

Tecogen Inc. (TGEN)

Company Report – September 14, 2019

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 3,000 units, some of which have been operating for more than 35 years.

Despite the strong margins and improving EBITDA in a historically weak quarter for the Company, the market was not receptive to Tecogen's Q2 results. Some investors must have been shaken by the decrease in revenue. Even though the decline can be easily explained by the drop in energy production revenues due to the ADG sale. Investors can feel confident that the declining revenue for Q2 2019 is not a trend. With the growing backlog and numerous recent deals signed, Tecogen is poised to show strong revenue growth.

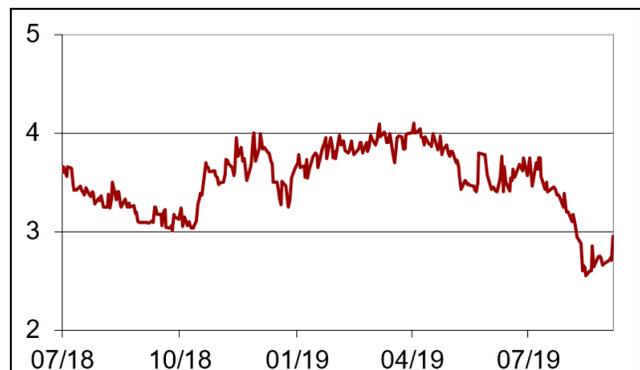
Tecogen remains an excellent investment for patient and risk-tolerant investors with at least a one year time horizon. Its thinly traded nature makes it a prime candidate for a major run towards our target price on continued positive news or demonstrated profitability and revenue growth.

We reiterate our buy recommendation for Tecogen Inc. with a target price of \$9.41, which is 253% above today's stock price.



- Tecogen's Ultra has achieved 100% compliance with regulatory emissions standards, even in the strictest regions. Combined with low cost and low maintenance requirements, the system operates such that no changes to the existing engine or controls are required.

The trend towards stricter emissions targets is motivating more consumers and businesses to invest in cleaner technologies. Tecogen is well positioned to capture additional sales momentum as a preferred and trusted supplier in this market. Thanks to the steady sales growth of Tecogen over the past few years, the Company has become one of the most attractive small cap stocks in the United States.



Market Data

Price	\$2.66
Sector	Technology
52-Week Price Range	\$2.46 - \$4.20
Shares Issued (m)	24.83
Market Cap (m)	\$66.08
Listings	TGEN (US) & 2T1 (Fra)
Website	www.tecogen.com

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 compressors or electric generators, which reduce the amount of electricity purchased from the utility. They then 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 of 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, commercial laundry facilities, ice rinks, swimming pools, factories, municipal buildings, and greenhouses.

Tecogen is a well-established and respected Company in the industry. It has shipped over 3,000 units so far, some of which have been operating for almost 25 years.

Tecogen announced second quarter revenues of \$7,867,396, a decline of 7% from \$8,453,165 for the same period in 2018. The decline was driven by the Company's decision to sell certain of its ADG energy producing assets at a profit back in March. Excluding the declining energy production revenues, Q2 revenues actually increased 5% from

\$6,944,940 to \$7,289,097 for the second quarter.

Despite the decreasing revenue, gross profit increased 8% from \$3,159,594 to \$3,425,915. The investment community never wants to see declining year-over-year revenues; however, the increase in service revenue and in gross margin is indicative of a turnaround.



A nursing home in Brooklyn, New York will soon enjoy all the benefits of Tecogen's 375 kW microgrid cogeneration system (Image for illustration purposes only).

The Company has been active in signing lucrative contracts this year. Most of these contracts haven't resulted in revenues just yet but will eventually bear fruit in the remaining two quarters of 2019 and the start of 2020. Backlog is \$28 million as of August 12 and doesn't include a large megawatt cogeneration opportunity spread among many buildings in a mostly new geography for Tecogen. A decision on this project is expected to be made in the third quarter, so investors should pay close attention for an upcoming news release.

This backlog figure includes the Company's first Tecofrost order. Tecogen expects to install an improved system at a local facility in Massachusetts before the end of 2019. It adeptly chose this site as a soft launch due to its proximity to the Company's factory in Waltham so its operations can be monitored closely. A similar soft launch is expected on the West Coast later this year. Assuming all goes to plan, the Company will be building a

strong pipeline of projects for Tecofrost across the United States in 2020.

