for our stock-based compensation expense applicable to stock options and restricted stock units ("RSU's") was approximately 10% for the year ended December 31, 2018 , 17% for the year ended December 31, 2017 and 18% for the year ended December 31, 2016 .

Restricted Stock Units

The fair value of our Restricted Stock Units ("RSUs") is determined based upon the closing fair market value of our common stock on the grant date. Changes in the unvested RSU's during the years ended December 31, 2018 , 2017 and 2016 were as follows:

	2018		2017		2016	
	Shares	Weighted-Average Grant Date Fair Value	Shares	Weighted-Average Grant Date Fair Value	Shares	Weighted-Average Grant Date Fair Value
RSUs outstanding at beginning of period	386	\$ 51.06	354	\$ 29.60	234	\$ 26.10
RSUs granted	245	64.48	252	63.63	297	30.37
RSUs vested	(207)	54.94	(211)	30.62	(157)	25.97
RSUs forfeited	(72)	50.79	(9)	33.91	(20)	28.32
RSUs outstanding at end of period	<u>352</u>	<u>58.17</u>	<u>386</u>	<u>51.06</u>	<u>354</u>	<u>29.60</u>

The total intrinsic value of RSUs converted to shares for the years ended December 31, 2018 , 2017 and 2016 were \$13.6 million , \$14.8 million and \$5.0 million , respectively. As of December 31, 2018 , there was \$7.0 million of total unrecognized compensation cost, net of expected forfeitures related to non-vested RSUs granted, which is expected to be recognized through fiscal September 2021 , with a weighted-average remaining vesting period of 1.1 years .

Stock Options

Stock option awards are generally granted with an exercise price equal to the market price of our stock at the date of grant and with either a three or four-year vesting schedule or performance based vesting as determined at the time of grant. Stock option awards generally have a term of 10 years .

The fair value of options granted during the year ended December 31, 2015 was estimated on the date of grant using the Black-Scholes-Merton option pricing model using the following assumptions: the risk-free interest rate was 1.1% - 1.4% , the expected term was 4.3 years and expected volatility was 43% . The risk-free interest rate is based on the five-year U.S. Treasury Bill at the time of the grant. We utilize our historical experience in determining the expected term of our stock options and volatility of our common stock. We have not historically issued dividends.

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
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Changes in our outstanding stock options during the years ended December 31, 2018, 2017 and 2016 were as follows:

	2018		2017		2016	
	Shares	Weighted-Average Exercise Price	Shares	Weighted-Average Exercise Price	Shares	Weighted-Average Exercise Price
Options outstanding at beginning of period	317	\$ 18.97	474	\$ 17.47	642	\$ 17.11
Options granted	—	—	—	—	—	—
Options exercised	(83)	14.41	(152)	14.32	(156)	15.28
Options forfeited	—	—	(2)	26.32	(12)	26.32
Options expired	(4)	11.97	(3)	11.09	—	—
Options outstanding at end of period	230	20.73	317	18.97	474	17.47
Options vested during the year	2		9		11	

The total intrinsic value of options exercised for the years ended December 31, 2018, 2017 and 2016 were \$4.1 million, \$9.7 million and \$2.8 million, respectively. Information about our stock options that are outstanding, options that we expect to vest and options that are exercisable at December 31, 2018 are as follows:

Options Expected to Vest:	Number	Weighted-Average Exercise Price	Weighted-Average Remaining Contractual Life	Aggregate Intrinsic Value
Options outstanding	230	\$ 20.73	4.6 years	\$ 5,108
Options expected to vest	230	20.73	4.6 years	5,108
Options exercisable	230	20.73	4.6 years	5,108

The following table summarizes information about the stock options outstanding at December 31, 2018:

Range of Exercise Prices	Options Outstanding			Options Exercisable	
	Number Outstanding	Weighted-Average Remaining Contractual Life	Weighted-Average Exercise Price	Number Exercisable	Weighted-Average Exercise Price
7.69 - 9.51	10	1.1 years	\$ 8.38	10	\$ 8.38
11.02 - 14.52	47	1.8 years	13.04	47	13.04
15.65 - 18.77	58	4.6 years	18.06	58	18.06
24.31 - 26.32	115	6.1 years	26.24	115	26.24
7.69 - 26.32	230	4.6 years	20.73	230	20.73

Employee Stock Purchase Plan

The ESPP, a stockholder-approved plan, provides for the issuance of rights to purchase up to 1,000,000 shares of common stock. In May 2010, stockholders approved an increase from 500,000 to 1,000,000 shares authorized for sale under our ESPP. Employees below the Vice President level are eligible to participate in the ESPP if employed by us for at least 20 hours per week during at least five months per calendar year. Participating employees may contribute up to the lesser of 15% of their eligible earnings or \$5,000 during each plan period. Currently, the plan period is six months. The purchase price of common stock purchased under the ESPP is currently equal to the lower of: 1) 85% of the fair market value of our common stock on the commencement date of each plan period or 2) 85% of the fair market value of our common shares on each plan period purchase date. At December 31, 2018, 0.3 million shares remained available for future issuance under the ESPP.

