Ascent Solar Technologies, Inc.
Form 10-K
March 29, 2018
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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

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FORM 10-K

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(Mark One)
x ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the fiscal year ended December 31, 2017
or
o TRANSITION REPORT UNDER SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the Transition Period from to
Commission File No. 001-32919

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Ascent Solar Technologies, Inc.
(Exact name of registrant as specified in its charter)

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| | |
|---|---|
| Delaware | 20-3672603 |
| (State or other jurisdiction of incorporation or organization) | (I.R.S. Employer Identification No.) |
| 12300 Grant Street, Thornton, CO | 80241 |
| (Address of principal executive offices) | (Zip Code) |

Registrant's telephone number including area code: 720-872-5000
Securities registered pursuant to Section 12(b) of the Act:

| Title of Each Class | Name of Each Exchange on Which Registered |
|---|---|
| Common Stock, $0.0001 par value per share | OTCBB Market |

Securities registered pursuant to Section 12(g) of the Act:
None
Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes o No x
Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Exchange Act. Yes o No x
Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes x No o
Indicate by check mark whether the registrant has submitted electronically and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). x Yes o No

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

| | | | |
|---|---|---|---|
| Large accelerated filer | o | Accelerated filer | o |
| Non-accelerated filer | o (Do not check if a smaller reporting company) | Smaller reporting company | x |
| | | Emerging growth company | o |

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.o

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

As of June 30, 2017, the last business day of the registrant’s most recently completed second fiscal quarter, the aggregate market value of the registrant’s common stock held by non-affiliates was approximately $2.9 million based upon the last reported sale price of the registrant’s common stock on that date as reported by OTCBB Market, operated by OTC Markets Group Inc.

As of March 26, 2018, there were 12,738,084,718 shares of our common stock issued and outstanding.

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FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K includes “forward-looking statements” that involve risks and uncertainties. Forward-looking statements include statements concerning our plans, objectives, goals, strategies, future events, future net sales or performance, capital expenditures, financing needs, plans or intentions relating to acquisitions, business trends and other information that is not historical information and, in particular, appear under headings including “Management’s Discussion and Analysis of Financial Condition and Results of Operations” and “Business.” When used in this Annual Report, the words “estimates,” “expects,” “anticipates,” “projects,” “plans,” “intends,” “believes,” “forecasts,” “foresees,” “likely,” “may,” “should,” “goal,” “target,” and variations of such words or similar expressions are inte to identify forward-looking statements. All forward-looking statements are based upon information available to us on the date of this Annual Report.

These forward-looking statements are subject to risks, uncertainties and other factors, many of which are outside of our control, that could cause actual results to differ materially from the results discussed in the forward-looking statements, including, among other things, the matters discussed in this Annual Report in the sections captioned “Risk Factors” and “Management’s Discussion and Analysis of Financial Condition and Results of Operations.” Factors you should consider that could cause these differences are:

- Our limited operating history and lack of profitability;
- Our ability to develop demand for, and sales of, our products;
- Our ability to attract and retain qualified personnel to implement our business plan and corporate growth strategies;
- Our ability to develop sales, marketing and distribution capabilities;
- Our ability to successfully develop and maintain strategic relationships with key partners, including OEMs, system integrators, distributors, retailers and e-commerce companies, who deal directly with end users in our target markets;
- The accuracy of our estimates and projections;
- Our ability to secure additional financing to fund our short-term and long-term financial needs;
- Our ability to maintain the listing of our common stock on the OTCBB Market;
- The commencement, or outcome, of legal proceedings against us, or by us, including ongoing ligation proceedings;
- Changes in our business plan or corporate strategies;
- The extent to which we are able to manage the growth of our operations effectively, both domestically and abroad, whether directly owned or indirectly through licenses;
- The supply, availability and price of equipment, components and raw materials, including the elements needed to produce our photovoltaic modules;
- Our ability to expand and protect the intellectual property portfolio that relates to our consumer electronics, photovoltaic modules and processes;
- Our ability to implement remediation measures to address material weaknesses in internal control;
- General economic and business conditions, and in particular, conditions specific to consumer electronics and the solar power industry; and
- Other risks and uncertainties discussed in greater detail in the section captioned "Risk Factors."

There may be other factors that could cause our actual results to differ materially from the results referred to in the forward-looking statements. We undertake no obligation to publicly update or revise forward-looking statements to reflect subsequent events or circumstances after the date made, or to reflect the occurrence of unanticipated events, except as required by law.

References to “we,” “us,” “our,” “Ascent,” “Ascent Solar” or the “Company” in this Annual Report mean Ascent Solar Technologies, Inc.

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PART I

Item 1. Business

Business Overview

Ascent Solar was formed in October 2005 as a development stage company to commercialize flexible photovoltaic ("PV") modules using our proprietary thin film technology. The technology was initially developed at ITN Energy Systems, Inc. ("ITN") beginning in 1994 and subsequently assigned and licensed to us. Our proprietary manufacturing process deposits multiple layers of materials, including a thin film of highly efficient copper-indium-gallium-diselenide ("CIGS") semiconductor material, on a flexible, lightweight, high tech plastic substrate using a roll-to-roll manufacturing process followed by laser patterning the layers to create interconnected PV cells, or PV modules, in a process known as monolithic integration. We believe that our technology and manufacturing process, which results in a much lighter, flexible yet durable module package, provides us with unique market opportunities relative to both the crystalline silicon ("c-Si") based PV manufacturers that currently lead the PV market, as well as other thin film PV manufacturers that use substrate materials such as glass, stainless steel or other metals that can be heavier and more rigid than plastics.

We believe that the use of CIGS on a flexible, durable, lightweight, high tech plastic substrate will allow for unique and seamless integration of our PV modules into a variety of electronic products, defense, transportation and aerospace applications, as well as other products and applications that may emerge. For markets that place a high premium on weight, such as consumer electronics, defense, space, near space, and aeronautic markets, we believe our materials provide attractive increases in power-to-weight ratio, and that our materials have higher power-to-area ratios and voltage-to-area ratios than competing flexible PV thin film technologies. These metrics will be critical as we position ourselves to compete in challenging high value markets such as aerospace where Ascent Solar products can be integrated into satellites, near earth orbiting vehicles, and fixed-wing unmanned aerial vehicles ("UAV").

Product History

In March 2008, we demonstrated initial operating capacity of our first production line by beginning production trials as an end to end integrated process. Initial operating capacity production trials resulted in average thin film device efficiencies of 9.5% and small area monolithically integrated module efficiencies of over 7.0%. During 2008, optimization trials resulted in thin film device efficiencies in the 9.5% to 11.5% range and corresponding module efficiencies in the 7.0% to 9.0% range. The test modules measured approximately 15 centimeters wide by 30 centimeters long. During the first quarter of 2009, we began limited production of monolithically integrated flexible CIGS modules in our initial production line. Our primary business model, at that time, was based upon mass production of solar modules of varying lengths, sizes and configurations. We provided sample modules to potential customers and development partners in various industries to explore integration of our products into new applications.

In July 2009, we obtained independent verification by the U.S. Department of Energy's National Renewable Energy Laboratory ("NREL") that our modules measured 10.4% in conversion efficiency. The modules tested at NREL were approximately 15 centimeters wide by 30 centimeters long. In October 2009, NREL further verified our achievement of a manufacturing milestone of 14.0% cell efficiency as well as a peak efficiency of 11.4% for CIGS modules. Later, in December 2010, we achieved 12.1% module efficiency on the same form factor. In October 2010, we completed internal qualification testing of a flexible packaging solution which successfully passed the rigorous standard of one thousand (1,000) hours of damp heat testing (85% relative humidity and 85° C temperature) guideline set forth by International Electrotechnical Commission ("IEC") 61646 standards for performance and long term reliability of thin film solar modules.

In February 2010, three of our product configurations were certified by an independent laboratory on a variety of U.S. Department of Defense (“DOD”) rugged standards known as MIL-STD-810G. In October 2010, we completed full external certification under IEC 61646 at an independent laboratory of a two meter module. Achieving this certification is required for building integrated photovoltaic ("BIPV") and building applied photovoltaic ("BAPV") applications used in commercial, industrial and residential rooftop markets. Certification activities will continue as required as we introduce new products and make changes or improvements to our already certified products.

In 2010, we received an award from R&D Magazine and were included in their list of the 100 Most Innovative Technologies based on our process of monolithic integration on polyimide substrate. In 2011, Time Magazine selected us as one of the 50 Best Inventions of the year. In 2015 Ascent Solar won its second R&D 100 Award. The 2015 award was given for the development of the MilPak platform, a military-grade (MIL-STD-810G tested) and fully integrated solar power generation and storage unit incorporated with a Maximum Peak Power Tracking (MPPT) management system. The MilPak platform is one of the most rugged, yet lightweight, power generation and storage solutions available, both attributes enabled by the use of Ascent’s CIGS technology.