Benjamin Locke, CEO of Tecogen commented, "While the second quarter has historically seen lower revenues, we made excellent progress in terms of improving our overall margins. Our backlog is as strong as ever, and we fully expect product sales and revenues to increase in the second half of the year with the goal of maintaining full year positive adjusted EBITDA. We are also very excited about a significant opportunity for an order for upwards of 3 megawatts of InVerde cogeneration equipment that, while not in our backlog, could be decided upon in the second half of the year with resulting equipment sales in the first half of 2020. Our growing product backlog, strong service margins, and increased interest in our Ultera emission technology is exciting for the Company, and I am very enthusiastic about our prospects for the remainder of the year and into 2020."

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.

Tecogen is supported by an established network of engineering, sales, and service personnel across the United States.

As of year-end 2018, Tecogen had 92 full-time employees and 5 part-time employees, including 8 sales and marketing personnel and 43 service personnel.

Revenue Sources

Tecogen manufactures, sells, installs, and maintains the following types of products:

- Combined Heat and Power (CHP) units that supply electricity and hot water;
- Chillers that provide air-conditioning and hot water;
- Tecofrost units that provide refrigeration with a natural gas driven engine;
- High-efficiency water heaters; and
- Ultera, a muffler-like kit that dramatically reduces a natural gas powered engine's

harmful emissions such as NOx, CO, and hydrocarbons.

Moreover, in 2017, Tecogen added another important revenue source, as the Company acquired American DG Energy, which 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 allowed the latter 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.

It is noteworthy that since the acquisition of ADG, approximately half of Tecogen's annual revenue is being derived from stable, long-term contracted sources. This revenue base provides 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.

The transaction has created a vertically integrated clean technology company with 84 installed energy systems that are able to offer equipment design, manufacturing, installation, financing, and long-term maintenance service (Also read Balance Sheet).

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 CO₂ 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.

Another innovative 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.

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.

Nationwide Factory Service

Besides selling machines, which in many cases are one-off deals, Tecogen generates substantial revenue 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 ten service centers spread all over the United States. 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.

In September 2018, the Company opened its 10th service center in Tampa, Florida, which will provide service for Tecogen's growing fleet of equipment and installations in the Southeast portion of the United States.

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.

Strengthening Patent Portfolio

Tecogen holds several patents that protect both its technology and specific methods of use. More importantly, the Company's patent portfolio continues to expand rapidly.

In June of 2018, for example, the Company obtained patent protection for its Ultera system in Japan. And in May of this year,

Tecogen was notified that the European Patent Office intends to grant a patent for the Company's Ultera emissions technology. This patent will give Tecogen exclusive control over the Ultera technology in Europe when it files for national protection in countries such as the United Kingdom, Ireland, France, and Germany.

Next to Europe, Tecogen has also filed for, or been granted, patents for this technology in Australia, Brazil, Canada, China, Costa Rica, Dominican Republic, India, Japan, Mexico, New Zealand, Republic of Korea, Singapore, and South Africa.

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.



The InVerde e+ is an improved CHP that leaves an even smaller ecological footprint. Each newly designed unit is tested by an industry-standard 15-minute emissions test measuring the levels of both NOx and CO versus time. The measurements are well below the CARB compliance limits, averaging less than 1ppm.

Note that this efficiency only refers to the produced electricity and does not take into account the harvested heat to produce thermal energy. With heat recovery a Tecogen CHP system can achieve an overall efficiency of 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 as solar panels, windmills, and backup batteries, eliminating the need for costly converters.

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.

Moreover, the InVerde e+ automatically starts 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.

This is also the first engine-driven product to carry full UL 1741 Certification for "utility-safe" interconnection. As a result, it does not require 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.

Tecofrost

Tecogen has recently relaunched its Tecofrost chiller. Unlike Tecochill, the Tecofrost product is meant for industrial ammonia refrigeration systems typically found in manufacturing facilities, such as dairy operations, meatpacking, bottling facilities, food processing and cold storage facilities.

The Tecochill product, which circulates chilled water or directly chilled air, is not an ideal fit for these applications, as ammonia is much more efficient. On the other hand, a Tecofrost unit can't be used in hotels, schools, or commercial buildings, as ammonia posed a safety hazard.



