

### Tecogen Inc. (TGEN)

Company Report – November 25, 2017

Tecogen Inc. designs, manufactures and sells industrial and commercial CHP (Combined Heat & Power), or cogeneration, systems that produce combinations of electricity, hot water, and air conditioning. It's a well-established Company that has already shipped over 2,500 units, some of which have been operating for more than 25 years.

Revenue in the third quarter, ended September 30, 2017 was \$8,501,198 compared to \$6,616,455 for the same period in 2016. An impressive surge of 28.5% in top line revenue and also the highest quarterly revenue ever in the Company's history.

Tecogen also successfully returned to profitability in Q3. The revenue contribution of American DG Energy allowed the Company to maintain profitable despite a decline in product sales. Having this new steady flow of revenue makes it easier for Tecogen to remain profitable despite the ups and downs of product shipments. Additionally, the Company continues to improve ADGE's fleet operations and profitability.

The decline of Tecogen's stock price following the release of the financials, creates a tremendous buying opportunity.

Based on the intrinsic value of Tecogen's shares derived from our model, we reiterate our buy recommendation for Tecogen Inc. with a price target of \$8.41, which is 246% above today's stock price.



- ▣ The Company has a number projects under way in the fourth quarter that should help to sustain its momentum going into 2018. For example, it will roll out an update of the Tecopower CHP unit, upgrade the chiller manufacturing capacity, and update some internal software systems to improve the operational efficiency.
- ▣ In addition, Tecogen keeps a close eye on upcoming state approvals for new indoor growing facilities. Indoor agriculture continues to be a rapidly emerging new opportunity for growth, particularly for the Tecochill line of natural gas powered chillers. To-date, Tecogen has inked nine transactions in the space, all but one of which is to buyers who intend to grow cannabis.



Market Data	
Price	\$2.43
Sector	Technology
52-Week Price Range	\$2.20 - \$4.43
Shares Issued (m)	24.72
Market Cap (m)	\$60.08
Listings	TGEN (NASDAQ)
Website	<a href="http://www.tecogen.com">www.tecogen.com</a>

## THE COMPANY

Tecogen designs, manufactures and sells industrial and commercial cogeneration systems that produce combinations of electricity, hot water, and air conditioning using engines that have been specially adapted to run on natural gas. This technology is called cogeneration, or Combined Heat and Power (CHP).

Cogeneration systems are efficient because they drive electric generators or compressors, which reduce the amount of electricity purchased from the utility. Plus they use the engine’s waste heat for water heating, space heating, and/or air conditioning at the customer’s building, vastly improving fuel efficiency.

The main drivers for end users to opt for a CHP system are a significant reduction in energy costs, fuel efficiency, emissions reduction, the availability of government incentives, zero capital outlay options (see revenue sources), backup power generation and Microgrid capabilities that allow for participation in demand response and load shaving incentive programs.

Existing customers for CHP systems include hospitals and nursing homes, colleges and universities, health clubs and spas, hotels and motels, office and retail buildings, food and beverage processors, multi-unit residential buildings, laundries, ice rinks, swimming pools, factories, municipal buildings, and greenhouses.

The Company’s products are sold directly to end-users by its own sales team and by established sales agents and representatives, who are compensated by commissions. Various agreements are in place with distributors and outside sales representatives for certain territories and product lines.

The Company is supported by an established network of engineering, sales, and service personnel across the United States. Service contracts make up a reliable and growing part of the Company’s total sales.

**Tecogen is a well-established and respected Company in the industry. It**

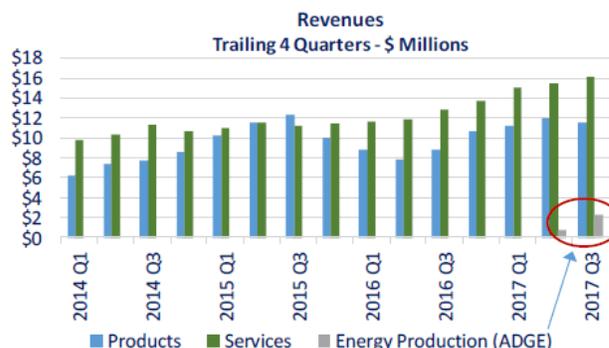
**has shipped over 2,500 units so far, some of which have been operating for almost 25 years.**

Third quarter financials were very important for Tecogen in that it was the first full quarter in which American DG’s (ADGE) results were integrated. Remember that American DG was acquired by Tecogen in May, 2017.

Revenue in the third quarter, ended September 30, 2017 was \$8,501,198 compared to \$6,616,455 for the same period in 2016. An impressive surge of 28.5% in top line revenue and also the highest quarterly revenue ever in the Company’s history.

Total service related revenues for the third quarter of 2017 grew 20.0% over the prior year period, driven primarily by installation activity, while product revenue declined 14.9% compared to the third quarter of 2016. Chiller and heat pump sales more than doubled, partly offsetting a 30.2% decline from what were record cogeneration sales in the year-ago period. This is a temporary issue however, as many sales were shifted to the fourth quarter.

In addition, the acquisition of American DG Energy added a new energy production revenue stream, worth \$1,556,115 in the third quarter. The ADGE revenue stream adds an important second source of annuity-like revenue thanks to its long-term contracts.



Also noteworthy is that the Company’s total revenue for the trailing 4-quarter period is at \$30 million, another record (see chart above). The energy revenue is represented by the gray bars circled in red. Because energy revenue only represents earnings of about 4 months and this chart represents annual revenues as a trailing 4-quarters metric, this

revenue appears insignificant for now. This is the introduction of ADGE's revenue contribution, which will grow with time.

Gross profit for the third quarter of 2017 was \$3,258,031 compared to \$2,774,818 in the third quarter of 2016, an increase of 17.4% versus the same period in the prior year. This substantial growth was generated by the full-quarter contribution of American DG Energy.

Overall gross margin in the third quarter of 2017 decreased to 38.3% compared to 41.9% in 2016. A shift in sales mix to lower margin items was partly offset by ADGE's margin contribution of about 53%. Despite the drop, gross margins remain well within management's targeted 35-40% range.

Tecogen delivered net income for the quarter of \$27,211 compared to \$207,868 in the third quarter of 2016. The quarter's results included non-recurring expenses totaling \$37,445 related to the Company's merger with American DG Energy.

Backlog of products and installations was \$14.5 million as of third quarter end, and stood at \$16.8 million as of November 8, 2017. The solid backlog was driven by strong traction in the InVerde and Tecochill product lines and installation services.