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In 2012, we evolved our business model to include B2C, solution based, PV integrated consumer electronics to our off grid high value solar power generation strategy. In June of 2012, we launched our new line of consumer products under the EnerPlex™ brand, and introduced our first product, the Surfr™; a battery and solar case for the Apple® iPhone® 4/4S smart phone featuring our ultra-light CIGS thin film technology integrated directly into the case. The case incorporates our ultra-light and thin PV module into a sleek, protective iPhone 4/4S case, along with a thin, life extending, lithium-polymer battery. The case adds minimal weight and size to an iPhone smartphone, yet provides supplemental charging when needed. In August of 2012, we announced the launch of the second version of the Surfr for the Samsung® Galaxy S® III, which provides 85% additional battery life.

In December 2012, we launched the EnerPlex Kickr™ and EnerPlex Jumpr™ product series. The Kickr IV is an extremely portable, compact and durable solar charging device, approximately seven inches by seven inches when folded, and weighs less than half a pound. The Kickr IV provides 6.5 watts of regulated power that can help charge phones, digital cameras, and other small USB enabled devices. The Kickr IV is ideal for outdoor activities such as camping, hiking and mountain climbing as well as daily city use. To complement the Kickr IV, we also released the Jumpr series of portable power banks in December of 2012. The Jumpr series provides a compact power storage solution for those who need to recharge their portable electronics while on the go.

During 2013, the EnerPlex brand rapidly expanded with the addition of two new product series as well as over fifteen new products. In 2013, we introduced further additions to the Jumpr line of portable power banks; releasing the Jumpr Mini and Jumpr Stack in August and the Jumpr Max in September. The latest additions to the Kickr line of portable solar chargers, the Kickr I and Kickr II, were introduced in August at the Outdoor Retailer show. In October 2013, we released our first series of solar integrated backpacks, the EnerPlex Packr™. The Packr is a functional backpack ideal for charging mobile electronic devices while on the go. Also in October of 2013, we introduced the Surfr battery and solar case for the Samsung Galaxy S® 4, and in December 2013, we introduced the Surfr battery and solar case for Apple's iPhone® 5. To complement our flagship product lines, we added an assortment of accessories, all of which can be integrated into the EnerPlex ecosystem of products; the LED wand, which can be easily plugged into a Jumpr power bank to provide hours of light, or the Travel Adaptor, which enables consumers to charge up their Jumpr power banks from a traditional outlet anywhere in the world.

Beginning in 2013, we aggressively pursued new distribution channels for the EnerPlex brand; these activities led to placement in a variety of high-traffic ecommerce venues such as www.amazon.com, www.walmart.com, www.brookstone.com, www.newegg.com, as well as many others including our own e-commerce platform at www.goenerplex.com. The April 2013 placement of EnerPlex products at Fry's Electronics, a US West Coast consumer electronics retailer, represented the company's first domestic retail presence; EnerPlex products were carried in all of Fry's 34 superstores across 9 states.

Throughout 2014, EnerPlex released multiple additions to the Jumpr line of products: including the Jumpr Stack 3, 6 and 9; innovative batteries equipped with tethered micro-USB and Apple Lightning cables with a revolutionary Stack and Charge design, enabling batteries to be charged simultaneously when they are placed on top of one another. Also released in 2014 were the Jumpr Slate series, products which push the boundaries of how thin batteries can be; the Jumpr Slate 10k, at less than 7mm thick was the thinnest lithium polymer battery available when it was released. The Jumpr Slate 5k and 5k Lightning each come with a tethered micro-USB and Lightning cable respectively; freeing consumers from worrying about toting extra cables with them while on the move.

At Outdoor Retailer 2014, EnerPlex debuted the Generatr Series. The Generatr 1200 and Generatr 100 are lithium-ion based, large format batteries. Lighter and smaller than competitors, the Generatr Series are targeted for consumers who require high-capacity, high-output batteries which remain ultra-portable. Also debuted at Outdoor Retailer was the Commandr 20, a high output solar charger designed specifically to integrate with and charge the Generatr series, allowing consumers to stay out longer without needing to charge their Generatr batteries from a traditional power

source. In August 2014, the Kickr II+ and IV+ were also announced, these products represent another evolution in EnerPlex's line of solar products; integrated with a 500mAh battery the Kickr II+ and IV+ are able to provide a constant flow of power even when there are intermittent disruptions in sunlight.

During 2015, we reached an agreement with EVINE Live, one of the premier home shopping networks with TV programming that reaches over 87 million US homes to begin selling EnerPlex products during their broadcasts. EnerPlex launched the Generatr S100 and select other products exclusively with EVINE, EnerPlex also launched the Generatr 1200 launched exclusively with EVINE for a limited period. Also during 2015, EnerPlex expanded its relationship with The Cellular Connection to include over 450 Verizon Wireless Premium Retail Stores; launched its products with two world recognized retailers; The Sports Authority and Cabela's; and launched its products with GovX; the premier online shopping destination for Military, Law Enforcement and Government agencies. Internationally, EnerPlex products became available in the United Kingdom via the brand's launch with 172 Maplin's stores throughout the country.

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In 2016, EnerPlex launched the new emergency sales vertical, partnering with Emergency Preparedness eCommerce leader, Emergency Essentials, and we announced new breakthroughs in the Company's line of high-voltage solar products, designed specifically for high-altitude and space markets. Also during the first quarter of 2016, the Company announced the launch of select products on the GSA Advantage website; allowing Federal employees, including members of all branches of the US Military, to directly purchase Ascent and EnerPlex products including: the MilPak E, Commandr 20, Kickr 4 and WaveSol solar modules.

In January 2017, Ascent was awarded a contract to supply high-voltage SuperLight thin-film CIGS PV blankets. These 50W, fully laminated, flexible blankets were manufactured using a new process that was optimized for high performance in near-space conditions at elevated temperatures, and are custom designed for easy modular integration into series and parallel configurations to achieve the desired voltage and current required for such application.

In February 2017 Ascent announced the discontinuation of our EnerPlex consumer business by disposing of the EnerPlex brand, and related intellectual properties and trademarks, to our battery product supplier, Sun Pleasure Co. Limited ("SPCL"). This transaction was completed in an effort to better allocate our resources and to continue to focus on our core strength in the high-value specialty PV market. Following the transfer, Ascent will no longer be producing or selling Enerplex-branded consumer products. Ascent will focus on its photovoltaic business and will supply solar PV products to SPCL, supporting the continuous growth of EnerPlex™ with Ascent's proprietary and award-winning thin-film solar technologies and products.

During the third quarter of 2017, Ascent Solar was selected by Energizer to develop and supply solar panels for their PowerKeep line of solar products, and in November 2017, Ascent introduced the next generation of our USB-based portable power systems with the XD™ series. The first product introduced was the XD-12 which, like previous products, is a folding, lightweight, easily stowable, PV system with USB power regulation. Unique to this generation of PV portable power is more PV power (12 Watts) and a 2.0 Amp smart USB output to enable the XD-12 to charge most smartphones, tablets, and USB-enabled devices as fast as a wall outlet. The enhanced smart USB circuit determines the maximum power the device is able to receive, and ensures the best possible charging performance directly from the sun.

Also in 2017, for a space customer, Ascent manufactured a new micro-module, approximately 12.8mm x 50mm (0.5in x 2.0in) in size that is ideal for both laboratory-scale environmental testing, and for subsequent integration into flight experiments.

In February 2018, the Company introduced the second product in our XD™ series. Delivering up to 48 Watts of solar power, the durable and compact Ascent XD-48 Solar Charger is the ideal solution for charging many portable electronics and off-grid power systems. The XD-48's versatility allows it to charge both military and consumer electronics directly from the sun wherever needed. Like the XD-12, the XD-48 has a compact and portable design, and its rugged, weather-resistant construction withstands shocks, drops, damage and even minor punctures to power through the harshest conditions.

We continue to design and manufacture PV integrated consumer electronics as well as portable power applications for commercial and military users. Due to the high durability enabled by the monolithic integration employed by our technology, the capability to customize modules into different form factors and the industry leading light weight and flexibility provided by our modules, we believe that the potential applications for our products are numerous.

Commercialization and Manufacturing Strategy

We manufacture our products by affixing a thin CIGS layer to a flexible, plastic substrate using a large format, roll-to-roll process that permits us to fabricate our flexible PV modules in an integrated sequential operation. We use

proprietary monolithic integration techniques which enable us to form complete PV modules with little to no costly back end assembly of inter cell connections. Traditional PV manufacturers assemble PV modules by bonding or soldering discrete PV cells together. This manufacturing step typically increases manufacturing costs and at times proves detrimental to the overall yield and reliability of the finished product. By reducing or eliminating this added step using our proprietary monolithic integration techniques, we believe we can achieve cost savings in, and increase the reliability of, our PV modules. All tooling necessary for us to meet our near term production requirements is installed in our Thornton, Colorado plant. In 2012, we further revised our strategy to focus on applications for emerging and high-value specialty PV markets, including off grid, aerospace, military and defense and consumer oriented products.