Refrigeration plants have extremely large electrical demand and usage loads. In many applications this load peaks in the daytime and summer, the same periods when electricity is the most expensive and natural gas supply is the most abundant. Owners can save significantly in their total energy costs by using Tecogen's Tecofrost.

Refrigeration plants have extremely large electrical demand and usage loads. In many applications this load peaks in the daytime and summer, the same periods when electricity is the most expensive and natural gas supply is the most abundant. By reducing the refrigeration plant's electric demand and usage during these periods, owners can save significantly in their total energy costs through the entire year.

The original Tecofrost product line was discontinued in the early 2000s due to high gas prices, but the resurgence in gas availability, combined with continued electric

grid escalation, particularly on the demand component of electric grids, makes Tecofrost an excellent product to reintroduce given the strong market pull. In fact, in many regions, the total cost of meeting refrigeration load by natural gas is substantially less than the cost of using electricity.

An important aspect to this product reboot is Tecogen's ability to work with its previous compressor manufacturing partner Vilter Manufacturing to jointly bring the products to market. The major advantage of again working together with Vilter Manufacturing is that all the product engineering, manufacturing data, testing, operation and maintenance are already in place. This minimizes cost and the timeframe to re-launch the product.

Maximum savings can be realized by utilizing the heat generated by the engine jacket and exhaust gas. Recovered heat can be used for space heating, domestic hot water, boiler feed water preheating, or process applications. Nearly one-half of the engine's fuel consumption can be recovered through this waste heat and is available up to 225°F.

Ultera

In 2008 there was a dramatic change in the air quality regulations for distributed electricity generation in Southern California. At that time no technology could enable engine-driven generators to meet the new, stricter, emission standards. In reaction to the new regulations, Tecogen developed the Ultera 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 some air between the first and second stages and altering the process conditions.

In 2012, a 75 kW CHP unit equipped with the Ultera 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.

The Ultera 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.

GROWTH DRIVERS

Ultera Applications With Tremendous Potential

Tecogen's current success is in part based on its exceptional emissions control technology called Ultera. This is a muffler-like kit that dramatically reduces a **natural gas powered engine's** harmful emissions such as NOx, CO, and hydrocarbons. Since 2012, the Ultera technology has been installed on hundreds of cogeneration systems and functions impeccably.

Following that achievement, Tecogen has been developing a number of applications for its Ultera technology with tremendous blue-sky potential.

In December 2015, following the outbreak of the Volkswagen emissions scandal, Tecogen initiated a program to adapt the Ultera 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.

Two phases of testing conducted since at the world-renowned AVL California Technical, showed that Ultera was highly successful in

reducing emissions of carbon monoxide (CO) and non-methane hydrocarbons (NMOG).

Subsequently, Tecogen entered into an agreement with a leading not-for-profit research and development organization with globally recognized expertise in vehicle powertrain development, including emissions after-treatment processes. The goal of this first phase is to optimize the chemistry and design of the second stage of the Ultra two-stage catalyst system.

The organization is performing the first phase of a three-phase program that will ultimately lead to Tecogen's goal of creating a working prototype of the Ultra system that is fully integrated into a vehicle.

This will enable potential partners in the automobile industry to have confidence in their evaluation, especially regarding cost, space and reliability. Tecogen is funding this initial phase. For the following phases, which will focus on component development, followed by completion and testing of the refined prototype, Tecogen may seek external financiers.

Additionally, 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 Ultra emissions systems on **propane fueled fork trucks**.

The project has significant potential for the industry, as these vehicles generally operate indoors, where health concerns are magnified. In recent years, the market share for propane fork trucks has been eroded, while battery-operated versions have taken over, mainly because of this issue.

Given these regulatory market drivers, the Company secured a commitment from Mitsubishi Caterpillar, a major fork truck company, to support the Tecogen engineering team and to supply a fork truck for testing. The initial results from these tests were superb.

During a heavy lift test, the truck was subjected to 20 repeated lifts in a 12-minute period. This was a strenuous duty cycle as the

weight, 4,300 pounds, was close to the 5,000 pound rating of the truck. Both Tecogen and a third party lab conducted this test with comparable results.



The test results of the Mitsubishi Caterpillar forklift truck are consistent with the program goal of near-zero certification.