Note that the backlog does not include service contract revenues, nor does it include ADGE's estimated undiscounted future energy production revenues, which exceed \$50 million, stretching over the next 15 years.

Co-CEO John Hatsopoulos said, "The third quarter showed the strategic importance of Tecogen's acquisition of American DG Energy. It adds another stable stream of revenue to help cushion the ups and downs of our product revenue. We've now been profitable during four out of the past five quarters, with the second quarter of 2017, in which we completed the ADGE transaction, being the exception."

As of year-end 2016, Tecogen had 83 full-time employees and 3 part-time employees, including 7 sales and marketing personnel and 35 service personnel.

## Revenue Sources

Tecogen manufactures, sells, installs, and maintains four types of products:

- Combined Heat and Power (CHP) units that supply electricity and hot water;
- Chillers that provide air-conditioning and hot water; and
- High-efficiency water heaters

Next to the three products above, Tecogen also markets an emissions control technology called Ultra. This is a muffler-like kit that dramatically reduces a natural gas powered engine's harmful emissions such as NOx, CO, and hydrocarbons.

In 2012, a 75 kW CHP unit equipped with the Ultra system became the first unit to obtain a conditional air permit in Southern California, an area with one of the strictest emissions regulations worldwide.



**The Ultra Emissions System mounted to a CHP unit. Hundreds of Ultras have been installed on cogeneration systems so far.**

Since then, the Ultra technology has been installed on hundreds of cogeneration systems and functions impeccably. **There is no comparable technology on the market today. It truly sets Tecogen apart from its competition** (also read Ultra on page 8).

Moreover, in May 2017, Tecogen added another important revenue source, as the Company completed its acquisition of American DG Energy (NYSE Mkt: ADGE). American DG offers On-Site Utility energy solutions without any capital or start-up costs to the customer and at lower costs than charged by conventional energy suppliers.

Thanks to the acquisition, Tecogen can offer a cost-free-installation option to customers who

do not have access to financing, or who are not interested in owning and maintaining the CHP equipment.

It is noteworthy that, when combined, approximately half of Tecogen's annual revenue will be derived from stable, long-term contracted sources (Tecogen Service revenue and American DG Energy revenue). This revenue base will provide a reliable funding source for both operating expense and growth initiatives, while also making Tecogen's revenue profile more predictable, as the revenue volatility caused by somewhat cyclical equipment sales and installations is reduced.

### Case Study – Toren Tower

The Company's business model, and its benefits for all parties involved, will become perfectly clear on the basis of a case study.

Toren is an iconic skyscraper that forever changed downtown Brooklyn. The 37 story building offers 240 condominium homes with breathtaking floor-to-ceiling views of the Manhattan skyline and New York Harbor as well as the opportunity to live in the most environmentally advanced high-rise residential building in New York, perhaps even in the U.S.

Toren uses five Tecogen InVerde 100kW cogeneration modules, located on-site, to meet much of the building's energy needs.

The cogen modules provide electricity, while the waste heat they produce is recovered and used to heat interior spaces, provide domestic hot water, heat the pool and even run the air conditioning.

That way, the remarkably efficient cogeneration system reduces Toren's carbon footprint by more than 2000 tons of CO<sub>2</sub> each year while providing annual cost savings of \$540,000.

Toren's CHP plant is designed to automatically follow the building's electric demand. As demand for electricity increases and decreases within the building, the electrical output from each of the five CHP modules will also increase and decrease.

Thanks to highly sophisticated load control software built into each unit, the amount of electricity being purchased from Consolidated Edison, the electric utility in Brooklyn, can be held to less than 20kW.



**Tecogen's cogeneration system reduces Toren's carbon footprint by more than 2000 tons of CO<sub>2</sub> each year while providing an annual energy cost savings of \$540,000.**

Another innovative, unique and very desirable feature of Toren's cogen system is that it is a "Microgrid" with the ability to run independent from the grid in "Island Mode", providing power for the building if New York City should ever experience a blackout like the one in 2003.

### Nationwide Factory Service

Besides selling machines, which in many cases are one-off deals, Tecogen generates plenty of revenues through service contracts. This is a reliable and growing part of the Company's total sales. In fact, more than half of Tecogen's installed units have a service contract.

Most of the service revenue is in the form of annual service contracts. Customers are invoiced based on equipment run-time hours without unforeseen add-ons for such items as unscheduled repairs or engine replacements.

Tecogen offers service support on all its CHP products nationwide through a network of nine field service centers in California, the Midwest, and the Northeast. These centers are staffed by full-time Tecogen technicians and have been an essential part of Tecogen's growth and success through the years, as good factory support from Tecogen allows its customers to focus on their core missions and businesses. Factory service also keeps Tecogen in close touch with its customers and their specific site issues.

## Government Regulations

Several kinds of government regulations affect the Company's current and future business, such as:

- ▣ Air pollution regulations, which govern the emissions allowed in engine exhaust;
- ▣ State and federal incentives for CHP technology; and
- ▣ Electric utility pricing and related regulations.

Strict regulations that control **air quality and greenhouse gases** increasingly favor Tecogen's low-emission products. In some states that have strict emissions regulations, such as California, the pollution from natural gas engines presents a challenge.

However, the development of the Ultra low-emissions technology has addressed this issue. In January 2013, a state-certified source test at a customer's site verified that emissions levels of a CHP unit equipped with the Ultra technology, were well below the new permitting requirements.

In addition, there are currently 23 states that recognize CHP as part of their Renewable Portfolio Standards. New York and New Jersey, for example, have **incentive programs** that rebate a significant portion of the CHP project cost.

Similar incentive programs also exist in Massachusetts, Rhode Island, and Maryland albeit with different structures and terms. Massachusetts has an additional CHP incentive in the form of an annual rebate proportional to the carbon savings versus conventional technology.

Finally, the Company is targeting customers in states with **high electricity rates** in the commercial sector, such as California, Connecticut, Massachusetts, New Hampshire, New Jersey, and New York. These regions also have high peak demand rates, which favor utilization of modular units in groups so as to assure redundancy and peak demand savings.

## Competition

Tecogen's products fall into the broad market category of distributed generation systems that produce electric power on-site to mitigate the drawbacks of traditional central power and the low efficiency of conventional heating processes.

The Company's CHP products use reciprocating engines originally designed for gasoline fuel that are modified to run on natural gas. Although gas-fueled CHP units are relatively common, Tecogen is confident that no other company has developed a product that competes with its inverter-based InVerde e+ CHP, which is highly efficient, facilitates battery or solar array integration, and is compliant with the NFPA 110 standard for emergency and standby power systems.