Purchase rights granted under the ESPP are valued using the Black-Scholes-Merton model. As of December 31, 2018, there was \$0.2 million of total unrecognized compensation cost related to the ESPP that is expected to be recognized over a remaining period of five months. Total compensation expense was \$0.4 million for the year ended December 31, 2018 and \$0.2 million for the years ended December 31, 2017, and 2016.

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
(in thousands, except per share amounts)

The fair value of each purchase right granted under the ESPP was estimated on the date of grant using the Black-Scholes-Merton option pricing model with the following assumptions:

	2018	2017	2016
Risk-free interest rates	2.10% - 2.56%	1.07% - 1.45%	0.49% - 0.60%
Expected dividend yield rates	—%	—%	—%
Expected term	0.5 years	0.5 years	0.5 years
Expected volatility	38.0%	33.3%	28.2%

The risk-free interest rate is based on the six month U.S. Treasury Bill at the time of the grant. We utilize our historical experience in determining the expected term of our stock options and volatility of our common stock. We have not historically issued dividends.

NOTE 18. COMMITMENTS AND CONTINGENCIES

Disputes and Legal Actions

We are involved in disputes and legal actions arising in the normal course of our business. While we currently believe that the amount of any ultimate loss would not be material to our financial position, the outcome of these actions is inherently difficult to predict. In the event of an adverse outcome, the ultimate loss could have a material adverse effect on our financial position or reported results of operations. An unfavorable decision in patent litigation also could require material changes in production processes and products or result in our inability to ship products or components found to have violated third-party patent rights. We accrue loss contingencies in connection with our commitments and contingencies, including litigation, when it is probable that a loss has occurred, and the amount of the loss can be reasonably estimated. The Company is currently not a party to any legal action that the Company believes would reasonably have a material adverse impact on its business, financial condition, results of operations or cash flows.

Operating Leases

We have various operating leases for automobiles, equipment, and office and production facilities. Rent expense under operating leases was approximately \$7.4 million in 2018, \$ 6.5 million in 2017, and \$ 6.4 million in 2016.

The future minimum rental payments required under non-cancelable operating leases as of December 31, 2018 are as follows:

2019	\$	9,093
2020		7,561
2021		6,938
2022		3,862
2023		3,448
Thereafter		18,349
Total	\$	<u>49,251</u>

NOTE 19. RELATED PARTY TRANSACTIONS

Members of our Board of Directors hold various executive positions and serve as directors at other companies, including companies that are our customers. During the years ended December 31, 2018, 2017, and 2016, we engaged in the following transactions with companies related to members of our Board of Directors, as described below:

	Years Ended December 31,		
	2018	2017	2016
Sales to related parties	\$ 1,028	\$ 1,425	\$ 616
Number of related party customers	1	1	2
Purchases from related parties	\$ —	\$ —	\$ 43
Number of related party vendors	—	—	1

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
(in thousands, except per share amounts)

Our accounts receivable balance from related party customers with outstanding balances as of December 31, 2018 and December 31, 2017 is as follows:

	December 31, 2018	December 31, 2017
Accounts receivable from related parties	\$ 109	\$ 27
Number of related party customers	1	1

We did not have any outstanding accounts payable with our related parties as of December 31, 2018 or December 31, 2017 .

NOTE 20. GEOGRAPHIC AND SIGNIFICANT CUSTOMER INFORMATION

The following table summarizes sales, and percentages of sales, by customers that individually accounted for 10% or more of our sales for the years ended December 31, 2018 and 2017 :

	Years Ended December 31,					
	2018		2017		2016	
Applied Materials, Inc.	\$ 258,027	35.9%	\$ 224,832	33.5%	\$ 170,162	35.2%
LAM Research	109,005	15.2%	155,312	23.1%	100,270	20.7%

The following table summarizes the accounts receivable balances, and percentages of the total accounts receivable, for customers that individually accounted for 10% or more of accounts receivable as of December 31, 2018 and December 31, 2017 :

	December 31, 2018		December 31, 2017	
Applied Materials, Inc.	\$ 34,301	34.2%	\$ 36,755	42.0%
LAM Research	12,181	12.1%	5,421	6.2%

Our sales to Applied Materials, Inc. and LAM Research include precision power products used in semiconductor processing and solar and flat panel display. No other customer accounted for 10% or more of our sales or accounts receivable balances during these periods.

The following table summarizes long-lived assets by geographic area as of December 31, 2018 and December 31, 2017 :

	December 31,	
	2018	2017
United States	\$ 115,869	\$ 32,528
Asia	12,274	7,601
Europe	59,936	64,977
Total	\$ 188,079	\$ 105,106

Long-lived assets include property and equipment, goodwill and other intangible assets.