As shown in the table, the Ultra reduced Carbon monoxide (CO) emissions with 99% and 91% respectively. Total hydrocarbons (THC) emissions were reduced by over 52% according to the third-party, while Tecogen instrumentation wasn't able to measure this pollutant. The Ultra also improved nitrogen oxides (NOx) emissions by 24% and 29% as measured by Tecogen instruments and that of the third party, respectively. This proves again that the Ultra technology is flexible and adaptable.

	Tecogen	Third Party
CO	98.8%	91.0%
THC	N/A	52.1%
NOx	24.3%	29.2%
Emission reductions achieved during heavy lift tests were confirmed by an independent third party.		

Further tests have shown that the reduced NOx and CO emissions qualify the system for near-zero certification. The next step would in fact be to conduct official tests on a dynamometer in a properly equipped laboratory to successfully achieve the near zero certification.

This may then result in a small fleet of fork trucks being upgraded with an Ultra to further demonstrate its benefits over a longer period of time as the fork trucks go through their daily activities. From that point on, the

program really has a clear path to commercialization.

Finally, in 2018, the South Coast Air Quality Management District (SCAQMD) reset its Best Available Control Technology (BACT) Guideline for **stationary non-emergency electrical generators** powered by a spark-ignition internal combustion engine to be consistent with its Rule 1110.2 emissions standard.

SCAQMD covers the Los Angeles Basin, extends eastward to within a few miles of the Arizona border, and represents almost half of the state's population. To date, Ultera is the only known technology that enables rich-burn engines to comply with the rule.

Tecogen's application has the potential to serve an emerging need in the region where there are dispersed loads in terrain that is vulnerable to woodland and brush fires. The hazard is most acute when high winds sever overhead power lines. The generators are then used to mitigate this problem by allowing overhead power lines in vulnerable areas to be de-energized during periods of high winds, with the dispersed loads powered by the generators located close to the load centers. Expected annual operating hours for generators used in this way exceed the 200-hour limit for which strict emissions standards are waived.

This application is significant given that Ultera equipped generators could cost effectively serve this need for utilities operating in areas of significant fire risk. The Ultera process works particularly well in this application as it is relatively inexpensive and requires no onsite chemical storage as is the case for some emission control systems used in distributed generation applications.

Cannabis Becomes Key Industry for Tecogen

In recent quarters, Tecogen has emerged as a premier supplier to the cannabis market due to the comprehensive natural gas powered chiller systems the Company has developed which provide cooling while also achieving superb energy efficiency, reduced pollution

output, high reliability, and certified performance. (Also read 'Recent Events' for Tecogen's most recent contract wins in the cannabis sector)

The Tecochill product not only delivers substantial energy savings over electric cooling systems, but also accomplishes significant greenhouse gas (GHG) savings compared to traditional forms of heating and cooling similar facilities which typically use grid-powered electric chillers and boilers. At one facility, where two Tecochill DTx 400-ton units were installed, the chillers are expected to reduce GHG emissions by upwards of 1,000 tons of CO₂/year.

This excellent performance is contributing to rapid growth for the Company, and a new sales record was achieved in 2018 for Tecochill products with more than half of that growth driven by demand from the indoor cannabis cultivation subsector. The successful trend continues into 2019, as the Company has announced several more sales in the indoor growing area.

The energy savings and infrastructure simplification of using the Tecochill product is becoming standard practice when engineering cannabis or other high value indoor growing crops. Tecogen's nationwide service presence and cloud-based remote monitoring capabilities ensure rapid response to critical process cooling customers such as indoor agriculture facilities.

RECENT EVENTS

Major Agreement for Tecogen at New Ice Skating Complex

Just last week, Tecogen Inc announced the sale of no less than five 200-ton Tecochill units to a brand new, state-of-the-art large ice skating complex in the eastern US. The Tecochill units will handle both ice making and building air conditioning, with heat utilized for dehumidification, space-heating, ice melt/resurface, and subsoil heating.

The cooling and "waste heat" process of the Tecochill is a natural fit for an ice rink and as a result it is projected to reduce the facility's

electrical load by almost three quarters of a megawatt. This isn't the first project of its kind undertaken by Tecogen. For example, in 2017, we highlighted the sale of a Tecochill system to a skating rink in Massachusetts.



Every year skating rinks become more popular, and increasingly they are being set up as a crowd-puller for all kinds of events. An ideal situation for Tecogen.