On February 2, 2012, we announced the appointment of Victor Lee as President and Chief Executive Officer. Mr. Lee has served on our Board since November 2011. Mr. Lee is the Managing Director of Tertius Financial Group Pte Ltd ("TFG"), which at the time was the largest shareholder of Ascent Solar. TFG held approximately 3% of the total outstanding shares as of December 31, 2017.

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Currently, we are producing OEM and consumer oriented products focusing on charging devices powered by our solar modules. Products in these markets are priced based on the overall value proposition rather than a commodity-style price per watt basis. We continue to develop new consumer products and we have adjusted our utilization of our equipment to meet our near term forecast sales. We plan to continue the development of our current PV technology to increase module efficiency, improve our manufacturing tooling and process capabilities and reduce manufacturing costs. We also plan to continue to take advantage of research and development contracts to fund a portion of this development.

Advantages of CIGS on a Flexible Plastic Substrate

Thin film PV solutions differ based on the type of semiconductor material chosen to act as a sunlight absorbing layer, and also on the type of substrate on which the sunlight absorbing layer is affixed. To the best of our knowledge, we believe we are the only company in the world currently focused on commercial scale production of PV modules using CIGS on a flexible, plastic substrate with monolithic integration. We utilize CIGS as a semiconductor material because, at the laboratory level, it has a higher demonstrated cell conversion efficiency than amorphous silicon ("a-Si") and cadmium telluride ("CdTe"). We also believe CIGS offers other compelling advantages over both a-Si and CdTe, including:

- CIGS versus a-Si: Although a-Si, like CIGS, can be deposited on a flexible substrate, its conversion efficiency, which already is generally much lower than that of CIGS, measurably degrades when it is exposed to ultraviolet light, including natural sunlight. To mitigate such degradation, manufacturers of a-Si solar cells are required to implement measures that add cost and complexity to their manufacturing processes.
- CIGS versus CdTe: Although CdTe modules have achieved conversion efficiencies that are generally comparable to CIGS in production, we believe CdTe has never been successfully applied to a flexible substrate on a commercial scale. We believe the use of CdTe on a rigid, transparent substrate, such as glass, makes CdTe unsuitable for a number of the applications. We also believe CIGS can achieve higher conversion efficiencies than CdTe in production.

Our choice of substrate material further differentiates us from other thin film PV manufacturers. We believe the use of a flexible, lightweight, insulating substrate that is easier to install provides clear advantages for our target markets, especially where rigid substrates are unsuitable. We also believe our use of a flexible, plastic substrate provides us significant cost advantages because it enables us to employ monolithic integration techniques on larger components, which we believe are unavailable to manufacturers who use flexible, metal substrates. Accordingly, we are able to significantly reduce part count, thereby reducing the need for costly back end assembly of inter cell connections. As the only company, to our knowledge, focused on the commercial production of PV modules using CIGS on a flexible, plastic substrate with monolithic integration, we believe we have the opportunity to address the consumer electronics, defense, aerospace, transportation, off grid, portable power and other weight-sensitive markets with transformational high quality, value added product applications. It is these same unique features and our overall manufacturing process that enables us to produce consumer products that enables our consumer products to be extremely robust, light and flexible.

Competitive Strengths

We believe we possess a number of competitive strengths that provide us with an advantage over our competitors.

- We are a pioneer in CIGS technology with a proprietary, flexible, lightweight, high efficiency PV thin film product that positions us to penetrate a wide range of attractive high value added markets such as consumer products, off grid, portable power, transportation, defense, aerial, and other markets. By applying CIGS to a flexible plastic substrate, we have developed a PV module that is efficient, lightweight and flexible; with the highest power-to-weight ratio in at-scale commercially available solar. The market for electronic components, such as electronic packages, casings and

accessories, as well as defense portable power systems, transportation integrated applications and space and near-space solar power application solutions represent a significant premium market for the company. Relative to our thin film competitors, we believe our advantage in thin film CIGS on plastic technology provides us with a superior product offering for these strategic market segments.

We have the ability to manufacture PV modules for different markets and for customized applications without altering our production processes. Our ability to produce PV modules in customized shapes and sizes, or in a variety of shapes and sizes simultaneously, without interrupting production flow, provides us with flexibility in addressing target markets and product applications, and allows us to respond quickly to changing market conditions. Many of our competitors are limited by their technology and/or their manufacturing processes to a more restricted set of product opportunities.

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- Our integrated, roll-to-roll manufacturing process and proprietary monolithic integration techniques provide us a potential cost advantage over our competitors. Historically, manufacturers have formed PV modules by manufacturing individual solar cells and then interconnecting them. Our large format, roll-to-roll manufacturing process allows for integrated continuous production. In addition, our proprietary monolithic integration techniques allow us to utilize laser patterning to create interconnects, thereby creating PV modules at the same time we create PV cells. In so doing, we are able to reduce or eliminate an entire back end processing step, saving time as well as labor and manufacturing costs relative to our competitors.

- Our lightweight, powerful, and durable solar panels provide a performance advantage over our competitors. For consumer applications where a premium is placed on the weight and profile of the product, our ability to integrate our PV modules into portable packages and cases offers the customer a lightweight and durable solution for all their portable electronics.

- Our proven research and development capabilities position us to continue the development of next generation PV modules and technologies. Our ability to produce CIGS based PV modules on a flexible plastic substrate is the result of a concerted research and development effort that began more than twenty years ago. We continue to pursue research and development in an effort to drive efficiency improvements in our current PV modules and to work toward next generation technologies and additional applications.

- Our manufacturing process can be differentiated into two distinct functions; a front end module manufacturing process and a back end packaging process. Our ability to produce finished unpackaged rolls of CIGS material for shipment worldwide to customers for encapsulation and integration into various products enhances our ability to work with partners internationally and domestically.

Markets and Marketing Strategy

In 2012, we modified our strategic focus away from large scale utility projects and rooftop applications to consumer products and high-value specialty solar markets. This new strategy enables us to fully leverage the unique advantages of our technology including flexibility, durability and attractive power to weight and power to area performance. It furthermore enables us to offer unique, differentiated solutions in large markets with less competition, and more attractive pricing. In the second half of 2012, we launched our EnerPlex line of personal power, portable solar solutions and accessories. This represented a significant paradigm shift for us and moved us into the realm of supplying complete consumer product solutions as opposed to strictly commercial solar modules. We also remain focused on specialty solar applications which can fully leverage the unique properties of our award winning CIGS technology. These include aerospace, defense, emergency management and consumer/OEM applications.

In February 2017 Ascent announced the discontinuation of our EnerPlex consumer business by disposing of the EnerPlex brand, and related intellectual properties and trademarks, to our battery product supplier, in an effort to better allocate its resources and to continue to focus on its core strength in the high-value specialty PV market. Ascent is no longer producing or selling Enerplex-branded consumer products and is focusing on its photovoltaic business. Ascent will continue to supply solar PV products for the EnerPlex™ products, thereby supporting their continued growth with Ascent’s proprietary and award-winning thin-film solar technologies and products.

Ascent’s strategic marketing efforts in 2018 will be focused on commercializing our proprietary solar technology in four high-value PV verticals:

I.Public Sector: Defense and Emergency Management
II.Aerospace: Space and Fixed Wing UAV
III.Commercial Off-grid

IV.Consumer and OEM

Each of these strategic verticals include customer segments that place a high value on lightweight, high performance and durable portable power solutions. The value proposition of Ascent's proprietary solar technology not only aligns with the needs of customers in these verticals, but also overcomes many of the obstacles other solar technologies face in these unique markets. Ascent has the capability to design and develop finished products for end users in these areas as well as collaborate with strategic partners to design and develop custom integrated solutions for products like fixed-wing UAVs. Ascent sees significant overlap in the needs of end users across some of these verticals and can achieve economies of scale in sourcing, development, and production in commercializing products for these customers.

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The integration of Ascent's solar modules into space, near space, and aeronautic vehicles with ultra-lightweight and flexible solar modules is an important market opportunity for the Company. Customers in this market have historically required a high level of durability, high voltage and conversion efficiency from solar module suppliers, and we believe our products are well suited to compete in this premium market. In May 2014, together with our partners, Silent Falcon UAS Technologies and Bye Aerospace, we announced the successful first flight of a production version of the Silent Falcon™ Unmanned Aircraft Systems, powered by Ascent's ultra-lightweight, flexible PV modules. In July 2014, our ultra-lightweight, flexible PV modules were selected by Vanguard Space Technologies for their NASA Small Business Innovative Research program. The NASA program is intended to develop an economical, lightweight alternative to existing and emerging high-cost solar arrays for high-power space applications. We expect opportunities in this segment to develop rapidly due to customers' extensive development, testing and evaluation processes.