NOTE 21. CREDIT FACILITY

On July 28, 2017, the Company entered into a Loan Agreement (the "Loan Agreement") with Bank of America N.A. ("BA") which provides a revolving line of credit of up to \$100.0 million subject to certain funding conditions through July 28, 2022. On December 21, 2017, the Company entered into the First Amendment to the Loan Agreement with BA to increase the line of credit to \$150.0 million . Interest on amounts drawn shall be paid quarterly based upon the LIBOR Daily Floating Rate then in effect, plus between one and one-quarter (1.25%) and one and three-quarters (1.75%) percentage points depending on the Funded Debt to EBITDA ratio. As of December 31, 2018 , the interest rate was 3.77% . The Loan Agreement also requires the Company to pay the lender on a quarterly basis an unused commitment fee based on credit availability. The obligations under the Loan Agreement are unsecured until the Funded Debt to EBITDA ratio exceeds 2.0 to 1.0, at which time the

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
(in thousands, except per share amounts)

Company and certain affiliates' tangible and intangible personal property will be subject to a first priority, perfected lien and security interest in favor of BA pursuant to a Security Agreement. As of December 31, 2018, the Company is in compliance with all covenants required under the Loan Agreement. Our credit availability under the Loan Agreement was \$150.0 million at December 31, 2018.

On September 9, 2016, the Company terminated its Credit Agreement with Wells Fargo Bank, National Association ("Wells Fargo") which provided for a secured revolving credit facility of up to \$50.0 million (the "Credit Facility"), subject to a borrowing base calculation. The Company had no borrowing during 2016 until the termination of the Credit Agreement.

Expense relating to interest, unused commitment fees and amortization of debt issuance costs included in our income from continuing operations is as follows:

	Years Ended December 31,		
	2018	2017	2016
Credit facility costs	\$ 228	\$ 66	\$ 346

NOTE 22. SUPPLEMENTAL QUARTERLY FINANCIAL DATA (UNAUDITED)

The following tables present unaudited quarterly results for each of the eight quarters in the periods ended December 31, 2018 and 2017, in thousands. We believe that all necessary adjustments have been included in the amounts stated below to present fairly such quarterly information. Due to the volatility of the industries in which our customers operate, the operating results for any quarter are not necessarily indicative of results for any subsequent period.

	Quarter Ended			
	December 31, 2018	September 30, 2018	June 30, 2018	March 31, 2018
Sales, net	\$ 154,161	\$ 173,082	\$ 196,032	\$ 195,617
Gross Profit	\$ 75,188	\$ 85,539	\$ 101,235	\$ 103,645
Restructuring Expense	\$ 3,836	\$ 403	\$ —	\$ —
Operating income	\$ 19,570	\$ 39,862	\$ 56,018	\$ 56,103
Income from continuing operations, net of income taxes	\$ 19,222	\$ 35,157	\$ 46,400	\$ 46,370
Income (loss) from discontinued operations, net of income taxes	\$ 188	\$ (371)	\$ 5	\$ 140
Net Income	\$ 19,410	\$ 34,786	\$ 46,405	\$ 46,510
Income from continuing operations attributable to noncontrolling interest	\$ 4	\$ 7	\$ 44	\$ 31
Net income attributable to Advanced Energy Industries, Inc.	\$ 19,406	\$ 34,779	\$ 46,361	\$ 46,479
Earnings (Loss) Per Share:				
Continuing Operations:				
Basic earnings per share	\$ 0.50	\$ 0.90	\$ 1.18	\$ 1.17
Diluted earnings per share	\$ 0.50	\$ 0.90	\$ 1.17	\$ 1.16
Discontinued Operations:				
Basic loss per share	\$ —	\$ (0.01)	\$ —	\$ —
Diluted loss per share	\$ —	\$ (0.01)	\$ —	\$ —
Net Income:				
Basic earnings per share	\$ 0.51	\$ 0.89	\$ 1.18	\$ 1.17
Diluted earnings per share	\$ 0.50	\$ 0.89	\$ 1.17	\$ 1.16

ADVANCED ENERGY INDUSTRIES, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - (continued)
(in thousands, except per share amounts)

	Quarter Ended			
	December 31, 2017	September 30, 2017	June 30, 2017	March 31, 2017
Sales, net	\$ 179,214	\$ 176,575	\$ 165,872	\$ 149,351
Gross Profit	\$ 98,175	\$ 92,234	\$ 87,141	\$ 78,831
Operating income	\$ 58,062	\$ 51,673	\$ 47,767	\$ 43,268
Income (loss) from continuing operations, net of income taxes	\$ (29,007)	\$ 83,794	\$ 45,873	\$ 35,441
Income (loss) from discontinued operations, net of income taxes	\$ (583)	\$ 70	\$ 179	\$ 2,094
Net income (loss) attributable to Advanced Energy Industries, Inc.	\$ (29,590)	\$ 83,864	\$ 46,052	\$ 37,535
Earnings per Share:				
Continuing Operations:				
Basic earnings (loss) per share	\$ (0.73)	\$ 2.11	\$ 1.15	\$ 0.89
Diluted earnings (loss) per share	\$ (0.73)	\$ 2.09	\$ 1.14	\$ 0.88
Discontinued Operations:				
Basic earnings (loss) per share	\$ (0.01)	\$ —	\$ —	\$ 0.05
Diluted earnings (loss) per share	\$ (0.01)	\$ —	\$ —	\$ 0.05
Net Income (loss):				
Basic earnings (loss) per share	\$ (0.75)	\$ 2.11	\$ 1.16	\$ 0.94
Diluted earnings (loss) per share	\$ (0.75)	\$ 2.09	\$ 1.14	\$ 0.93

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE

None.