If competitors wanted to develop a similar product, development time and costs would be significant. In addition, certain Tecogen patents and licenses for microgrid software would prevent others from offering certain important functions.

## DISSOLUTION ULTRATEK JV

In December 2015, following the outbreak of the Volkswagen emissions scandal, Tecogen formed Ultra Emissions Technologies Ltd (Ultratek), with the goal to adapt the Ultra technology to gasoline fueled automotive engines. The prospect of vehicle engines realizing fuel cell like emissions is

tremendously compelling from a policy and market standpoint.

The joint venture completed two phases of testing, which were highly successful in demonstrating Ultera's effectiveness. These tests were conducted at the world-renowned AVL California Technical Center and were the subject of a peer-reviewed paper presented at the SAE World Congress in May 2017.



**The tests conducted at the world-renowned AVL California Technical Center were highly successful in demonstrating Ultera's effectiveness for automotive applications.**

The test results show that carbon monoxide (CO) emissions were reduced by as much as 94% thanks to the use of the Ultera. In addition, levels of non-methane hydrocarbons (NMOG) were lowered by 81%. Needless to say these were outstanding test results! As far as we know no other technology in the world has ever accomplished similar results with gasoline powered engines.

Over the past few months, Ultratek has had several productive meetings with potential partners from the automotive industry, as well as with government regulators. Based on the feedback and insight from these meetings, a more advanced Ultera device will be completed so that it can fit under the hood of the car and overseen by the vehicle's control system.

Thanks to two phases of testing, conducted over the past 18 months, Ultratek has a successful proof of concept, which

demonstrates Ultera's effectiveness for automotive applications. Emissions of carbon monoxide (CO) and non-methane hydrocarbons (NMOG) were reduced by as much as 94% and 81% respectively due to the use of the Ultera!

As for the next step, Ultratek had two options. It could either discontinue the automotive related development of Ultera and find a commercial partner, such as an automaker or OEM, that would undertake the further development. Alternatively, Ultratek itself could develop a refined prototype, which would substantially increase the value of the technology. This would enable Ultratek to develop a practical design and assess the per-unit-cost.

This is exactly why Ultratek was dissolved, as some of the independent investors in Ultratek and Tecogen couldn't come to an agreement on the next phase forward. The third party investors preferred to immediately engage talks with the industry, while Tecogen was in favor of allowing Ultratek to further develop the technology. Consequently, it was opted to part at this stage.

When the Ultratek JV was formed, Tecogen received a 50% equity interest in it in exchange for a worldwide license to use its Ultera emissions control technology in the field of mobile vehicles burning gasoline. The remaining 50% interest was purchased for \$3,000,000 by a small group of offshore investors.

In August 2016, both Tecogen and the offshore investors invested an additional \$2 million each through the exercise of warrants. The following month another \$6.25 million was raised in a third round financing.

In total \$13.25 million cash was invested in the JV, including \$2 million by Tecogen. Currently, about \$10 million is still in the bank. Tecogen, will receive \$1.6 million back, along with all the IP. The offshore investors, which invested \$11.25 million, will only receive \$8.4 million back. A favorable settlement for Tecogen indeed.

John Hatsopoulos stated, "Unwinding Ultratek is the right move for the Company for several

reasons. Firstly, we will add \$1.6 million to our balance sheet, which we can apply to our growing core business. Secondly, we will gain the complete rights and control of the Ultratek technology following the successful completion of 18 months of intense research. This puts us in a strong position from which we can restructure the R&D business entity and raise funds to carry the technology forward to commercialization."

Despite the JV being dissolved, Ultratek representatives will continue to have productive meetings with potential partners from the automotive industry, as well as with government regulators. Based on the feedback and insight from these meetings, a more advanced Ultera device will be completed so that it can fit under the hood of a car and overseen by the vehicle's control system.

The refined Ultera prototype, which will be tested in an upcoming phase 3, will be a true showcase for the system, while providing a basis for accurate costing. Tecogen assumes that it will take about 1.5 years to develop the finished product.

To further finance the development of the revolutionary Ultera emissions technology for automotive applications, Tecogen will most likely set up a new company soon after the dissolution of Ultratek. The idea is to make this a non-public company, funded by third party investors, in which Tecogen has a controlling interest, and which will consolidate its financials with Tecogen's. The Company's management already has several investors lined up to participate in this new endeavor.

In addition, further work to advance the research program, funded by the Propane Education and Research Council (PERC) to demonstrate the effectiveness of the Ultera emissions systems on propane fueled fork trucks, may also be conducted under the umbrella of this new joint venture (Also read Growth Drivers).

## TECHNOLOGY

Combined Heat & Power (CHP) is truly a way to get "two for the price of one". It produces

the electricity or cooling power that a customer needs, and it captures much of the thermal energy that is normally lost during the energy conversion into power.

With CHP, the "waste" thermal energy gets captured and put to good use on site, for heating water or building spaces.

Following is an overview of the three types of CHP systems that Tecogen offers. Also, the highly efficient Ultera system that makes CHPs meet the most stringent emissions standards is described in more detail below.

### Combined Heat and Power

Tecogen's premier cogeneration product is the InVerde e+ CHP system. The revolutionary unit combines the best technologies in the field, and features a unique set of proprietary innovations.

The InVerde incorporates an inverter, which converts direct current, or DC, electricity to alternating current, or AC. With an inverter, the engine and generator can run at variable speeds, which maximizes efficiency at varying loads. The inverter then converts the generator's variable output to the constant-frequency power required by customers (50 or 60 Hertz).

Thanks to the cutting edge inverter technology, an innovative power control, and a new and improved engine, the InVerde e+ reaches an electrical efficiency of 33%, while its nearest competitor achieves efficiencies between 27 and 29 percent.

Note that this efficiency only refers to the produced electricity and that the harvested heat to produce thermal energy is not taken into account. A Tecogen CHP system that also uses the recovered heat, achieves efficiency between 80 to 90 percent.

The DC input capability, facilitating battery or solar array integration, is another huge innovation. It allows for a seamless transfer of energy between the CHP unit, other energy generators, such solar panels, windmills, and backup batteries, eliminating the need for costly converters.

Moreover, the InVerde e+ automatically start up within 10 seconds in the event of a full blackout of the grid, making the CHP compliant with the new strict Type 110 standard for emergency and standby power systems by the National Fire Protection Association (NFPA). This is yet another innovation that very few competitors offer.