In March 2016, the Company announced a major breakthrough of our high-voltage superlight modules, achieving a power-to-weight ratio of 1,700 watts per kilogram at AM0 environment. In December 2016, Ascent was selected by the Japan Aerospace Exploration Agency ("JAXA") as part of their next round of evaluations for providing solar technology for an upcoming mission to Jupiter, as well as to address additional missions. This decision followed an earlier round of investigation with promising results, during which the Company's flexible, monolithically integrated CIGS solar module was subjected to environmental extremes, and continued to operate well. During the first phase of JAXA's evaluation, Ascent's PV was successfully tested below -146°C (-231°F) and up to +190°C (+374 °F), and to only 4% of the sunlight generally received in earth's orbit. In addition, JAXA has subjected Ascent's PV to radiation and mechanical testing.

In 2017 we continued to solidify our position in the space and near-space markets; these challenging requirements and environments allow for the full utilization of the unique nature and advantages of our lightweight, flexible monolithically-integrated CIGS PV. Through continued work in the PV-powered drone field, Ascent made significant strides in providing PV power to high-altitude airships and next-generation space applications.

In January 2017, Ascent was awarded a contract to supply high-voltage SuperLight thin-film CIGS PV blankets. These 50W, fully laminated, flexible blankets were manufactured using a new process that was optimized for high performance in near-space conditions at elevated temperatures, and are custom designed for easy modular integration into series and parallel configurations to achieve the desired voltage and current required for such application.

In November 2017, Ascent fulfilled a third order from JAXA for custom PV products designed specifically for their upcoming solar sail deployment demonstration project. This project was comprised of small area test cells and large, 19.5cm x 30cm monolithically-integrated modules, all on a very thin, 25-micron (0.001 inch) plastic substrate which is half the thickness of Ascent's production substrate for a standard product. In space, near-space, and drone applications, the PV substrate accounts for a significant portion of the product's overall mass; the PV construction on the new 25-micron substrates represents a major breakthrough for these markets. JAXA placed this order after achieving the desired experimental results from the previous shipments and subsequent electrical, mechanical and environmental testing. The 19.5cm x 30cm module is a custom design to match the anticipated deployment mechanism and PV layout for the final Jovian spacecraft.

Also in 2017, Ascent fulfilled a new order, with another repeat space customer, to manufacture a new micro-module, approximately 12.8mm x 50mm (0.5in x 2.0in) in size that is ideal for both laboratory-scale environmental testing, and for subsequent integration into flight experiments.

In 2015 Ascent Solar won its second R&D 100 Award, the 2015 award was given for the development of the MilPak platform, a military-grade solar power generation and storage unit. The MilPak platform is one of the most rugged, yet lightweight, power generation and storage solutions available, both attributes enabled by the use of Ascent's CIGS technology.

The military market has a unique set of requirements we believe are well suited to our products. When integrated with fabric to form re-deployable arrays, our highly efficient, rugged, lightweight modules may allow soldiers to minimize battery loads, reduce the use of conventional fuels, and increase safety through the streamlining of fuel transport operations. We are also working to expand our foldable line of outdoor solar chargers, such as the XD-12 and the XD-48, which are well suited for the individual soldier or for the bigger power needs of a platoon with the ability of several chargers to be strung together. Our modules can also provide a reliable source of renewable power in remote areas, regardless of local infrastructure. We will continue to reach the military market through partnerships with top systems providers, by providing Government Service Administration Letters of Supply, and through direct sales and other blanket purchase agreements with the government.

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Transportation integrated PV, or integration of our flexible solar modules with vehicles such as commercial trucks, buses, trains and passenger cars, is another market segment that represents a significant opportunity. Due to their flexible form and durable, lightweight properties, our modules can be fitted to the exterior of various vehicles to provide supplemental power without significantly affecting the aerodynamics, weight or aesthetics of the vehicle. We are currently working with multiple integrators and OEMs to develop effective value added solutions for this market.

During the third quarter of 2017, Ascent Solar demonstrated its breadth of capabilities at the US Special Operations Command ("SOCOM") exclusive Technical Experimentation ("TE") 17-3 Event in Washington, DC. SOCOM is tasked, by the Department of Defense ("DoD"), with providing Special Operations Forces ("SOF") with the latest war fighting technology available; in support of this effort, SOCOM sponsors an annual TE event. In July of 2017 SOCOM requested the participation of companies who have proficiency in the areas of Satellite Communication ("SATCOM") and Unattended Ground Sensors ("UGS") for a TE event. Over 30 companies were selected to participate, and Ascent Solar was one of only 2 companies selected to participate who didn't actually make SATCOM or UGS products. Ascent Solar was selected on the basis and recognition that one of the primary issues facing the DoD today is the ability to power all of their war fighting technology. Ascent's diverse line-up of rugged and lightweight portable solar products offers the potential for the DoD to generate unattended ongoing power, which could save lives and increase the efficiency of the war fighting effort. Ascent was honored to be chosen to participate, and the assessed score we received is indicative of a capability that has "high potential for SOF use with few limitations".

We continue to supply our strategic partners with PV modules to support their development, testing and certification of new integrated PV products, including product testing by several branches of the U.S. military. We believe that our high power density flexible solar modules enable new applications for solar power. By creating mutually beneficial partnerships and strategically penetrating the markets discussed above, we plan to transform the landscape of solar power generation with truly innovative end products.

Competition

We have shifted our strategic focus away from large scale utility projects of the traditional solar markets. We believe our thin film, monolithically integrated CIGS technology enables us to deliver sleek, lightweight, rugged, high performance solutions to serve these markets as competitors from other thin film and c-Si companies emerge. The landscape of thin film manufacturers encompasses a broad mix of technology platforms at various stages of development, and consists of a number of medium and small companies.

The market for traditional, grid connected PV products is dominated by large manufacturers of c-Si technology, although thin film technology on glass has begun to emerge among the major players. We anticipate that while these large manufacturers may continue to dominate the market with their silicon based products, thin film manufacturers will likely capture an increasingly larger share of the market, as is evident from the success of First Solar (CdTe) and Solar Frontier (CIGS), both among the top 20 producers worldwide. In 2016, crystalline silicon PV technology represented over 90% of global market revenue and 93% of global production, with the balance captured by thin film. Approximately half of thin film production is CdTe production, with the other half being split between CIGS and a-Si.

We believe that our modules offer unique advantages. Their flexibility, low areal density (mass per unit area), and high specific power (power per unit mass) enable use on weight-sensitive applications, such as portable power, conformal aircraft surfaces, high altitude long endurance (HALE) fixed wing and lighter than air (LTA) vehicles, and space applications that are unsuitable for glass-based modules. Innovative product design, customer focused development , and our rapid prototyping capability yield modules that could be integrated into virtually any product to create a source of renewable energy. Whether compared to glass based or other flexible modules, our products offer competitive advantages making them unique in comparison to competing products.

We define the consumer and portable power space as comprising solar powered solutions in the sub-single watt range (i.e. solar power for remote sensors) all the way up to the several hundred watts of power range (i.e. outdoor solar chargers for camping, military or outdoor work). Competitors in the consumer products space include companies that design and distribute solar charging solutions but outsource manufacturing. These include Goal Zero, Voltaic, A-Solar, Solio, PowerTraveller, Solar Components, and RDK Products. Mono or polycrystalline silicon solar technologies are common in these products. Other competitors in this segment include thin-film solar manufacturers who provide a complete product under their company name or brand. These companies include P3 solar, PowerFilm, Trony, and more recently Alta Devices. We believe our differentiated technology lends itself to delivering competitive solutions in the emerging market for personal and portable solar and non-solar charging solutions.

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Research and Development and Intellectual Property

We intend to continue to invest in research and development in order to provide near term improvements to our manufacturing process and products, as well as to identify next generation technologies relevant to both our existing and potential new markets. During 2017 and 2016 we incurred approximately $4.8 million and $6.6 million respectively, in research and development costs, which include research and development incurred in relation to our government contracts, as well as manufacturing costs incurred while developing our product lines and manufacturing process.

Our technology was initially developed at ITN beginning in 1994. In early 2006, ITN assigned to us certain CIGS PV-specific technologies, and granted to us a perpetual, exclusive, royalty free, worldwide license to use these technologies in connection with the manufacture, development, marketing and commercialization of CIGS PV to produce solar power. In addition, certain of ITN's existing and future proprietary process and control technologies, although nonspecific to CIGS PV, were assigned to us. ITN retained the right to conduct research and development activities in connection with PV materials, and we agreed to grant a license back to ITN for improvements to the licensed technologies and intellectual property outside of the CIGS PV field.