Stephen Lafaille, Director of Business Development at Tecogen, described exactly why the Tecochill is such a valuable system for ice rink operators, "The energy savings of gas cooling over electric chillers is the primary economic driver for most rink operators, but ice rinks also typically require heating systems for ice maintenance and climate control. The Tecochill system provides free heat to be utilized for these requirements, resulting in increased savings for rink owners."

Tecogen is showing yet again that its products can touch a diverse range of industries within the building management space. Skating rinks are added to a long list of facilities including apartments, nursing homes, cannabis cultivation facilities and data centers that have become Tecogen clients just within the past several months in 2019.

Not only can the Company sell to building owners in a variety of industries, it does so with a defined product that doesn't need to drastically change in order to meet the needs of the many industries it serves. The Tecochill is a naturally versatile and self-sustaining system that provides efficient cooling and heating solutions that are often eligible for green energy rebates or tax credits and utility incentives for reducing pressures on the grid.

Benjamin Locke, Tecogen CEO, stated, "Our CHP systems are sold almost entirely on the economic benefits of onsite energy generation. However, the GHG benefits of Tecochill also allow owners to benefit from substantial utility incentives and federal tax credits. As electric rates continue to rise, the savings and GHG benefits of our Tecochill and Tecofrost products become increasingly compelling."

Why Tecogen Chillers Are Becoming Indispensable in the Cannabis Industry

Late July, Tecogen announced the sale of five Tecochill systems to three separate cannabis cultivation facilities. The first facility will install two 200-ton Tecochill systems, while the second one is installing two 300-ton Tecochill systems. These are both located in Massachusetts. The third cannabis cultivation company has purchased a 150-ton chiller for installation in a Nevada facility.

And just this week, Tecogen announced the sale of two 400-ton Tecochill units to a cannabis cultivation facility located in south-eastern US. The order supplements the existing 800 tons of Tecochill equipment at the facility to bring the full building engine-driven chilling capacity to 1600 tons, reducing the electric load requirement by approximately 1.2 Megawatts compared to electric chillers.

The efficiency of the systems will be demonstrated at the sites as each will utilize the chilled water for cooling the facility, while the waste heat from the chillers will be used for dehumidification. The deals will favorably impact Tecogen's revenues for Q4 2019 and in 2020 as the units will be installed and operational by the end of this year and include factory service contracts.

Cannabis cultivators need to be mindful of cost reduction and efficient operations starting the first day of building of their facilities. Marijuana will eventually hit commodity pricing as more companies acquire operating licenses and build facilities. The most profitable operations will be the ones with the lowest costs and best yields.

Moreover, the use of non-electric Tecochill chilling systems allows growth facilities to significantly downsize the backup generation needed to maintain critical growth conditions during disruptions in the electric grid.



Intense lightning and space conditioning needed in indoor cannabis growing facilities place a heavy burden on most electric supply services.

These farmers have an added challenge not seen by other producers of agricultural products given the strict state-by-state and Federal regulations of marijuana across the United States. Growth and sales need to occur within the state, so growers can't just build a facility where they can access the cheapest power rates.

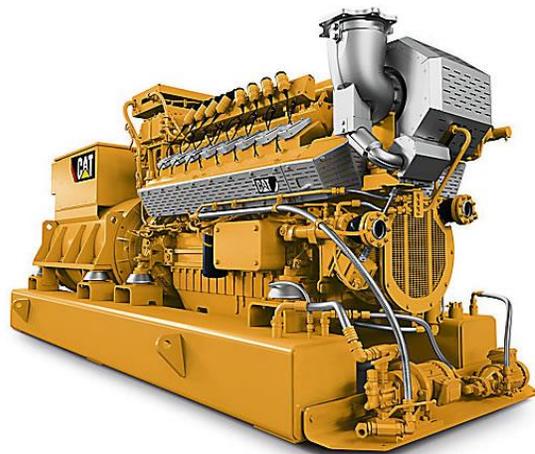
Tecochill is doing particularly well in Massachusetts, where year-round climate presents specific challenges for growers in a very small state with limited space for building facilities. With these two recent orders, the total number of Massachusetts marijuana cultivation facilities using at least one Tecochill system is up to 16. Adding the Nevada and the most recent sale, Tecogen has already sold over 30 chillers into the indoor cultivation market in North America, with new orders expected as additional states legalize medicinal and/or recreational marijuana products.