ITEM 9A. CONTROLS AND PROCEDURES

Evaluation of Disclosure Controls and Procedures

We have established disclosure controls and procedures, which are designed to ensure that information required to be disclosed in reports filed or submitted under the Securities Exchange Act of 1934 (the "Act") is recorded, processed, summarized, and reported, within the time periods specified in the Securities and Exchange Commission's rules and forms. These disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed in the reports that we file or submit under the Act is accumulated and communicated to management, including our Principal Executive Officer (Yuval Wasserman, Chief Executive Officer) and Principal Financial Officer (Paul Oldham, Chief Financial Officer & Executive Vice President), as appropriate, to allow timely decisions regarding required disclosures.

As of the end of the period covered by this report, we conducted an evaluation, with the participation of management, including our Chief Executive Officer and Chief Financial Officer, of the effectiveness of the design and operation of the disclosure controls and procedures pursuant to the Exchange Act Rule 13a-15(b). Based upon this evaluation, the Chief Executive Officer and Chief Financial Officer concluded that our disclosure controls and procedures were effective as of December 31, 2018. The conclusions of the Chief Executive Officer and Chief Financial Officer from this evaluation were communicated to the Audit Committee. We intend to continue to review and document our disclosure controls and procedures, including our internal controls and procedures for financial reporting, and may from time to time make changes aimed at enhancing their effectiveness and to ensure that our systems evolve with our business.

Management's Annual Report on Internal Control over Financial Reporting

It is management's responsibility to establish and maintain effective internal control over our financial reporting, which is a process designed under the supervision of our Chief Executive Officer and Chief Financial Officer and effected by our Board of Directors, management, and other personnel. Our internal control over financial reporting is designed to provide reasonable assurance concerning the reliability of our financial reporting and the preparation of our financial statements for external purposes in accordance with generally accepted accounting principles.

In February 2018 and September 2018, we acquired Trek Holdings Co. Inc. ("Trek") and LumaSense Technologies Holdings ("LumaSense"), respectively, as discussed in *Note 2. Business Acquisitions* in Item 8 "Financial Statements and Supplementary Data." The objectives of Trek's and LumaSense's established internal controls over financial reporting is consistent, in all material respects, with Advanced Energy's objectives. We are in the process of completing a more comprehensive review of Trek's and LumaSense's internal control over financial reporting, and will be implementing changes to better align their reporting and controls with the rest of Advanced Energy. As a result of the timing of the acquisitions and the changes that are anticipated to be made, and in accordance with the general guidance issued by the SEC regarding exclusion of certain acquired businesses, we have excluded Trek and LumaSense from the December 31, 2018 assessment of Advanced Energy's internal controls over financial reporting. Trek and LumaSense, in aggregate, accounted for approximately 14% of Advanced Energy's total assets at December 31, 2018, and 5% of Advanced Energy's total net sales for the fiscal year ended December 31, 2018.

Management, with the participation of our Chief Executive Officer and Chief Financial Officer, evaluated the effectiveness of our internal control over financial reporting as of December 31, 2018, using the criteria described in *Internal Control-Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission. Based upon this evaluation, management concluded that our internal control over financial reporting was effective as of December 31, 2018.

Grant Thornton LLP, an independent registered public accounting firm, has audited our Consolidated Financial Statements included in this Form 10-K, and as part of the audit, has issued an attestation report, included herein, on the effectiveness of our internal control over financial reporting as of December 31, 2018.

Attestation Report of Independent Registered Public Accounting Firm

The attestation report required under this Item 9A is contained in Item 8 of Part II of this Annual Report on Form 10-K under the heading "Report of Independent Registered Public Accounting Firm."

Changes in Internal Control over Financial Reporting

There was no change in our internal control over financial reporting that occurred during 2018 that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

Limitations on Controls and Procedures

Management has concluded that our disclosure controls and procedures and internal control over financial reporting provide reasonable assurance that the objectives of our control system are met. We do not expect, however, that our disclosure controls and procedures or internal control over financial reporting will prevent or detect all misstatements, errors, or fraud, if any. All control systems, no matter how well designed and implemented, have inherent limitations, and therefore no evaluation can provide absolute assurance that every misstatement, error, or instance of fraud, if any, or risk thereof, has been or will be prevented or detected. The occurrence of a misstatement, error, or fraud, if any, would not necessarily require a conclusion that our controls and procedures are not effective.