We protect our intellectual property through a combination of trade secrets and patent protections. We own the following patents and published patent applications:

Issued Patents and Registrations

1. US Patent No. 7,271,333 entitled "Apparatus and Method of Production of Thin-Film Photovoltaic Modules" (issued September 18, 2007)
2. US Patent No. 7,812,247 entitled "Flexible Photovoltaic Array With Integrated Wiring And Control Circuitry, And Associated Methods" (issued October 12, 2010; (co-owned with PermaCity Corporation)
3. US Patent No. 8,021,905 entitled "Machine and Process for Sequential Multi-Sublayer Deposition of Copper Indium Gallium Diselenide Compound Semiconductors" (issued September 20, 2011)
4. US Patent No. 8,124,870 entitled "Systems and Processes for Bifacial Collection and Tandem Junctions Using a Thin film Photovoltaic Device" (issued February 28, 2012)
5. US Patent No. 8,207,442 entitled "Reinforcing Structures for Thin film Photovoltaic Device Substrates, and Associated Methods" (issued June 26, 2012)
6. US Patent No. 8,426,725 entitled "Apparatus and Method for Hybrid Photovoltaic Device Having Multiple, Stacked, Heterogeneous, Semiconductor Junctions" (issued April 23, 2013)
7. US Patent No. 8,465,589 entitled "Machine and Process for Sequential Multi-Sublayer Deposition of Copper Indium Gallium Diselenide Compound Semiconductors" (issued June 18, 2013)
8. US Patent No. D697,502 entitled "Mobile Electronic Device Case" (issued January 14, 2014)
9. US Patent No. 8,648,253 entitled "Machine and Process for Continuous, Sequential, Deposition of Semiconductor Solar Absorbers Having Variable Semiconductor Composition Deposited in Multiple Sublayers" (issued February 11, 2014)
10. US Patent No. 8,716,591 entitled "Array of Monolithically Integrated Thin Film PhotoVoltaic Cells and Associated Methods" (issued May 6, 2014)
11. ECD No. 001429773-0001 entitled "Mobile Handheld Electronic Device Case" (issued February 6, 2015)
12. ECD No. 001429773-0002 entitled "Mobile Handheld Electronic Device Case" (issued February 6, 2015)
13. ECD No. 001429773-0003 entitled "Mobile Handheld Electronic Device Case" (issued February 6, 2015)
14. ECD No. 001429773-0004 entitled "Mobile Handheld Electronic Device Case" (issued February 6, 2015)
15. ECD No. 001429773-0005 entitled "Mobile Handheld Electronic Device Case" (issued February 6, 2015)
16. ECD No. 001429773-0006 entitled "Mobile Handheld Electronic Device Case" (issued February 6, 2015)
17. ECD No. 001429773-0007 entitled "Mobile Handheld Electronic Device Case" (issued February 6, 2015)

18. ECD No. 002732123-0001 entitled “Portable Battery Charging Device” (issued July 7, 2015)
19. ECD No. 002732123-0002 entitled “Portable Battery Charging Device” (issued July 7, 2015)
20. ECD No. 002732123-0003 entitled “Portable Battery Charging Device” (issued July 7, 2015)
21. ECD No. 002735159-0001 entitled “Portable Energy Storage And Distribution Device” (issued July 10, 2015)
22. ECD No. 002735159-0002 entitled “Portable Energy Storage And Distribution Device” (issued July 10, 2015)
23. ECD No. 002735159-0003 entitled “Portable Energy Storage And Distribution Device” (issued July 10, 2015)
24. ECD No. 002735159-0004 entitled “Portable Energy Storage And Distribution Device” (issued July 10, 2015)

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25. US Patent 9,147,783 entitled “Apparatus and Method for Hybrid Photovoltaic Device Having Multiple, Stacked, Heterogeneous, Semiconductor Junctions” (issued September 29, 2015)
26. KR Patent No. 30. 0860220 entitled “Apparatus and Method for Hybrid Photovoltaic Device Having Multiple, Stacked, Heterogeneous, Semiconductor Junctions” (issued October 13, 2015)
27. KR Patent 10-1561453 entitled “Apparatus and Method for Hybrid Photovoltaic Device Having Multiple, Stacked, Heterogeneous, Semiconductor Junctions” (issued October 13, 2015)
28. US Patent No. 9,209,322 entitled “Multilayer Thin-Film Back Contact System For Flexible Photovoltaic Devices On Polymer Substrates” (issued December 8, 2015)
29. US Patent No. 9,219,179 entitled “Multilayer Thin-Film Back Contact System For Flexible Photovoltaic Devices On Polymer Substrates” (issued December 22, 2015)
30. CN Patent No. ZL 201530237203.8 entitled “Photovoltaic-Based Fully Integrated Portable Power System” (issued February 10, 2016)
31. TW Patent No. I526630 entitled “Subtractive Hinge and Associated Methods” (issued March 21, 2016)
32. US Patent No. 9,349,905 entitled “Hybrid Multi-Junction Photovoltaic Cells And Associated Methods” (issued May 24, 2016)
33. TW Patent No. I536592 entitled “Photovoltaic Assembly and Associated Methods” (issued June 1, 2016)
34. KR Patent No. 30-0860220 entitled “Photovoltaic-Based Fully Integrated Portable Equipment For Control of Electric Power” (issued June 16, 2016)
35. CN Patent No. ZL 201180067131.6 entitled “Apparatus and Method for Hybrid Photovoltaic Device Having Multiple, Stacked, Heterogeneous, Semiconductor Junctions” (issued August 10, 2016)
36. CN Patent No. ZL201380012566.X entitled “Subtractive Hinge And Associated Methods” (issued August 24, 2016)
37. US Patent No. 9538671 entitled System For Housing And Powering A Battery-Operated Device And Associated Methods (issued January 3, 2017)
38. US Patent No. D781,228 entitled Pocket-Sized Photovoltaic-Based Fully Integrated Portable Power System (issued March 14, 2017)
39. US Patent No. 9601650 entitled Machine And Process For Continuous, Sequential, Deposition Of Semiconductor Solar Absorbers Having Variable Semiconductor Composition Deposited In Multiple Sublayers (issued March 21, 2017)
40. US Patent No. 9634175 entitled Systems And Methods For Thermally Managing High-Temperature Processes On Temperature Sensitive Substrates (issued April 25, 2017)
41. US Patent No. 9640706 entitled Hybrid Multi-Junction Photovoltaic Cells And Associated Methods (issued May 2, 2017)
42. US Patent No. 9640692 entitled Flexible Photovoltaic Array with Integrated Wiring and Control Circuitry, and Associated Methods (issued May 2, 2017)
43. US Patent No. 9653635 entitled Flexible High-Voltage Adaptable Current Photovoltaic Modules and Associated Methods (issued May 16, 2017)
44. Tawian Patent No. I583810 entitled Systems And Methods For Thermally Managing High-Temperature Processes On Temperature Sensitive Substrates (issued May 21, 2017)
45. Switzerland Patent No. 2742535 entitled Multilayer Thin-Film Back Contact System for Flexible Photovoltaic Devices on Polymer Substrates (issued July 26, 2017)
46. EPC Patent No. 2742535 entitled Multilayer Thin-Film Back Contact System for Flexible Photovoltaic Devices on Polymer Substrates (issued July 26, 2017)
47. France Patent No. 2742535 entitled Multilayer Thin-Film Back Contact System for Flexible Photovoltaic Devices on Polymer Substrates (issued July 26, 2017)
48. Great Britain Patent No. 2742535 entitled Multilayer Thin-Film Back Contact System for Flexible Photovoltaic Devices on Polymer Substrates (issued July 26, 2017)
49. Germany Patent No. 602012035034.2 entitled Multilayer Thin-Film Back Contact System for Flexible Photovoltaic Devices on Polymer Substrates (issued July 26, 2017)
50.

Taiwan Patent No. I595674 entitled Multilayer Thin-Film Back Contact System for Flexible Photovoltaic Devices on Polymer Substrates (issued August 11, 2017)

51. US Patent No. 9780242 entitled “Multilayer Thin-Film Back Contact System for Flexible Photovoltaic Devices on Polymer Substrates” (issued October 3, 2017)

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Published Patent Applications