CEO Benjamin Locke agrees with our assessment of the opportunity, stating, "We are pleased that the indoor cultivation industry is recognizing the tremendous energy savings of natural gas cooling with Tecochill. As other states anticipate recreational marijuana sales, we are working with owners, operators and consulting engineers to keep energy and capital costs down in order to succeed in an increasingly competitive and expanding market."

Stephen Lafaille, Director of Business Development at Tecogen, also added, "Operating costs become crucial for the long-term viability of cultivation facilities such as these. The Tecochill solution is an important factor in reducing energy costs associated with maintaining precise temperature and humidity for optimal growth. Our chillers provide a unique set of benefits including the efficiency of combined heat and power wrapped into an industrial-grade chiller solution which is already a necessity, so the chillers satisfy multiple needs while significantly reducing operating costs."

A Winning Combination: Tecogen's Ultra Technology and Caterpillar Engines

In June, Tecogen announced a new contract awarded by a Southern California water district. The contract is for the design and manufacture of two Ultra emission after-treatment units. The Ultras will be installed on two new 800-horsepower Caterpillar natural gas engines. This effort will involve an inventive scale-up of nearly twice the size of the largest kits produced by Tecogen to date.



Two 800-horsepower Caterpillar engines will be equipped with an innovative Ultra after-treatment system.

The water utility bears all development costs, and the units are expected to be installed and operating in the early part of 2020. When the systems are operational, the district is planning to contract with the local Caterpillar dealer to maintain the systems.

While this certainly isn't the biggest contract in Tecogen's history, the important consideration from this arrangement is that a growing number of manufacturers support the install of the Ultera technology on their engines. In this case, Caterpillar upholds the factory warranty on the engines after the Ultera kits have been installed. This is based on the manufacturer's trust and confidence in the performance of the Ultera units.

"We are excited to expand our Ultera system product line to accommodate extra-large engines. This should broaden our markets to include higher capacity gensets, CHP, and other engine-powered platforms," said Benjamin Locke, CEO.

The same Southern California water district has already had very positive experiences with Ultera retrofits in the past. The water district first utilized the Ultera emissions technology on one of its municipal water pumping engines fueled by natural gas.

In 2014, Tecogen was selected by the water district to install its Ultera technology on a 48 liter engine, which would be fueled by biogas.

A byproduct of wastewater treatment plants, biogas is collected as a combustible energy source and then serves as a renewable fuel source for the engine. In this elegant set up, combined with the Ultera system, the functioning of the plant was powered more efficiently and with lower overall emissions than conventional fuel options. It represented the first time that an Ultera system had been used for a biofuel application. The outcome was a big success!

FINANCIALS

Product revenues in the second quarter of 2019 were \$2,445,448 compared to \$2,483,657 for the same period in 2018, a decrease of 2%. While cogeneration sales increased by 10%, chiller sales declined 14% year-over-year. Service revenues in the second quarter of 2019 were \$4,843,649 compared to \$4,461,283 for the same period in 2018, an increase of 9%. This increase was due to certain engineering service projects. Energy production revenues in the second

quarter of 2019 were \$578,299 compared to \$1,508,225 for the same period in 2018, a decrease of 62%. This decline is attributable to the sale of a portion of the Company's ADG energy producing assets as mentioned above.

Consolidated gross profit for the second quarter of 2019 was \$3,425,915 compared to \$3,159,594 in the second quarter of 2018, an increase of 8%. Overall gross margin for the second quarter of 2019 was 44% compared to 37% for the same period in 2018, an increase of seven points and above management's targeted 35-40% gross margin range. Product gross margin decreased to 37% for the second quarter of 2019 compared to 40% for the same period in 2018. Overall service gross margin skyrocketed to 48% in the second quarter of 2019, fourteen points higher than the 34% for the same period in 2018 due to an increase in margins recognized on installation projects during the quarter. Energy production gross margin declined from 44% to 37%.