ITEM 9B. OTHER INFORMATION

None.

PART III

In accordance with General Instruction G(3) of Form 10-K, certain information required by this Part III is incorporated by reference to the definitive proxy statement relating to our 2019 Annual Meeting of Stockholders (the "2019 Proxy Statement"), as set forth below. The 2019 Proxy Statement will be filed with the Securities and Exchange Commission within 120 days after the end of our fiscal year.

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

The information set forth in the 2019 Proxy Statement under the headings "Proposal No. 1/Election of Directors" and "Section 16(a) Beneficial Ownership Reporting Compliance" is incorporated herein by reference. The information under the heading "Executive Officers of the Registrant" in Part I of this Form 10-K is also incorporated herein by reference.

The Company has adopted a Code of Ethical Conduct that applies to all of the Company's employees, including the Company's Chief Executive Officer and Chief Financial Officer and other persons performing similar functions. The Company has posted a copy of the Code of Ethical Conduct on its website at www.advancedenergy.com, and such Code of Ethical Conduct is available, in print, without charge, to any stockholder who requests it from the Company's Secretary. The Company intends to satisfy the disclosure requirements under Item 5.05 of Form 8-K regarding amendments to, or waivers from, the Code of Ethical Conduct by posting such information on its website at www.advancedenergy.com. The Company is not including the information contained on its website as part of, or incorporating it by reference into, this report.

ITEM 11. EXECUTIVE COMPENSATION

The information set forth in the 2019 Proxy Statement under the headings "Executive Compensation" is incorporated herein by reference.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS

The information set forth in the 2019 Proxy Statement under the headings "Security Ownership of Certain Beneficial Owners and Management" and "Equity Compensation Plan Information" is incorporated herein by reference.

ITEM 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS

The information is set forth in *Note 19. Related Party Transactions* in Item 8 "Financial Statements and Supplementary Data," and in the 2019 Proxy Statement under the captions "Election of Directors" and "Certain Relationships and Related Transactions" is incorporated herein by reference.

ITEM 14. PRINCIPAL ACCOUNTING FEES AND SERVICES

The information set forth in the 2019 Proxy Statement under the caption "Ratification of the Appointment of Grant Thornton LLP as Advanced Energy's Independent Registered Public Accounting Firm for 2019" is incorporated herein by reference.

PART IV

ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

(A) Documents filed as part of this Annual Report on Form 10-K are as follows:

1. Financial Statements:

Reports of Grant Thornton LLP

Consolidated Balance Sheets at December 31, 2018 and 2017

Consolidated Statements of Operations for each the years ended December 31, 2018 , 2017 and 2016

Consolidated Statements of Comprehensive Income (Loss) for the years ended December 31, 2018 , 2017 and 2016

Consolidated Statements of Stockholders' Equity for the years ended December 31, 2018 , 2017 and 2016

Consolidated Statements of Cash Flows for the years ended December 31, 2018 , 2017 and 2016

Notes to Consolidated Financial Statements

2. Financial Statement Schedules for the years ended December 31, 2018 , 2017 and 2016

NOTE: All schedules have been omitted because they are either not applicable or the required information is included in the financial statements and notes thereto.

(B) Exhibits:

[2.1 Agreement and Plan of Merger by and among Advanced Energy Industries, Inc., Eclipse Merger Sub, Inc., LumaSense Technologies Holdings, Inc., and Shareholder Representative Services LLC, dated July 26, 2018.\(23\)**](#)

[3.1 Restated Certificate of Incorporation. \(2\)](#)

[3.2 Certificate of Amendment of Restated Certificate of Incorporation. \(2\)](#)

[3.3 Certificate of Amendment of Restated Certificate of Incorporation. \(3\)](#)

[3.4 Certificate of Amendment of Restated Certificate of Incorporation. \(3\)](#)

[3.5 Amended and Restated By-laws of Advanced Energy Industries, Inc. \(12\)](#)

[3.6 Fifth Amendment to the By-laws of Advanced Energy Industries, Inc. \(19\)](#)

4.1 Form of Specimen Certificate for Common Stock. (1)

[10.1 Lease Agreement, dated as of December 28, 2011, by and between Sharp Point Properties, LLC and Advanced Energy Industries, Inc., for a building located at 1625 Sharp Point Drive, Fort Collins, Colorado. \(9\)](#)

[10.2 Lease Agreement, dated as of December 28, 2011, by and between Sharp Point Properties, LLC and Advanced Energy Industries, Inc., for a building located at 2424 Midpoint Drive, Fort Collins, Colorado. \(9\)](#)

[10.3 Lease dated January 16, 2003, by and between China Great Wall Computer Shenzhen Co., Ltd., Great Wall Limited and Advanced Energy Industries \(Shenzhen\) Co., Ltd., for a building located in Shenzhen, China. \(4\)](#)

10.4 Form of Indemnification Agreement. (1)

[10.5 Form of Director Indemnification Agreement. \(6\)](#)