1. "Flexible Photovoltaic Array with Integrated Wiring and Control Circuitry, and Associated Methods" (US 12/901,963) (filed October 11, 2010) (co-owned with PermaCity Corporation)
2. “Cd-Free, Oxide Buffer Layers for Thin Film CIGS Solar Cells By Chemical Solution Deposition Methods” (US 13/227,935) (filed September 8, 2011)
3. “Systems and Processes for Bifacial Collection and Tandem Junctions Using a Thin film Photovoltaic Device” (US 13/406,376) (filed February 27, 2012)
4. “Multilayer Thin Film Back Contact System for Flexible Photovoltaic Devices on Polymer Substrates” (US 13/572,387) (filed August 10, 2012)
5. “Multilayer Thin Film Back Contact System for Flexible Photovoltaic Devices on Polymer Substrates” (PCT/US2012/050398) (filed August 10, 2012)
6. “Multilayer Thin Film Back Contact System for Flexible Photovoltaic Devices on Polymer Substrates” (CN 201280047345.1) (filed August 10, 2012)
7. “Apparatus and Method for Hybrid Photovoltaic Device Having Multiple, Stacked, Heterogeneous, Semiconductor Junctions” (EP 11804861.0) (filed December 13, 2011)
8. “Apparatus and Method for Hybrid Photovoltaic Device Having Multiple, Stacked, Heterogeneous, Semiconductor Junctions” (CN 201180067131.6) (filed December 13, 2011)
9. “Subtractive Hinge and Associated Methods (US 13/783,336) (filed March 3, 2013)
10. “Subtractive Hinge and Associated Methods (PCT/US 2013/28,929) (filed March 4, 2013)
11. “Subtractive Hinge and Associated Methods (CN 201380012566.X) (filed March 4, 2013)
12. “Subtractive Hinge and Associated Methods (EP 13758462.9) (filed March 4, 2013)
13. “System For Housing And Powering A Battery-Operated Device And Associated Methods” (US 13/802,713) (filed March 14, 2013)
14. “System For Housing And Powering A Battery-Operated Device And Associated Methods” (US 13/802,719) (filed March 14, 2013)
15. “System For Housing And Powering A Battery-Operated Device And Associated Methods” (PCT/US2013/34988) (filed April 2, 2013)
16. “Photovoltaic Assembly and Associated Methods” ( US 14/038096) (filed September 26, 2013)
17. “Photovoltaic Assembly and Associated Methods” (PCT/US2013/62355) (filed September 27, 2013)
18. “Photovoltaic Assembly and Associated Methods” (CN 201380060351.5) (filed September 27, 2013)
19. “Photovoltaic Assembly and Associated Methods” (EP 13840976.8) (filed September 27, 2013)
20. “Flexible High-Voltage Adaptable Current Photovoltaic Modules and Associated Methods” (US 14/041,886) (filed September 30, 2013)
21. “Hybrid Multi-Junction Photovoltaic Cells And Associated Methods” (US 14/100,960) (filed December 9, 2013)
22. “System For Housing And Powering A Battery-Operated Device And Associated Methods” (PCT/US2013/74936) (filed December 13, 2013)
23. “Systems And Methods For Thermally Managing High-Temperature Processes On Temperature Sensitive Substrates” (US 14/150,376) (filed January 8, 2014)
24. “Systems And Methods For Thermally Managing High-Temperature Processes On Temperature Sensitive Substrates” (PCT/US2014/10867) (filed January 8, 2014)
25. “Systems And Methods For Thermally Managing High-Temperature Processes On Temperature Sensitive Substrates” (CN 201480004408.4) (filed January 8, 2014)
26. “Systems And Methods For Thermally Managing High-Temperature Processes On Temperature Sensitive Substrates” (EP 14738271.7) (filed January 8, 2014)
27. “Multilayer Thin-Film Back Contact System For Flexible Photovoltaic Devices On Polymer Substrates” (PCT/US15/20184) (filed March 12, 2015)
28. “Array Of Monolithically Integrated Thin Film Photovoltaic Cells And Associated Methods” (14/252,485) (filed April 14, 2014)

29. “Subtractive Hinge And Associated Methods” (EP 13758462.9) (filed March 4, 2013)
30. “Photovoltaic Assembly and Associated Methods” (EP 13840976.8) (filed September 27, 2013)

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31. "Systems And Methods For Thermally Managing High-Temperature Processes On Temperature Sensitive Substrates" (CN 201480004408.4) (filed January 9, 2014)
32. "Systems And Methods For Thermally Managing High-Temperature Processes On Temperature Sensitive Substrates" (EP 14738271.7 ) (filed January 9, 2014)
33. "Multilayer Thin-Film Back Contact System For Flexible Photovoltaic Devices On Polymer Substrates" (US 14/932,933) (filed November 4, 2015)
34. "Photovoltaic-Based Fully Integrated Portable Power Systems" (PCT/US16/12047) (filed January 4, 2016)
35. "Photovoltaic-Based Fully Integrated Portable Power System" (US 14/987,214) (filed January 4, 2016)
36. "Systems and Processes for Bifacial Collection and Tandem Junctions Using a Thin-Film Photovoltaic Device" (US 15/099,835) (filed April 15, 2016)
37. "Photovoltaic-Based Fully Integrated Portable Power Management And Networking System" (PCT/US16/25647) (filed April 1, 2016)
38. "Photovoltaic-Based Fully Integrated Portable Power Management And Networking System" (US 15/089,028) (filed April 1, 2016)
39. "Photovoltaic Device and Method of Manufacturing Same" (CN 201610416638.2) (filed December 13, 2011)
40. "Multilayer Thin-Film Back Contact System For Flexible Photovoltaic Devices On Polymer Substrates" (US 15/258,169) (filed September 7, 2016)
41. "Hybrid Multi-Junction Photovoltaic Cells And Associated Methods" (US 15/137,696) (filed April 25, 2016)
42. "Machine And Process For Continuous, Sequential, Deposition Of Semiconductor Solar Absorbers Having Variable Semiconductor Composition Deposited In Multiple Sublayers" (US 15/584,241) (filed May 2, 2017)
43. "Multilayer Thin-Film Back Contact System for Flexible Photovoltaic Devices on Polymer Substrates" (GB 12759843.1) (Filed August 10, 2012)
44. "Multilayer Thin-Film Back Contact System for Flexible Photovoltaic Devices on Polymer Substrates" (WO PCT/US16/58933) (Filed October 26, 2016)
45. "Subtractive Hinge and Associated Methods" (US 15/673,283) (Filed August 9, 2017)

Ascent Solar has trademark applications and registrations in the United States and worldwide for slogans and product family names such as Milpak, Corpak, Life is Limitless, Transforming Everyday Life, and Solar Power Everywhere.

Depending on country laws, the marks listed above may include the ™ or ® symbols.

Suppliers

We rely on several unaffiliated companies to supply certain raw materials used during the fabrication of our PV modules and PV integrated electronics. We acquire these materials on a purchase order basis and do not have long term purchase quantity commitments with the suppliers, although we may enter into such contracts in the future. We currently acquire all of our high temperature plastic from one supplier, although alternative suppliers of similar materials exist. We purchase component molybdenum, copper, indium, gallium, selenium and indium tin oxides from a variety of suppliers. We also currently are in the process of identifying and negotiating arrangements with alternative suppliers of materials in the United States and Asia.

The manufacturing equipment and tools used in our production process have been purchased from various suppliers in Europe, the United States and Asia. Although we have had good relations with our existing equipment and tools suppliers, we monitor and explore opportunities for developing alternative sources to drive our manufacturing costs down.

Employees

As of December 31, 2017, we had 71 full time employees.

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Company History

We were formed in October 2005 from the separation by ITN of its Advanced Photovoltaic Division and all of that division's key personnel and core technologies. ITN, a private company incorporated in 1994, is an incubator dedicated to the development of thin film, PV, battery, fuel cell and nano technologies. Through its work on research and development contracts for private and government entities, ITN developed proprietary processing and manufacturing know-how applicable to PV products generally, and to CIGS PV products in particular. Our company was established by ITN to commercialize its investment in CIGS PV technologies. In January 2006, ITN assigned to us all its CIGS PV technologies and trade secrets and granted to us a perpetual, exclusive, royalty free worldwide license to use certain of ITN's proprietary process, control and design technologies in the production of CIGS PV modules. Upon receipt of the necessary government approvals in January 2007, ITN assigned government funded research and development contracts to us and also transferred the key personnel working on the contracts to us.

Corporate Information

We were incorporated under the laws of Delaware in October 2005. Our principal business office is located at 12300 Grant Street, Thornton, Colorado 80241, and our telephone number is (720) 872-5000. Our website address is www.ascentsolar.com. Information contained on our website or any other website does not constitute, and should not be considered, part of this Annual Report.

Available Information

We file with the Securities and Exchange Commission ("SEC") our annual report on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and all amendments to those reports, proxy statements and registration statements. You may read and copy any material we file with the SEC at the SEC's Public Reference Room at 100 F Street, NE, Washington, D.C. 20549. You may also obtain information on the operation of the Public Reference Room by calling the SEC at 1-800-SEC-0330. In addition, the SEC maintains an internet site at http://www.sec.gov that contains reports, proxy and information statements, and other information regarding issuers, including us, that file electronically. We make available free of charge on, or through, our website at www.ascentsolar.com our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendments to these reports filed or furnished pursuant to Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended ("Exchange Act") as soon as reasonably practicable after we file these materials with the SEC.

Item 1A. Risk Factors

The risks included here are not exhaustive or exclusive. Other sections of this Annual Report may include additional factors which could adversely affect our business, results of operations and financial performance. We operate in a very competitive and rapidly changing environment. New risk factors emerge from time to time, and it is not possible for management to predict all such risk factors, nor can it assess the impact of all such risk factors on our business or the extent to which any factor, or combination of factors, may cause actual results to differ materially from those contained in any forward-looking statements. Given these risks and uncertainties, investors should not place undue reliance on forward-looking statements as a prediction of actual results.