#### **NFPA 110**

The NFPA 110 standard covers performance requirements for emergency and standby power systems providing an alternate source of electrical power in buildings and facilities in the event that the normal electrical power source fails. Amongst these requirements is that the backup equipment needs to supply electrical power within 10 seconds of the blackout in order for it to qualify.

This is also the first engine-driven product to carry full UL 1741 Certification for "utility-safe" interconnection. So it doesn't need any additional permitting for interconnecting to the electric grid, speeding the installation process.

### **Ilios High-Efficiency Water Heaters**

The Ilios high-efficiency water heater operates like an electric heat pump but uses a natural gas engine instead of an electric motor to power the system.

The water heater, uses a heat pump, which captures warmth from outdoor air even if it is moderately cool outside. Heat pumps work somewhat like a refrigerator, but in reverse. Refrigerators extract heat from inside the refrigerator and move it outside the refrigerator. Heat pumps extract heat from outside and move it indoors.

In both cases, fluids move the heat around by flowing through heat exchangers. At various points the fluids are compressed or expanded, which absorbs or releases heat.

The gas engine's waste heat is recovered and used in the process, unlike its electric counterpart, which runs on power that has already lost its waste heat.

The net effect is that the efficiency of an Ilios' heat pump far surpasses that of conventional boilers for water heating. This translates directly to lower fuel consumption and, for heavy use customers, significantly lower operating costs. Gas engine heat pumps can deliver efficiencies in excess of 200%.

The Ilios market continues to expand both geographically and into different end-market segments. The high-efficiency water heater is ideal for locations with a gas demand of at least 4000 Therms/month, such as water parks, swimming pools, hotels, hospitals, apartment buildings and recreation centers.

The Ilios system also attracts customers that consistently have the simultaneous need for heating and cooling, such as manufacturing and R&D type facilities.

### **Chillers**

TECOCHILL natural gas engine-driven chillers provide building owners with a reliable, proven, efficient, and cost-effective alternative to conventional electric motor-powered chillers. It's the only natural gas engine-driven chiller on the North American market in its size range.

The engine drives a compressor that makes chilled water; while the engine's free waste heat can be recovered to satisfy the building's needs for hot water or heating. This process is sometimes referred to as "mechanical" cogeneration, as it generates no electrical power, and the equipment does not have to be connected to the utility grid.

A TECOCHILL's benefits are significant. It cuts a building's cooling costs in half, by eliminating most of the electrical demand (kW) associated with providing cooling. In addition, it offers optional "waste" heat that is always available at the same time. This high-quality heat source (up to 230°F hot water) literally comes for free, whenever the chiller is running.

The TECOCHILL chillers are available in capacities ranging from 25 to 400 tons, with the smaller units air-cooled and the larger ones water-cooled. They are ideal in facilities

where new chilling capacity is desired, as replacements for aging electric chilling equipment, where the local electric utility's kW demand charges are high, or where the site's electrical capacity is limited.

Basically, they make sense wherever large chillers are needed, including hospitals, colleges, schools, office buildings, aquariums, government buildings, large residential facilities, industrial facilities, hotels, and ice rinks.

## Ultra

In 2008 there was a dramatic change in the air quality regulations in Southern California. At that time no technology could meet the new, stricter, emission standards. In reaction to the new regulations, Tecogen developed the Ultra technology.

Tecogen decided to look at the chemistry of emissions instead of the mechanical controls of the engine to simultaneously get rid of NOx compounds, CO and hydrocarbons. They broke the catalyst process into two steps and ran each step at a different temperature.

By controlling the temperature in the first stage, the system could achieve very low NOx emissions. In a second stage process the remaining pollutants were oxidized by injecting a little air between the first and second stages and altering the process conditions.

In 2012, a 75 kW CHP unit equipped with the Ultra system became the first unit to obtain a conditional air permit in Southern California since the strict regulations went into place in 2009. A state-certified source test, administered in January 2013, verified that the emissions levels of the system were well below the new permitting requirements, and the final permit version was approved in August 2013.

Tecogen originally developed and patented the Ultra-low emission control technology for its own CHP products but has since decided to make the technology available for retrofit on non-Tecogen applications.

**The Ultra retrofit kits deliver simple, cost-effective and robust solutions for meeting even the most stringent emissions standards. The patented system provides peace of mind to its customers by lowering NOx and CO to near-zero levels without the need for complex additional controls or frequent maintenance.**

## RECENT EVENTS

### Tecogen Signs One of the Largest Contracts in Its History

Last September, Tecogen received an order for no less than 10 InVerde e+ Combined Heat and Power (CHP) units, one of the largest contracts in the Company's history. The CHPs will be installed in a brand new residential building in Brooklyn, NY. Although no details were provided, the order is estimated to be worth well over \$5 million.

Combined, the 10 systems have a peak generation capacity of over 1MW. The buyer opted to install 10 InVerde e+ units, instead of one large unit from a third party, simply because Tecogen's equipment outclasses the competition. Knowing that the average InVerde e+ saves customers \$50,000 - \$100,000 annually on their utility bills, these 10 units will generate combined savings of approximately \$500,000 - \$1,000,000 per year.



**A new residential building in Brooklyn, NY will soon be powered by 10 InVerde e+ Combined Heat and Power (CHP) units.**

In addition, these units will be equipped with cloud-based real-time performance monitoring via Tecogen's CHPInsight software. That way, their performance can be

monitored on an iPad or computer from anywhere in the world.

Moreover, the CHPs will be equipped with an Ultra system so that harmful emissions of NOx and CO are lowered to near-zero levels. The 10-unit system is expected to eliminate approximately 5,500 tons of carbon dioxide per year when compared to traditional energy sources. That means that this installation will generate annual carbon savings on par with removing over 1,000 cars from the road or planting nearly 130,000 trees.

Finally, because Tecogen has a market-leading fleet of installed CHPs in New York City, the Company is able to provide the highest level of customer service to both new and existing customers. After all, proper servicing ensures that buyers of our equipment can enjoy the levels of savings and reliability that they expect and demand.

**This impressive order again highlights the scalability of Tecogen's exclusive microgrid technology and the growing awareness of the Company's rock-solid reliability, substantial cost savings, and small environmental footprint of its products.**

### Tecogen Wins First Non-Cannabis Deal In Agriculture Space

After selling over a dozen chillers to the rapidly emerging cannabis industry (Also see Growth Drivers), Tecogen last month inked its first transaction with an indoor vegetable grower called Beverly Greenhouses. With over 20 acres of greenhouses onsite, it is one of the larger indoor cucumber operations in Ontario, Canada.