[10.6 Form of Notice of Grant for Restricted Stock Unit. \(11\)*](#)

[10.7 Form of Restricted Stock Unit Agreement. \(11\)*](#)

[10.8 Form of Notice of Grant of Stock Option. \(11\)*](#)

[10.9 Form of Incentive Stock Option Agreement. \(11\)*](#)

[10.10 Form of Non-Qualified Stock Option Agreement. \(11\)*](#)

[10.11 Form of LTI Notice of Grant. \(11\)*](#)

10.12	Form of LTI Performance Stock Option Agreement pursuant to the 2008 Omnibus Incentive Plan. (11)*
10.13	Form of LTI Performance Stock Unit Agreement pursuant to the 2008 Omnibus Incentive Plan. (11)*
10.14	Non-Employee Director Compensation Structure for 2016.(15)*
10.15	2017 Long-Term Incentive (LTI) Plan. (16)*
10.16	2017 Short-Term Incentive (STI) Plan. (17)*
10.17	2017 Omnibus Incentive Plan. (16)*
10.18	2008 Omnibus Incentive Plan, as amended May 4, 2010. (7)*
10.19	Employee Stock Purchase Plan. (1)*
10.20	Offer Letter, dated September 28, 2014, by and among Advanced Energy Industries, Inc. and Yuval Wasserman. (13)*
10.21	Global Supply Agreement by and between Advanced Energy Industries, Inc. and Applied Materials Inc. dated August 29, 2005. (5)+
10.22	Shipping Amendment to the Global Supply Agreement by and between Advanced Energy Industries, Inc. and Applied Materials Inc. dated August 29, 2005. (5)+
10.23	Bridge Amendment to the Global Supply Agreement by and between Advanced Energy Industries, Inc. and Applied Materials Inc. dated January 28, 2011. (8)+
10.24	Sale and Purchase Agreement by and among Advanced Energy Industries, Inc., Blitz S13-103 GmbH, Jolaos Verwaltungs GmbH and Prettl Beteiligungs Holdings, GmbH, dated as of April 8, 2013. (10)
10.25	Loan Agreement, dated July 28, 2017, by and between Advanced Energy Industries, Inc. and Bank of America, N.A. (18)
10.26	First Amendment to Loan Agreement, dated December 21, 2017, by and between Advanced Energy Industries, Inc. and Bank of America, N.A. (20)
10.27	Continuing and Unconditional Guaranty dated July 28, 2017 among Ultravolt Group, Inc., AE Solar Energy, Inc., Ultravolt, Inc., AEI US Subsidiary, LLC, AEI Global Holdings, LLC and Sekidenko, Inc. (18)
10.28	Form of Security and Pledge Agreement among Advanced Energy Industries, Inc., Ultravolt Group, Inc., AE Solar Energy, Inc., Ultravolt, Inc., AEI US Subsidiary, LLC, AEI Global Holdings, LLC, Sekidenko, Inc. and Bank of America, N.A. (18)
10.29	Fixed Dollar Accelerated Share Repurchase Transaction, dated November 6, 2015, between Advanced Energy Industries, Inc. and Morgan Stanley & Co. LLC. (14)
10.30	Offer Letter to Paul Oldham, dated March 26, 2018. (21)
10.31	Offer Letter to Neil Brinker, dated May 7, 2018. (22)
10.32	Form of Executive Change in Control & General Severance Agreement. (24)
21.1	Subsidiaries of Advanced Energy Industries, Inc.
23.1	Consent of Grant Thornton LLP, Independent Registered Public Accounting Firm.
31.1	Certification of the Chief Executive Officer Pursuant to Rule 13a-14(a) under the Securities Exchange Act of 1934, as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
31.2	Certification of the Principal Financial Officer Pursuant to Rule 13a-14(a) under the Securities Exchange Act of 1934, as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
32.1	Certification of the Chief Executive Officer Pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
32.2	Certification of the Chief Financial Officer Pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
101.INS	XBRL Instance Document
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document



101.DEF XBRL Taxonomy Extension Definition Linkbase Document

101.LAB XBRL Taxonomy Extension Label Linkbase Document

101.PRE XBRL Taxonomy Extension Presentation Linkbase Document

Attached as Exhibit 101 to this report are the following materials from Advanced Energy, Inc.'s Annual Report on Form 10-K for the year ended December 31, 2018, formatted in XBRL (eXtensible Business Reporting Language): (i) the Consolidated Statements of Operations, (ii) the Consolidated Statements of Comprehensive Income (Loss), (iii) the Consolidated Balance Sheets, (iv) the Consolidated Statements of Cash Flows, (v) the Consolidated Statements of Stockholders' Equity, and (vi) the Notes to the Consolidated Financial Statements.