Risks Relating to Our Business

We have a limited history of operations, have not generated significant revenue from operations and have had limited production of our products. We have a limited operating history and have generated limited revenue from operations. Currently we are producing products in quantities necessary to meet current demand. Under our current business plan, we expect losses to continue until annual revenues and gross margins reach a high enough level to cover operating

expenses. We are utilizing contract manufacturers in Asia for components and for final assembly of finished goods. Our ability to achieve our business, commercialization and expansion objectives will depend on a number of factors, including whether:

- We can generate customer acceptance of and demand for our products;
- We successfully ramp up commercial production on the equipment installed;
- Our products are successfully and timely certified for use in our target markets;
- We successfully operate production tools to achieve the efficiencies, throughput and yield necessary to reach our cost targets;
- The products we design are saleable at a price sufficient to generate profits;
- We raise sufficient capital to enable us to reach a level of sales sufficient to achieve profitability on terms favorable to us;

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- We are able to successfully design, manufacture, market, distribute and sell our products;
- We effectively manage the planned ramp up of our operations;
- We successfully develop and maintain strategic relationships with key partners, including OEMs, system integrators and distributors, retailers and e-commerce companies, who deal directly with end users in our target markets;
- Our ability to maintain the listing of our common stock on the OTCBB Market;
- Our ability to achieve projected operational performance and cost metrics;
- Our ability to enter into commercially viable licensing, joint venture, or other commercial arrangements; and
- The availability of raw materials.

Each of these factors is critical to our success, and accomplishing each of these tasks may take longer or cost more than expected, or may never be accomplished. It also is likely that problems we cannot now anticipate will arise. If we cannot overcome these problems, our business, results of operations and financial condition could be materially and adversely affected.

We have to date incurred net losses and may be unable to generate sufficient sales in the future to become profitable. We incurred a net loss of $19 million for the year ended December 31, 2017 and reported an accumulated deficit of $402 million as of December 31, 2017. We expect to incur net losses in the near term. Our ability to achieve profitability depends on a number of factors, including market acceptance of our specialty PV products at competitive prices. If we are unable to raise additional capital and generate sufficient revenue to achieve profitability and positive cash flows, we may be unable to satisfy our commitments and may have to discontinue operations.

Our business is based on a new technology, and if our PV modules or processes fail to achieve the performance and cost metrics that we expect, then we may be unable to develop demand for our PV modules and generate sufficient revenue to support our operations. Our CIGS on flexible plastic substrate technology is a relatively new technology. Our business plan and strategies assume that we will be able to achieve certain milestones and metrics in terms of throughput, uniformity of cell efficiencies, yield, encapsulation, packaging, cost and other production parameters. We cannot assure you that our technology will prove to be commercially viable in accordance with our plan and strategies. Further, we or our strategic partners and licensees may experience operational problems with such technology after its commercial introduction that could delay or defeat the ability of such technology to generate revenue or operating profits. If we are unable to achieve our targets on time and within our planned budget, then we may not be able to develop adequate demand for our PV modules, and our business, results of operations and financial condition could be materially and adversely affected.

Our failure to further refine our technology and develop and introduce improved PV products could render our PV modules uncompetitive or obsolete and reduce our net sales and market share. Our success requires us to invest significant financial resources in research and development to keep pace with technological advances in the solar energy industry. However, research and development activities are inherently uncertain, and we could encounter practical difficulties in commercializing our research results. Our expenditures on research and development may not be sufficient to produce the desired technological advances, or they may not produce corresponding benefits. Our PV modules may be rendered obsolete by the technological advances of our competitors, which could harm our results of operations and adversely impact our net sales and market share.

Failure to expand our manufacturing capability successfully at our facilities would adversely impact our ability to sell our products into our target markets and would materially and adversely affect our business, results of operations and financial condition. Our growth plan calls for production and operation at our facility. Successful operations will require substantial engineering and manufacturing resources and are subject to significant risks, including risks of cost overruns, delays and other risks, such as geopolitical unrest that may cause us not to be able to successfully operate in other countries. Furthermore, we may never be able to operate our production processes in high volume or at the volumes projected, make planned process and equipment improvements, attain projected manufacturing yields or

desired annual capacity, obtain timely delivery of components, or hire and train the additional employees and management needed to scale our operations. Failure to meet these objectives on time and within our planned budget could materially and adversely affect our business, results of operations and financial condition.

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We may be unable to manage the expansion of our operations and strategic alliances effectively. We will need to significantly expand our operations and form beneficial strategic alliances in order to reduce manufacturing costs through economies of scale and partnerships, secure contracts of commercially material amounts with reputable customers and capture a meaningful share of our target markets. To manage the expansion of our operations and alliances, we will be required to improve our operational and financial systems, oversight, procedures and controls and expand, train and manage our growing employee base. Our management team will also be required to maintain and cultivate our relationships with partners, customers, suppliers and other third parties and attract new partners, customers and suppliers. In addition, our current and planned operations, personnel, facility size and configuration, systems and internal procedures and controls, even when augmented through strategic alliances, might be inadequate or insufficient to support our future growth. If we cannot manage our growth effectively, we may be unable to take advantage of market opportunities, execute our business strategies or respond to competitive pressures, resulting in a material and adverse effect to our business, results of operations and financial condition.

We depend on a limited number of third party suppliers for key raw materials, and their failure to perform could cause manufacturing delays and impair our ability to deliver PV modules to customers in the required quality and quantity and at a price that is profitable to us. Our failure to obtain raw materials and components that meet our quality, quantity and cost requirements in a timely manner could interrupt or impair our ability to manufacture our products or increase our manufacturing cost. Most of our key raw materials are either sole sourced or sourced by a limited number of third party suppliers. As a result, the failure of any of our suppliers to perform could disrupt our supply chain and impair our operations. Many of our suppliers are small companies that may be unable to supply our increasing demand for raw materials as we implement our planned expansion. We may be unable to identify new suppliers in a timely manner or on commercially reasonable terms. Raw materials from new suppliers may also be less suited for our technology and yield PV modules with lower conversion efficiencies, higher failure rates and higher rates of degradation than PV modules manufactured with the raw materials from our current suppliers.

Our continuing operations will require additional capital which we may not be able to obtain on favorable terms, if at all or without dilution to our stockholders. Since inception, we have incurred significant losses. We expect to continue to incur net losses in the near term. For the year ended December 31, 2017, our cash used in operations was $12.6 million. At December 31, 2017, we had cash and equivalents of $90,000.

Although we have commenced production at our manufacturing facility, we do not expect that sales revenue and cash flows will be sufficient to support operations and cash requirements until we have fully implemented our new strategy of focusing on high value PV products. Additional projected product revenues are not anticipated to result in a positive cash flow position for the year 2018 overall. The Company will need to raise additional capital in order to continue our current level of operations throughout 2018.

To the extent that we may need to raise additional capital in the future there is no assurance that we will be able to raise additional capital on acceptable terms or at all. If we raise additional funds through the issuance of equity or convertible debt securities, the percentage ownership of our existing stockholders could be significantly diluted, and these newly issued securities may have rights, preferences or privileges senior to those of existing stockholders. If we raise additional funds through debt financing, which may involve restrictive covenants, our ability to operate our business may be restricted. If adequate funds are not available or are not available on acceptable terms, if and when needed, our ability to fund our operations, take advantage of unanticipated opportunities, develop or enhance our products, expand capacity or otherwise respond to competitive pressures could be significantly limited, and our business, results of operations and financial condition could be materially and adversely affected.

In addition, the terms of a loan we obtained from the Colorado Housing and Finance Authority (“CHFA”) in connection with our purchase and improvement of our Thornton, Colorado facility contain covenants that limit our ability, without the consent of CHFA, to create or incur additional indebtedness (other than obligations created or incurred in

the ordinary course of business such as working capital financing); merge or consolidate with any other entity; or make loans or advances to our officers, shareholders, directors or employees. The presence of these covenants gives CHFA the ability to bar us from engaging in certain transactions in the future that we may determine are necessary or advisable to meet our business objectives, including debt offerings and acquisitions of or by other companies. If CHFA were to withhold its written consent under these or other circumstances, we could be forced to prepay such loans at a premium, which could adversely affect our business, results of operations and financial condition.

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Our products may never gain sufficient market acceptance, in which case we would be unable to sell our products or achieve profitability. Demand for our products may never develop sufficiently, and our products may never gain market acceptance, if we fail to produce products that compare favorably against competing products on the basis of cost, quality, weight, efficiency and performance. Demand for our products also will depend on our ability to develop and maintain successful relationships with key partners, including distributors, retailers, OEMs, system integrators and value added resellers. If our products fail to gain market acceptance as quickly as we envision or at all, our business, results of operations and financial condition could be materially and adversely affected.