The Company has sold both an InVerde e+ and a Tecopower CM-75 combined heat and power (CHP) unit to the indoor farmer. The machines will operate independently of each other and will mainly be used to generate power. The high quality waste heat from the units will most certainly be used, but it's not the main driver for this purchase.

The installation will generate significant cost savings for Beverly Greenhouses, as it will

reduce the amount of electricity purchased from the utility. After all, utility costs are one of the biggest operating expenses for indoor farmers.

Because the province of Ontario has massive amounts of available farmland, but also harsh winters, it is very well suited for indoor farming. Thanks to greenhouses, the farms can operate year-round.



**With over 20 acres of greenhouses onsite, Beverly Greenhouses is one of the larger indoor cucumber operations in Ontario, Canada.**

Consequently, Ontario is one of North America's biggest greenhouse vegetable producing areas with an estimated annual farm gate value of \$782 million. Cucumbers, peppers, and especially tomatoes are grown in about 500 greenhouse operations.

A significant amount of greenhouse products from Ontario are exported to the United States, differentiating the sector from many other parts of agriculture that are primarily domestic in their market focus.

Although greenhouse agriculture is much more capital intensive than field agriculture, due to new construction costing up to \$1 million per acre, it has several advantages. Firstly, inside a greenhouse, crops can grow all year round, yielding up to seven times more than field production. At Beverly Greenhouses, harvest starts on January 1 and comes to an end at the end of November when planting begins again. This way, Beverly

Greenhouses ships anywhere from 3,000 to 12,000 cases of cucumbers each day nearly year-round.

Secondly, the production environment is tightly controlled, which means that biocontrol measures, such as insect pollination, can be utilized. This is also how Beverly Greenhouses keeps unwanted bugs away from its plants. They will use yellow sticky cards that hang from individual plants. When the number of insects that are stuck to each card reaches threshold levels, the introduction of beneficial insects is increased. Parasitic wasps, for example, are used to control whitefly, an insect pest that sucks sap from cucumber plants and negatively impacts plant vigor.

**This is a breakthrough for Tecogen, as it gives the Company a foot in the door of Ontario's vast agriculture industry. Farmers are typically well-connected with each other through partnerships and organizations. When one greenhouse operation successfully reduces costs, word gets around fast.**

## GROWTH DRIVERS

### Ultera Will Soon Show Its Value

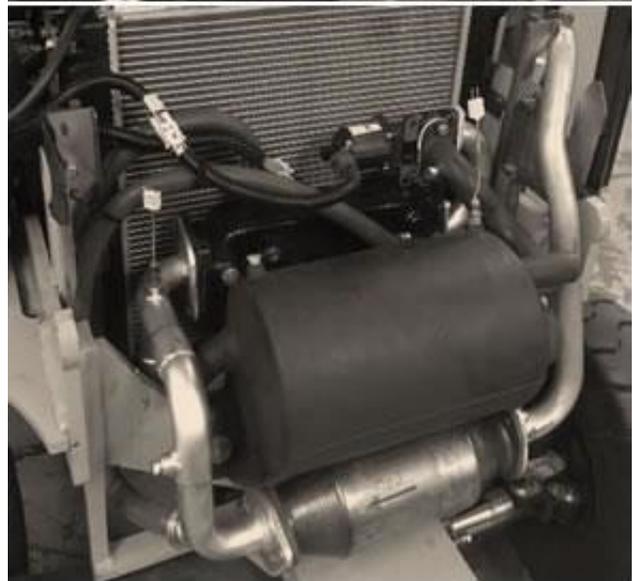
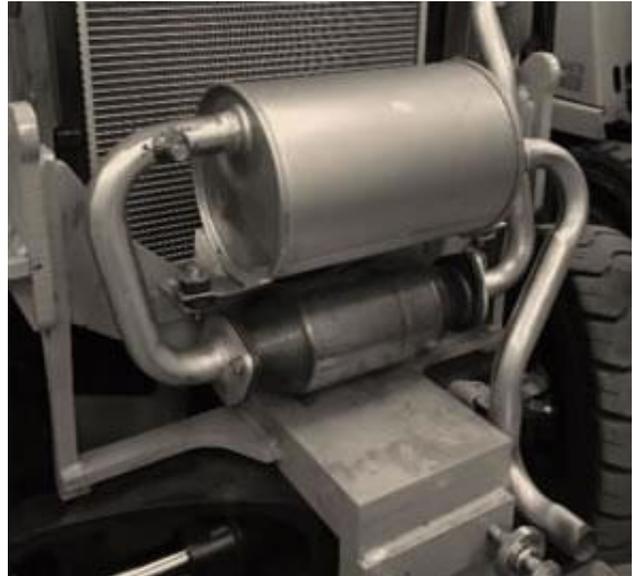
The efforts of Tecogen to commercialize its extraordinary emissions technology for use beyond the Company's core products, continues to progress.

A couple of weeks ago, Tecogen and **Ultratek's** co-investors decided to dissolve the joint venture before the end of the year. All unspent funds of Ultratek will be distributed to its investors. As part of this disbursement, Tecogen will receive \$1.6 million in cash, the IP that it licensed to Ultratek when it was founded, and all the non-cash assets of Ultratek, including two awarded patents, four patent applications, and all data and knowhow gained during the lifespan of the JV.

To further finance the development of the revolutionary Ultera emissions technology for automotive applications, Tecogen will most likely set up a new company soon after the

dissolution of Ultratek (Also read Dissolution Ultratek JV on page 5).

In the first quarter of 2017, Tecogen began a research program, funded by the Propane Education and Research Council (PERC), to demonstrate the effectiveness of the Ultera emissions systems on **propane fueled fork trucks.**



**On top, the fork truck's exhaust system as received from the factory. Below, that same fork truck after the Ultera upgrade.**

The program's main goal is to develop a retrofit emissions system for fork trucks to reduce their emissions to levels more acceptable for air quality in indoor work environments. Earlier in the year, baseline

testing of the unmodified fork truck was completed utilizing a donated fork truck from a major manufacturer that has expressed strong interest in Ultera and has agreed to assist with Tecogen's research effort. The test data effectively indicates that the fork truck is an excellent fit for the Ultera technology.

At this time, the Company has completed modification to the fork truck associated with the Ultera retrofit and is ready to begin testing of the system. Executives from the manufacturer and PERC are tentatively planning to visit Tecogen in December to view the prototype operation first hand.

Finally, after successfully developing the Ultera technology for Tecogen's own equipment, the Company's Research & Development team began exploring other possible emissions control applications in an effort to expand the market for the ultra-clean emissions system. **Retrofit kits were developed in 2014 for other stationary engines** and in 2015 the Ultera Retrofit Kit was applied successfully to natural gas stand-by generators from other manufacturers, including Generac and Caterpillar.