-
- (1) Incorporated by reference to the Registrant's Registration Statement on Form S-1 (File No. 33-97188), filed September 21, 1995.
 - (2) Incorporated by reference to the Registrant's Quarterly Report on Form 10-Q for the quarter ended June 30, 1999 (File No. 000-26966), filed July 28, 1999.
 - (3) Incorporated by reference to the Registrant's Quarterly Report on Form 10-Q for the quarter ended September 30, 2003 (File No. 000-26966), filed November 4, 2003.
 - (4) Incorporated by reference to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2003 (File No. 000-26966), filed February 24, 2004.
 - (5) Incorporated by reference to the Registrant's Quarterly Report on Form 10-Q for the quarter ended September 30, 2005 (File No. 000-26966), filed November 7, 2005.
 - (6) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-26966), filed December 14, 2009.
 - (7) Incorporated by reference to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2010 (File No. 000-26966), filed March 2, 2011.
 - (8) Incorporated by reference to the Registrant's Quarterly Report on Form 10-Q for the quarter ended March 31, 2011 (File No. 000-26966), filed May 6, 2011.
 - (9) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-26966), filed December 29, 2011.
 - (10) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-26966) filed April 11, 2013.
 - (11) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-26966) filed May 10, 2013.
 - (12) Incorporated by reference to the Registrant's Quarterly Report on Form 10-Q for the quarter ended June 30, 2013 (File No. 000-26966), filed August 6, 2013.
 - (13) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-26966) filed October 1, 2014.
 - (14) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-26966) filed November 6, 2015.
 - (15) Incorporated by reference to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2016 (File No. 000-26966), filed February 24, 2017.
 - (16) Incorporated by reference to Appendix A of the Registrant's Proxy Statement for the Registrant's 2017 Annual Meeting of Stockholders (File No. 000-26966), filed March 14, 2017.
 - (17) Incorporated by reference to Appendix B of the Registrant's Proxy Statement for the Registrant's 2017 Annual Meeting of Stockholders (File No. 000-26966), filed March 14, 2017.
 - (18) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-26966), filed July 31, 2017.
 - (19) Incorporated by reference to the Registrant's Quarterly Report on Form 10-Q for the quarter ended June 30, 2017 (File No. 000-26966), filed July 31, 2017.
 - (20) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-26966), filed December 21, 2017.
 - (21) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-26966), filed March 29, 2018.
 - (22) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-26966), filed May 9, 2018.
 - (23) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-26966), filed July 30, 2018.
 - (24) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-26966), filed August 6, 2018.

* Compensation Plan

** Schedules have been omitted pursuant to Item 601(b)(2) of Regulation S-K. Advanced Energy Industries, Inc. undertakes to furnish supplemental copies of any of the omitted schedules upon request by the Securities and Exchange Commission.

+ Confidential treatment has been granted for portions of this agreement.

ITEM 16. FORM 10-K SUMMARY

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this Annual Report on Form 10-K to be signed on its behalf by the undersigned, thereunto duly authorized.

ADVANCED ENERGY INDUSTRIES, INC.

(Registrant)

/s/ Yuval Wasserman

Yuval Wasserman

Chief Executive Officer

Date: February 21, 2019

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

Signatures	Title	Date
<u>/s/ Yuval Wasserman</u> Yuval Wasserman	Chief Executive Officer and Director (Principal Executive Officer)	February 21, 2019
<u>/s/ Paul Oldham</u> Paul Oldham	Chief Financial Officer & Executive Vice President (Principal Financial and Accounting Officer)	February 21, 2019
<u>/s/ Grant H. Beard</u> Grant H. Beard	Chairman of the Board	February 21, 2019
<u>/s/ Frederick A. Ball</u> Frederick A. Ball	Director	February 21, 2019
<u>/s/ Tina M. Donikowski</u> Tina M. Donikowski	Director	February 21, 2019
<u>/s/ Ronald C. Foster</u> Ronald C. Foster	Director	February 21, 2019
<u>/s/ Edward C. Grady</u> Edward C. Grady	Director	February 21, 2019
<u>/s/ Thomas M. Rohrs</u> Thomas M. Rohrs	Director	February 21, 2019
<u>/s/ John A. Roush</u> John A. Roush	Director	February 21, 2019