We are targeting emerging markets for a significant portion of our planned product sales. These markets are new and may not develop as rapidly as we expect, or may not develop at all. Our target markets include portable power, defense, transportation, space and near space markets. Although certain areas of these markets have started to develop, some of them are in their infancy. We believe these markets have significant long term potential; however, some or all of these markets may not develop and emerge as we expect. If the markets do develop as expected, there may be other products that could provide a superior product or a comparable product at lower prices than our products. If these markets do not develop as we expect, or if competitors are better able to capitalize on these markets our revenues and product margins may be negatively affected.

Failure to consummate strategic relationships with key partners in our various target market segments, such as defense and portable power, transportation, space and near space, and the respective implementations of the right strategic partnerships to enter these various specified markets, could adversely affect our projected sales, growth and revenues. We intend to sell thin-film PV modules for use in portable power systems, defense and portable power systems, transportation, space and near space solar panel applications. Our marketing and distribution strategy is to form strategic relationships with distributors, value added resellers and e-commerce to provide a foothold in these target markets. If we are unable to successfully establish working relationships with such market participants or if, due to cost, technical or other factors, our products prove unsuitable for use in such applications; our projected revenues and operating results could be adversely affected.

If sufficient demand for our products does not develop or takes longer to develop than we anticipate, we may be unable to grow our business, generate sufficient revenue to attain profitability or continue operations. The solar energy industry is at a relatively early stage of development, and the extent to which PV modules, including our own, will be widely adopted is uncertain. While pure PV solutions is not our short term primary market, if PV technology proves unsuitable for widespread adoption or if demand for PV modules fails to develop sufficiently, long term we may be unable to grow our business, generate sufficient sales to attain profitability or continue operations. Many factors, of which several are outside of our control, may affect the viability of widespread adoption of PV technology and demand for PV modules.

We face intense competition from other manufacturers of thin-film PV modules and other companies in the solar energy industry. The solar energy and renewable energy industries are both highly competitive and continually evolving as participants strive to distinguish themselves within their markets and compete with the larger electric power industry. We believe our main sources of competition are other thin film PV manufacturers and companies developing other solar solutions, such as solar thermal and concentrated PV technologies.

Many of our existing and potential competitors have substantially greater financial, technical, manufacturing and other resources than we do. A competitor’s greater size provides them with a competitive advantage because they often can realize economies of scale and purchase certain raw materials at lower prices. Many of our competitors also have greater brand name recognition, established distribution networks and large customer bases. In addition, many of our competitors have well-established relationships with our current and potential partners and distributors and have extensive knowledge of our target markets. As a result of their greater size, these competitors may be able to devote more resources to the research, development, promotion and sale of their products or respond more quickly to

evolving industry standards and changes in market conditions than we can. Our failure to adapt to changing market conditions and to compete successfully with existing or future competitors could materially and adversely affect our business, results of operations and financial condition.

Problems with product quality or performance may cause us to incur warranty expenses, damage our market reputation and prevent us from maintaining or increasing our market share. If our products fail to perform as expected while under warranty, or if we are unable to support the warranties, sales of our products may be adversely affected or our costs may increase, and our business, results of operations and financial condition could be materially and adversely affected.

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We may also be subject to warranty or product liability claims against us that are not covered by insurance or are in excess of our available insurance limits. In addition, quality issues can have various other ramifications, including delays in the recognition of revenue, loss of revenue, loss of future sales opportunities, increased costs associated with repairing or replacing products, and a negative impact on our goodwill and reputation. The possibility of future product failures could cause us to incur substantial expenses to repair or replace defective products. Furthermore, widespread product failures may damage our market reputation and reduce our market share causing sales to decline.

The interests of Tertius Financial Group and our CEO Victor Lee may conflict with our interests or your interests now or in the future. As of December 31, 2017, Tertius Financial Group Pte Ltd ("Tertius") owned approximately 3% of our outstanding common stock. Our CEO Victor Lee is a 50% owner and managing director of Tertius. Tertius is an investment firm based in Singapore. Mr. Lee devotes substantially all of his business time to his positions with the Company and does not devote a material amount of his business time to Tertius.

Tertius may from time to time acquire and hold interests in businesses that compete directly or indirectly with us. Tertius also may pursue opportunities (including by acquisition) that may be adverse to, or be in direct or indirect competition with us. Additionally, our potential customers may be competitors of Tertius and our interests in selling to those customers could be divergent from Tertius's competitive interests. So long as Tertius continues to own a significant amount of the outstanding shares of our common stock and Mr. Lee is President and Chief Executive Officer, Tertius may be able to strongly influence or effectively control our decisions,

Currency translation risk may negatively affect our net sales, cost of equipment, cost of sales, gross margin or profitability and could result in exchange losses. Although our reporting currency is the U.S. dollar, we may conduct business and incur costs in the local currencies of other countries in which we operate, make sales or buy equipment or materials. As a result, we are subject to currency translation risk. Our future contracts and obligations may be exposed to fluctuations in currency exchange rates, and, as a result, our capital expenditures or other costs may exceed what we have budgeted. Further, changes in exchange rates between foreign currencies and the U.S. dollar could affect our net sales and cost of sales and could result in exchange losses. We cannot accurately predict future exchange rates or the overall impact of future exchange rate fluctuations on our business, results of operations and financial condition.

A significant increase in the price of our raw materials could lead to higher overall costs of production, which would negatively affect our planned product margins, or make our products uncompetitive in the PV market. Our raw materials include high temperature plastics and various metals. Significant increases in the costs of these raw materials may impact our ability to compete in our target markets at a price sufficient to produce a profit.

Our intellectual property rights or our means of enforcing those rights may be inadequate to protect our business, which may result in the unauthorized use of our products or reduced sales or otherwise reduce our ability to compete. Our business and competitive position depends upon our ability to protect our intellectual property rights and proprietary technology, including any PV modules that we develop. We attempt to protect our intellectual property rights, primarily in the United States, through a combination of patent, trade secret and other intellectual property laws, as well as licensing agreements and third party nondisclosure and assignment agreements. Because of the differences in foreign patent and other laws concerning intellectual property rights, our intellectual property rights may not receive the same degree of protection in foreign countries as they would in the United States. Our failure to obtain or maintain adequate protection of our intellectual property rights, for any reason, could have a materially adverse effect on our business, results of operations and financial condition. Further, any patents issued in connection with our efforts to develop new technology for PV modules may not be broad enough to protect all of the potential uses of our technology.

We also rely on unpatented proprietary technology. It is possible others will independently develop the same or similar technology or otherwise obtain access to our unpatented technology. To protect our trade secrets and other proprietary information, we require our employees, consultants and advisors to execute proprietary information and invention assignment agreements when they begin working for us. We cannot assure these agreements will provide meaningful protection of our trade secrets, unauthorized use, misappropriation or disclosure of trade secrets, know how or other proprietary information. Despite our efforts to protect this information, unauthorized parties may attempt to obtain and use information that we regard as proprietary. If we are unable to maintain the proprietary nature of our technologies, we could be materially adversely affected.

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In addition, when others control the prosecution, maintenance and enforcement of certain important intellectual property, such as technology licensed to us, the protection and enforcement of the intellectual property rights may be outside of our control. If the entity that controls intellectual property rights that are licensed to us does not adequately protect those rights, our rights may be impaired, which may impact our ability to develop, market and commercialize our products. Further, if we breach the terms of any license agreement pursuant to which a third party licenses us intellectual property rights, our rights under that license may be affected and we may not be able to continue to use the licensed intellectual property rights, which could adversely affect our ability to develop, market and commercialize our products.

If third parties claim we are infringing or misappropriating their intellectual property rights, we could be prohibited from selling our PV products, be required to obtain licenses from third parties or be forced to develop non-infringing alternatives, and we could be subject to substantial monetary damages and injunctive relief. The PV industry is characterized by the existence of a large number of patents and frequent litigation based on allegations of patent infringement. We are aware of numerous issued patents and pending patent applications owned by third parties that may relate to current and future generations of solar energy. The owners of these patents may assert the manufacture, use or sale of any of our products infringes one or more claims of their patents. Moreover, because patent applications can take many years to issue, there may be currently pending applications, unknown to us, which may later result in issued patents that materially and adversely affect our business. Third parties could also assert claims against us that we have infringed or misappropriated their intellectual property rights. Whether or not such claims are valid, we cannot be certain we have not infringed the intellectual property rights of such third parties. Any infringement or misappropriation claim could result in significant costs or substantial damages to our business or an inability to manufacture, market or sell any of our PV modules found to infringe or misappropriate. Even if we were to prevail in any such action, the litigation could result in substantial cost and diversion of resources that could materially and adversely affect our business. The large number of patents, the rapid rate of new patent issuances, the complexities of the technology involved and uncertainty of litigation increase the risk of business assets and management’s attention being diverted to patent litigation. Even if obtaining a license were feasible, it could be costly and time consuming. We might be forced to obtain