Amounts in \$000's	06/30/19	06/30/18
Product Revenue	2,445	2,484
Service Revenue	4,844	4,461
Energy Revenue	578	1,508
Total Revenue	7,867	8,453
Cost of Product Sales	1,547	1,492
Cost of Services Sales	2,530	2,962
Cost of Energy Sales	365	840
Total Cost of Sales	4,441	5,294
Gross Profit	3,426	3,160
Operating Expenses	3,760	3,796
Income (Loss) from Operations	(335)	(636)
Total Other Income or (Expenses)	3	(64)
Net Income (Loss)	(357)	(754)
Diluted EPS	(0.01)	(0.03)
Diluted Shares Outs.	24,826	24,818
Selected income statement data for the quarters ending June 30, 2019 and June 30, 2018. Source: Company Filing		

Tecogen's net loss for the second quarter of 2019 was \$357,129, compared to \$754,350 for Q2 2018, an improvement of \$397,221. The Company's operating expenses decreased 1% from \$3,795,880 to \$3,760,497. Tecogen has managed to keep opex flat while simultaneously prioritizing the market rollout of the Tecofrost system and continuing the

development of the Company's Ultera Emissions Technology. Adjusted EBITDA, which excludes non-recurring merger related costs, goodwill impairment, mark to market adjustments and stock compensation expense, improved \$124,511 from -\$329,541 to -\$205,030 for Q2.

Balance Sheet as of June 30, 2019

Tecogen ended Q2 2019 with \$26,177,250 in current assets against current liabilities of \$10,649,607 for a very strong 2.5x current ratio. The Company currently has no debt as it was paid off from the proceeds of the sale of a portion of the ADG assets in Q1 (see below table). The Company has no need to finance, unless it is to fund a substantial growth opportunity.

Cash used in operating activities for the six months ended June 30, 2019 was \$2,080,213 compared to \$2,541,234 for the same period in 2018. The accounts receivable balance remained somewhat equal at \$11,628,702 on June 30, 2019 compared to \$11,440,542 on June 30, 2018. In addition, inventory increased to \$6,990,697 at June 30, 2019 compared to \$5,533,590 at June 30, 2018 as plenty of machines are being manufactured.

Amounts in \$000's	06/30/19	06/30/18
Cash and Cash Eq.	1,088	1,015
Accounts Receivable	11,629	11,441
Inventory	6,991	5,534
Total Current Assets	26,177	23,386
Property & Equipment	3,764	11,361
Intangible Assets	1,555	2,951
Goodwill	5,282	13,366
Total Assets	39,756	51,472
Accounts Payable	6,235	4,962
Accrued Expenses	2,062	1,946
Total Current Liabilities	10,650	11,270
Unfavorable Contract Liability	2,754	6,783
Total Liabilities	15,402	18,372
Total Stockholder Equity	24,354	32,647
Selected balance sheet data for June 30, 2019 and June 30, 2018. Source: Company Filing		

In March 2019, Tecogen announced that it strengthened its balance sheet with

approximately \$7 million thanks to the sale of eight projects that it obtained when it acquired American DG Energy Inc (ADGE) in May 2017.

The assets were sold to a company managed by the New York office of Sustainable Development Capital, an investment firm with a proven track record of investment in energy efficiency and decentralized generation projects.

At the time when ADGE was acquired, it had 92 installed energy systems, including various models of Tecogen cogeneration units, Tecochill water chillers, and conventional air-conditioning systems. The acquisition was a stock-for-stock transaction, which valued American DG Energy at approximately \$18.8 million.

Tecogen continues to maintain the equipment and perform invoicing for the energy supplied by the equipment for the duration of the power purchase agreements. These agreements include performance incentives split evenly by both parties for energy savings collections exceeding the minimum collection guarantees in the agreements.

The Company used the cash generated by the sale to eliminate debt, support growth in strategic product areas, and strengthen the balance sheet.

OUTLOOK & VALUATION

The exponential demand growth for cannabis, and the unique regulatory framework that requires cultivation of the plants within each state where the sales are completed, has led to a rapid increase in the construction of new indoor cultivation centers for cannabis plants. The specific requirements necessary for optimal plant yields and the high energy costs associated with many of the states where these facilities are located, has encouraged cannabis growers to purchase integrated systems developed by Tecogen as the ideal solution for their needs.

Moreover, the increasing population density and continued urbanization of the northeastern United States is a gold mine for Tecogen. Building owners will have

tremendous incentive to reduce operating costs through a cleaner power footprint by any means necessary. Governments and utilities will want to reduce the strain on the power grid. The demographic factors that make the Company's Tecochill and microgrid systems must-have products will only get more favorable. An aging population needs reliable and secure power to their nursing home or medical facility. Data centers will need to be built and kept cool. Cannabis cultivators will continue to grow a newly legal product. And families will want to have well-run sports facilities within their vicinity.