SUBSIDIARIES OF THE REGISTRANT

Name	Jurisdiction of Incorporation or Organization
Advanced Energy Industries	China
Advanced Energy Industries (Shenzhen) Co., Ltd. (manufacturing)	China
Advanced Energy Industries AE - Israel Ltd.	Israel
Advanced Energy Industries GmbH	Germany
Advanced Energy Industries Limited	Hong Kong
Advanced Energy Industries U.K. Limited	United Kingdom
Advanced Energy Industries, Inc., Shanghai	China
Advanced Energy Japan K.K.	Japan
Advanced Energy Services Pte. Ltd.	Singapore
Advanced Energy Singapore, Pte. Ltd.	Singapore
Advanced Energy Taiwan, Ltd.	Taiwan
Advanced Energy Xi'an Co., Ltd.	China
AE Korea, Ltd.	South Korea
AE Precision Power Products Pvt. Ltd.	India
AE Solar Energy, LLC	Oregon
AEI Canada, Inc.	Canada
AEI Finance GmbH & Co., KG	Germany
AEI Finance Ltd.	Hong Kong
AEI Finance Verwaltungs GmbH	Germany
AEI Global Holdings CV	Netherlands
AEI Global Holdings LLC	Delaware
AEI Holdings, GmbH	Germany
AEI International Holdings CV	Netherlands
AEI Irish Holdings Ltd.	Ireland
AEI Korea Services, Ltd.	South Korea
AEI Power GmbH	Germany
AEI Power India Pvt. Ltd.	India
AEI US Subsidiary, LLC	Delaware
AES Global Holdings PTE Ltd.	Singapore
Ascent Investments Ltd.	United Kingdom
Eclipse MergerSub, Inc.	Delaware
Excelsys Group Ltd.	Ireland
Excelsys Holdings Ltd.	Ireland
Excelsys Technologies Ltd.	Ireland
Fuyogo Limited	Hong Kong
HiTek DB Pension Scheme Trustees Ltd.	England
HiTek Power GmbH	Germany
HiTek Power Ltd.	United Kingdom
HV Investments Ltd.	United Kingdom
LumaSense Equipment India Pvt. Ltd. Co.	India
LumaSense Europe GmbH	Germany
LumaSense Holdings	Cayman Islands
LumaSense International LP	Cayman Islands
LumaSense Sensor GmbH	Germany
LumaSense Technologies A/S	Denmark
LumaSense Technologies B.V.	Netherlands
LumaSense Technologies GmbH	Germany
LumaSense Technologies Holdings, Inc.	Delaware

LumaSense Technologies SARL	France
LumaSense Technologies, Inc.	Delaware
Melbourne Group Ltd.	United Kingdom
Sekidenko, Inc.	Washington
Siren Acquisition Sub, Inc.	New York
Solvix GmbH	Switzerland
Solvix LLC	Colorado
T.J. Acquisition Subsidiary, Inc.	New York
Tamio Limited	Hong Kong
Torrent EMS	New York
Trek Holding Co., Ltd.	Japan
Trek Japan K.K.	Japan
Trek, Inc.	New York
UltraVolt Group, Inc.	Delaware
UltraVolt, Inc.	New York
Wankia Limited	Hong Kong

Consent of Independent Registered Public Accounting Firm

We have issued our reports dated February 21, 2019 , with respect to the consolidated financial statements and internal control over financial reporting included in the Annual Report of Advanced Energy Industries, Inc. on Form 10-K for the year ended December 31, 2018 . We consent to the incorporation by reference of said reports in the Registration Statements of Advanced Energy Industries, Inc. on Forms S-3, as amended (File Nos. 333-167027, 333-110534, 333-87720, 333-72748, 333-47114, 333-37378, 333-87455, 333-87459, and 333-34039) and on Forms S-8 (File Nos. 333-01616, 333-04073, 333-46705, 333-57233, 333-65413, 333-79425, 333-79429, 333-62760, 333-69148, 333-69150, 333-87718, 333-105367, 333-105366, 333-105365, 333-129859, 333-129858, 333-147289, 333-152865, 333-167741, 333-168519, and 333-221376).

/s/ GRANT THORNTON LLP

Denver, Colorado
February 21, 2019

I, Yuval Wasserman, certify that:

1. I have reviewed this annual report on Form 10-K for the period ended December 31, 2018 of Advanced Energy Industries, Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
 - a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
 - a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
 - b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 21, 2019

/s/ Yuval Wasserman

Yuval Wasserman
Chief Executive Officer

I, Paul Oldham, certify that:

1. I have reviewed this annual report on Form 10-K for the period ended December 31, 2018 of Advanced Energy Industries, Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
 - a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
 - a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
 - b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 21, 2019

/s/ Paul Oldham

Paul Oldham

Chief Financial Officer & Executive Vice President

Certification of the Chief Executive Officer
Pursuant to 18 U.S.C. Section 1350,
as Adopted Pursuant to Section 906
of the Sarbanes-Oxley Act of 2002

In connection with the accompanying annual report on Form 10-K of Advanced Energy Industries, Inc. (the "Company") for the year ended December 31, 2018 (the "Report"), I, Yuval Wasserman, Chief Executive Officer of the Company, certify, pursuant to 18 U.S.C. § 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that:

- (1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
- (2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: February 21, 2019

/s/ Yuval Wasserman

Yuval Wasserman

Chief Executive Officer

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

Certification of the Chief Financial Officer
Pursuant to 18 U.S.C. Section 1350,
as Adopted Pursuant to Section 906
of the Sarbanes-Oxley Act of 2002

In connection with the accompanying annual report on Form 10-K of Advanced Energy Industries, Inc. (the "Company") for the year ended December 31, 2018 (the "Report"), I, Paul Oldham, Chief Financial Officer of the Company, certify, pursuant to 18 U.S.C. § 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that:

- (1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
- (2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: February 21, 2019

/s/ Paul Oldham

Paul Oldham

Chief Financial Officer & Executive Vice President

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