Historically, standby generators have not been subjected to the same strict air quality emissions standards of traditional power generation. However, generators which run for more than 200 hours per year or run for non-emergency purposes (other than routine scheduled maintenance) in some territories, such as California, are subject to compliance with the same stringent regulations applied to a typical electric utility.

In 2015, Tecogen purchased a sample generator and retrofitted it with an Ultera. The results were extremely favorable. Meanwhile, an initial customer in California applied for permits to retrofit his existing onsite units. These permits were received, and Tecogen engineers have now retrofitted all generators with the Ultera system and commissioned for their normal, intended use.

The customer will complete third party "source testing" of the units, the final step in the permit process, in the upcoming month, at which time Tecogen will have independent confirmation of its ground-breaking emissions

reduction capability applied to this very stringent application. This will be a very significant event for the Company and its emissions technology.

## American DG Energy Acquired by Tecogen

American DG Energy distributes, owns and operates natural gas powered cogeneration systems that produce electricity, hot water, heat and cooling. ADGE's business model is to own the equipment that it installs at customers' facilities and to sell the energy produced by these systems to the customer under long-term contracts at prices guaranteed to the customer to be below conventional utility rates.

Consequently, bringing American DG under the Tecogen umbrella allows Tecogen to offer a cost-free-installation option to customers without access to financing, sufficient capital on hand, or for those who may not be interested in owning and maintaining the equipment.

As of December 31, 2016, ADGE had 92 installed energy systems, representing an aggregate of approximately 5,445 kilowatts, or kW, 41.6 million British thermal units, or MMBtu's, of heat and hot water and 4,500 tons of cooling.

Approximately half of the revenue generated by the merged entity now comes from stable, long-term contracted sources (Tecogen Service revenue and American DG Energy revenue). This revenue base provides a reliable funding source for both operating expense and growth initiatives. Furthermore, it makes Tecogen's revenue profile more predictable, reducing the revenue volatility caused by somewhat cyclical equipment sales and installations.

Another major advantage of the acquisition is that there are plenty of cost saving opportunities. For instance, Tecogen is expected to benefit from approximately \$1 million of general and administrative cash savings annually as duplicative functions are eliminated. Also, the combined companies allow for more efficient deployment of service

technicians thanks to Tecogen's wide service network. In addition, the consolidated inventory improves purchasing economics and shipping costs.

**The transaction has created a vertically integrated clean technology company able to offer equipment design, manufacturing, installation, financing, and long term maintenance service.**

### Tecogen Significantly Expanding in Booming Cannabis Industry

A great deal of the marijuana that is produced in the U.S. and Canada is grown indoors. In these growing facilities an environment can be created that is ideal for the cannabis plants. Key factors that may be controlled include temperature, levels of light and shade, irrigation, fertilizer application, atmospheric humidity, etc.

Due to the high number of horticulture lamps, necessary to grow the plants, it can become very hot in growth houses. Without proper ventilation and air conditioning, many indoor growing facilities would experience temperatures of more than 100 degrees F (38 degrees C), which is not ideal for marijuana plants.

Consequently, growers must use air conditioning systems to maintain a constant temperature for their marijuana crop. Unfortunately, the constant use of powerful air conditioners again increases a grow house's demand for electricity.

A 5,000 square foot indoor cannabis facility, for example, will use on average 29,000 kilowatt hours (kWh) of electricity monthly, while a local household consumes about 630kWh. In general, it's fair to say that electricity represents roughly 30% of the total cost of a cannabis operation.

Additionally, many growing facilities were either constructed without large capacity electric infrastructure or are housed in converted warehouses that do not have the necessary wiring for a traditional large scale electric solution.

For exactly this reason, the TECOCHILL is exceptionally useful. It consumes virtually no electricity thanks to its natural gas powered engine. Another advantage of the TECOCHILL running on natural gas is that it helps customers avoid expensive and generally time consuming electric service upgrades when they are retrofitting an older building into a growing facility.

In most cases, dated buildings do not have the electrical infrastructure needed to support the immense electrical needs required by both the lighting as well as the HVAC (Heating, ventilation and air conditioning) system necessary to remove the heat generated by the lighting.



**TECOCHILL units reduce operating costs for indoor growing facilities by up to 50%.**

In addition, the chillers offer optional "waste" heat that is available whenever it is running. The free engine heat can be recovered and used to offset boiler gas that would have been needed to meet the dehumidification requirements.

Also, the units are equipped with Tecogen's patented Ultra system. Thanks to this cutting-edge emissions control technology, the carbon dioxide (CO<sub>2</sub>) from the cleaned exhaust stream can be used as fertilizer to improve growing conditions.

Finally, state-based incentives for natural gas-engine driven chillers are a boon for facilities across the Northeastern states. In Massachusetts, for example, an incentive of between \$0.25 and \$0.30 per kilowatt hour that is removed from the grid, is provided. Other states, such as Connecticut, New Jersey

and Pennsylvania also offer incentives for similar installations.

So it's no wonder that Tecogen continues to receive more orders for its equipment from places such as California, Colorado, Massachusetts, and Canada where the production and sale of cannabis has been legalized.

Only a few days ago, Tecogen announced that a cannabis grower in southeastern Massachusetts agreed to purchase three 200-ton Tecochill STx Series water-cooled chillers. Installation work at the 25,000 square-foot indoor grow facility will include provisions for a potential fourth Tecochill chiller to be added at a later date should the facility require an increase in cooling capacity. The order is Tecogen's eighth into North America's rapidly emerging indoor cannabis grow industry.

Indoor farming, specifically of cannabis, holds enormous potential for Tecogen, as utility costs are the single biggest operating cost for these facilities. In general, electricity represents roughly 30% of the total cost of a cannabis operation.

Another advantage for Tecogen is that given the expected growth of the industry, it is going to get competitive for growers very quickly. To date, some 240 applications to grow and sell marijuana have been submitted in Massachusetts alone. Once the price per pound starts to decline as more growers enter the market, only those who truly have a handle on their energy cost and usage will be successful.

**Consequently, it is fair to say that due to the exceptional cost savings that are generated with Tecogen chillers, the units are becoming a necessity in the competitive cannabis industry.**

## FINANCIALS

Product sales declined 14.9% for the quarter as compared to Q3 of 2016, which was a record quarter at the time. The drop is caused by a decline in InVerde e+ sales. However, this is mostly the result of timing of shipments, where a number of customers were not ready to accept delivery of the

equipment until after the quarter ended. In contrast, chiller sales increased 176.3% year over year. Increasing interest from both the indoor agriculture market and the growing recognition of the value proposition of "mechanical CHP" are the key drivers.