Tecogen management has laid the groundwork for a very successful 2020. Backlog is at record highs and every few weeks the Company announces a new contract that is set to deploy in late 2019 or 2020. These contracts often come with multi-year maintenance agreements.

Tecogen has done everything it can to prove that it is a worthy investment but in these volatile times, many small cap stocks of its size are struggling. There are two silver linings for investors though. First, this drop that has occurred since the start of summer has been on very low volume. Few people are running to the exits because they don't like the investment opportunity in TGEN. We believe it is more likely a result of certain small investors looking for liquidity wherever they can find it. Second, the drop represents a tremendous buying opportunity for anyone with the patience to hold on to the stock long enough to see how it performs over the next six quarters between now and the end of 2020. We remain confident that TGEN will recover in price and have maintained our target price despite the drop based on improving fundamentals made possible by all of the deals being signed recently. This presents a higher upside for anyone willing and able to buy and hold TGEN at these low prices.

Valuation

Given the still emerging nature of Tecogen's earnings, a multiple-based valuation is challenging. Instead, we apply a Discounted Cash Flow (DCF) model.

Based on our estimate of 26.2 million diluted shares outstanding, the intrinsic value of Tecogen's shares derived from our model is \$9.41.

We reiterate our buy recommendation for Tecogen Inc. with a target price of \$9.41, which is 253% above today's stock price.

SHARE DATA & OWNERSHIP

As of July 31, 2019, Tecogen had 24,843,261 common shares outstanding. In addition, the Company had 1,364,329 stock options outstanding with a weighted average exercise price of \$3.56. Each stock option entitles its holder to purchase one common share of the Company.

The principal owners of the Company's common stock are George Hatsopoulos (10.9%), John Hatsopoulos (9.3%), Joseph Comeau (9.1%), Ann Marie Pacheco (6.6%), and Tryfon Natsis (6.5%).

MANAGEMENT

▣ BENJAMIN LOCKE – CHIEF EXECUTIVE OFFICER

Mr. Locke was named Co-Chief Executive Officer in October, 2014 and sole Chief Executive Officer in March, 2018. 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.

▣ **DR. JOHN N. HATSOPOULOS - CHAIRMAN EMERITUS, DIRECTOR**

Dr. Hatsopoulos was the Chief Executive Officer of the Company since the organization of Tecogen in 2000. Later, he became the co-CEO of the Company next to Benjamin Locke. On March 29, 2018, Mr. John Hatsopoulos resigned as Co-Chief Executive Officer of the Company, making Mr. Locke the sole Chief Executive Officer. Mr. Hatsopoulos will continue to serve as a Director of the Company through the end of his current term. 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.

ANNUAL INCOME STATEMENT FY 2016 – 6M 2019

All numbers in thousands

PERIOD ENDING	FY 2016	FY 2017	FY 2018	6M 2019
Total Revenue	24,490	33,203	38,884	16,044
Cost of Revenue	15,190	20,248	22,292	9,659
Gross Profit or (Loss)	9,301	12,954	13,592	6,385
Operating Expenses				
General & Administrative	7,994	9,520	10,791	5,339
Selling	1,637	2,272	2,651	1,398
R&D	667	937	1,298	718
Goodwill Impairment	-	-	4,391	3,693
Total Operating Expenses	10,289	12,729	19,130	10,066
Operating Income or (Loss)	(997)	225	(5,538)	(3,682)
Other Income or (Expense)				
Interest Income/Expense	(176)	(155)	(120)	(44)
Unrealized Gain (Loss) on Investment Securities	-	-	(118)	(20)
Benefit (Provision) for State Income Taxes	-	-	(33)	(8)
Income or (Loss) attributable to the non-controlling interest	65	50	(93)	116
Net Income (Loss) attributable to Tecogen	(1,096)	47	(5,709)	(3,637)

Annual Income Statement FY 2016 – 6M 2019. Source: Company Filings



NASDAQ: TGEN
Frankfurt: 2T1

Company Headquarters

45 First Avenue
Waltham, MA 02451
United States

Company Contact Information

Benjamin Locke, Chief Executive Officer
Phone : +1 781-466-6402
Email : Benjamin.Locke@tecogen.com

John N. Hatsopoulos, Chairman Emeritus
Phone: + 1 781-622-1120
Email : John.Hatsopoulos@tecogen.com

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Contact: editor@smallcaps.us

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