Services revenues grew 20.0% year-on-year, benefiting from increasing penetration in service contracts and favorable operating metrics for the installed fleet as well as an active period for installations work. Continued penetration of the Company's 'turnkey lite' offering, which includes custom value-added engineering design work as well as custom factory engineered accessories and load modules, has been a good source of services revenue growth and is expected to continue to develop as an important revenue stream.

Amounts in \$000's	09/30/17	09/30/16
Product Revenue	2,426	2,851
Service Revenue	4,519	3,766
Energy Revenue	1,556	-
<b>Total Revenue</b>	<b>8,501</b>	<b>6,616</b>
Cost of Product Sales	1,539	1,715
Cost of Services Sales	2,981	2,126
Cost of Energy Sales	723	-
Total Cost of Sales	5,243	3,842
<b>Gross Profit</b>	<b>3,258</b>	<b>2,775</b>
Operating Expenses	3,172	2,525
<b>Income (Loss) from Operations</b>	<b>86</b>	<b>249</b>
Total Other Expenses	(19)	(42)
<b>Net Income (Loss)</b>	<b>67</b>	<b>208</b>
Diluted EPS	0.00	0.01
Diluted Shares Outs.	24,931	20,229

**Selected income statement data for the quarters ending September 30, 2017 and September 30, 2016. Source: Company Filing**

Note that **Product Revenue** is derived from the sale of the various cogeneration and chiller units. Because the equipment is built to last 20 or more years, most of the product sales are to first time customers. The Company's **Service Revenue**, however, lends itself to recurring revenue from long-term maintenance contracts, which provide the Company with a somewhat predictable revenue stream.

Product gross margin was 36.6% for third quarter of 2017 compared to 39.8% in third

quarter of 2016 as revenue from chiller sales accounted for a larger portion of product sales compared to the year-earlier period.

Services gross margin declined to 34.0% in the period compared to the 43.5% in the prior year. Strong growth in lower margin turnkey installations accounted for the lion's share of the drop in margin.

Energy production gross margin (ADGE) was an exceptionally strong 53.5%. Energy production gross margin is expected to fluctuate materially though due to seasonality.

Product sales revenue for the nine months ended September 30, 2017 was \$8.35 million, an increase of 11% versus \$7.56 million in the comparable period in 2016. Services revenue grew by 24% during the first nine months of 2017 compared with the same period in 2016.

The Company's net loss declined from \$1.10 million in the first nine months of 2016 to \$406 thousand in this year's comparable period.

On a combined basis, operating expenses increased to \$3,172,492 for the third quarter 2017 from \$2,525,325 in the same quarter of 2016. An increase in selling expenses, which rose 37.0% to \$503,415, merger related expenses of \$37,445, and the consolidation of ADGE's core overhead, accounted for most of the increase. The increase in selling expenses was due to an uptick in marketing related activity and higher sales commissions.

Depreciation and amortization jumped to \$160,061 for the third quarter of 2017 from \$66,484 for the same period in the prior year. The increase is related to the depreciation of the equipment that American DG Energy owns to deliver energy to its customers and the amortization of the corresponding contracts.

### Balance Sheet as of September 30, 2017

Note that due to the American DG acquisition it is hard to compare the current balance sheet with the one a year ago.

For example, the favorable contract asset and unfavorable contract liability in the foregoing table represent the estimated fair value of American DG Energy's customer contracts (both positive for favorable contracts and negative for unfavorable contracts).

Pricing to the customer for electrical power produced and supplied by ADGE under the contracts is under a fixed formula which requires the customer to pay for the kilowatts of electrical power provided at a fixed percentage discount to the local utility's electric rate for that period. As a result, as utility rates for electrical power change, the amount ADGE is able to charge the customer under the contract also changes.

Amounts in \$000's	09/30/17	09/30/16
Cash and Cash Eq.	2,077	3,502
Accounts Receivable	11,094	7,957
Inventory	6,119	5,058
<b>Total Current Assets</b>	<b>23,593</b>	<b>19,501</b>
Property & equipment	15,503	548
Intangible Assets	2,430	1,042
Excess of Cost Over Fair Value of Net Assets Acquired	12,602	-
<b>Total Assets</b>	<b>56,632</b>	<b>23,191</b>
Accounts Payable	5,356	3,033
Accrued Expenses	1,676	1,190
<b>Total Current Liabilities</b>	<b>9,399</b>	<b>5,237</b>
Promissory Note	3,149	3,137
Unfavorable Contract Liability	10,358	-
<b>Total Liabilities</b>	<b>23,293</b>	<b>8,813</b>
Total Stockholder Equity	32,856	14,377
<b>Selected balance sheet data for September 30, 2017 and September 30, 2016. Source: Company Filing</b>		

There has been a sharp decrease in electric rates over the past several years, subsequent to the vast majority of customer contract dates, causing the billable value of the electrical power generated by ADGE's systems to decrease, resulting in a deterioration of expected profitability.

Tecogen's cash balance is currently approximately \$2.8 million. Once the Ultratek dissolution is completed however (see below),

Tecogen will receive an additional \$1.6 million in cash, putting the Company in a comfortable position from a balance sheet standpoint.

Current assets at quarter end were \$23.59 million, more than double current liabilities of \$9.40 million.

## OUTLOOK & VALUATION

Tecogen successfully returned to profitability in its third quarter. It's great to see that the contribution of ADGE revenues allowed the Company to maintain profitability despite a decline in product sales. Having this new steady flow of revenue makes it easier for Tecogen to remain profitable despite the ups and downs of product shipments. Additionally, the Company continues to improve ADGE's fleet operations and profitability.

The Company has a number of projects under way in the fourth quarter that should help to sustain its momentum going into 2018. For example, it will roll out an update of the Tecopower CHP unit, upgrade the chiller manufacturing capacity, and update some internal software systems to improve the operational efficiency.

In addition, Tecogen keeps a close eye on upcoming state approvals for new indoor growing facilities. Indoor agriculture continues to be a rapidly emerging new opportunity for growth, particularly for the Tecochill line of natural gas powered chillers. To-date, Tecogen has inked nine transactions in the space, all but one of which is to buyers who intend to grow cannabis.

An additional driver for growth is Tecogen's expanding base of relationships with leading Energy Service Companies (ESCOs). Tecogen was contracted to perform feasibility and design studies for over one megawatt worth of new projects with a leading ESCO.

These projects are on track and actual equipment orders are expected in early 2018. Tecogen is in negotiations with another leading ESCO for upwards of 900 kW of CHP projects. Lastly, the Company is working with a project financing group on several large

projects initially projected to be over two megawatts in total.

Co-CEO of Tecogen, Benjamin Locke mentioned during the conference call following the publication of the financials, "We have demonstrated tremendous financial growth over the past few quarters, culminating in our record revenues this quarter. We are planning on continued success going into 2018, including making renovations to our building to facilitate a larger production area needed for increased product manufacturing."

He continued, "We foresee predictable revenues and margins from the ADGE fleet. Next, we will continue to grow our revenues and margins through our core business of product sales and service. Our CHP systems are becoming increasingly acknowledged and specified as the best technical choice for CHP in our size range. Our chillers are becoming the standard design for indoor growing facilities, and our relationships with key partners continue to grow and expand. Consequently, we expect robust product orders in the coming quarters as we continue to make good progress with our direct sales efforts, interactions with ESCOs and continuing need for our chiller systems."

The decline of Tecogen's stock price following the release of the financials, creates a tremendous buying opportunity.

### Valuation

Given the emerging nature of Tecogen's earnings, and the uncertainty of American DG's exact contribution to earnings, a multiple-based valuation is challenging. Instead, we apply a Discounted Cash Flow (DCF) model.

Based on our estimate of 26.1 million diluted shares outstanding, the intrinsic value of Tecogen's shares derived from our model is \$8.41.

**We reiterate our buy recommendation for Tecogen Inc. with a price target of \$8.41, which is 246% above today's stock price.**

## SHARE DATA & OWNERSHIP

As of October 31, 2017, Tecogen had 24,724,392 common shares outstanding. Also, the Company has an aggregate of 485,736 shares of common stock issuable upon exercise of outstanding warrants and options. And finally, Tecogen has \$3,149,086 convertible debt, which is convertible into 889,830 shares of common stock.

The principal owners of the Company's common stock are John Hatsopoulos (13.3%), Monovoukas Yiannis (10.5%), Tryfon Natsis (6.5%), George Hatsopoulos (5.7%), and Clear Harbor Asset Management (2.7%).

## MANAGEMENT

### ▣ DR. JOHN N. HATSOPOULOS – CO-CHIEF EXECUTIVE OFFICER

Dr. Hatsopoulos has been the Chief Executive Officer of the Company since the organization of Tecogen in 2000. He has also been the Chief Executive Officer of American DG Energy Inc. since 2000, and the Chairman of EuroSite Power Inc. since 2009. Mr. Hatsopoulos is a co-founder of Thermo Electron Corporation, which is now Thermo Fisher Scientific (NYSE: TMO), and the retired President and Vice Chairman of the Board of Directors of that company. Mr. Hatsopoulos graduated from Athens College in Greece, and holds a bachelor's degree in history and mathematics from Northeastern University, as well as honorary doctorates in business administration from Boston College and Northeastern University.

### ▣ BEJAMIN LOCKE – CO-CHIEF EXECUTIVE OFFICER

Mr. Locke was named Co-Chief Executive Officer in October, 2014. He joined Tecogen in June, 2013 as the Director of Corporate Strategy and was promoted to General Manager prior to his appointment as Co-CEO. Previously Mr. Locke was the Director of Business Development and Government Affairs at Metabolix, responsible for developing and executing plans for

partnerships, joint ventures, acquisitions, and other strategic arrangements for commercializing profitable clean energy technologies. Mr. Locke has a B.S. in Physics from the University of Massachusetts, an M.S. in Electrical Engineering from Tufts University, and an MBA in Corporate Finance from Boston University.

### ▣ ROBERT PANORA – CHIEF OPERATIONS OFFICER

Mr. Panora has served as President of Tecogen since 2000. He had been General Manager of Tecogen's Product Group since 1990 and Manager of Product Development, Engineering Manager, and Operations Manager of the Company since 1984. Over his 27-year tenure with Tecogen, he has been responsible for sales and marketing, engineering, service, and manufacturing. Mr. Panora contributed to the development of Tecogen's first product, the CM-60 cogeneration module, and was Program Manager for the cogeneration and chiller projects that followed. Mr. Panora has B.S. and M.S. degrees in Chemical Engineering from Tufts University.

### ▣ BONNIE BROWN – CHIEF ACCOUNTING OFFICER

Ms. Brown served as ADGE's Chief Financial Officer, Treasurer and Secretary since September 2015. From September 2015 to January 2017, Ms. Brown served as Chief Financial Officer, Treasurer, and Secretary of EuroSite Power Inc. Ms. Brown was a Financial Advisor at Barker Financial Group, a strategic wealth management advisement company, from July 2014 to September 2015. From 2009 to December 2014, Ms. Brown served as the Chief Financial Officer of Ilios Inc. She joined Tecogen as its Controller in 2005 and became the Chief Financial Officer in 2007 and remained in that position until December 2014. Prior to 2005, Ms. Brown was a partner at Sullivan Bille PC, a regional accounting firm, for 15 years where she provided financial, accounting, audit, tax, and business consulting services for mid-sized companies.

## ANNUAL INCOME STATEMENT FY 2014 – 9M 2017

All numbers in thousands

PERIOD ENDING	FY 2014	FY 2015	FY 2016	9M 2017
<b>Total Revenue</b>	<b>19,343</b>	<b>21,443</b>	<b>24,490</b>	<b>22,939</b>
Cost of Revenue	12,944	13,809	15,190	13,779
<b>Gross Profit or (Loss)</b>	<b>6,399</b>	<b>7,633</b>	<b>9,301</b>	<b>9,159</b>
<b>Operating Expenses</b>				
General & Administrative	7,265	7,998	7,994	7,043
Selling	1,796	1,687	1,637	1,558
R&D	1,041	592	667	641
Total Operating Expenses	10,102	10,277	10,289	9,242
<b>Operating Income or (Loss)</b>	<b>(3,703)</b>	<b>(2,643)</b>	<b>(997)</b>	<b>(83)</b>
<b>Other Income or (Expense)</b>				
Interest & Other Income	10	14	12	21
Interest Expense	(177)	(172)	(176)	(115)
Income or (Loss) attributable to the non-controlling interest	125	74	65	(45)
<b>Net (Loss) attributable to Tecogen Inc.</b>	<b>(3,746)</b>	<b>(2,727)</b>	<b>(1,096)</b>	<b>(407)</b>

Annual Income Statement FY 2014 – 9M 2017. Source: Company Filings



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