

# MagneGas

Securing future through sales of cutting gas

Initiation of coverage

Alternative energy

MagneGas has recently been transformed through three acquisitions. This has created a platform for selling its alternative metal cutting fuel in California and Texas, which are the two largest consumers of metal cutting fuel in the US. Cash generated from gas sales will be used to commercialise its proprietary technology for plasma sterilisation and gasification of waste.

Year end	Revenue (US\$m)	EBITDA (US\$m)	PBT* (US\$m)	EPS (US\$)	DPS (US\$)	P/E (x)
12/16	3.6	(9.6)	(10.3)	(31.0**)	0.0	N/A
12/17	3.7	(10.3)	(11.0)	(15.3)	0.0	N/A
12/18e	11.6	(8.1)	(9.5)	(0.71)	0.0	N/A
12/19e	16.8	(5.4)	(7.3)	(0.46)	0.0	N/A

Note: \*PBT and EPS are normalised, excluding amortisation of acquired intangibles, exceptional items and share-based payments. \*\*Adjusted for reverse share split.

## Creating a sales platform in the US and Europe

During Q118, MagneGas announced the acquisition of three distributors of metal cutting gases: Trico in Northern California; Complete Welding in Southern California; and Green Arc in Texas and Louisiana, bringing total annualised revenues to \$14m. These acquisitions complement its existing direct sales network in Florida, giving access to the two states with the highest consumption of metal cutting gases in the US. Management intends to double annualised revenues over the next three to five years by strengthening the existing sales team and making further small acquisitions in California and Texas. Management is also developing a direct route into Europe, which is the second largest market for industrial gases globally, focusing on supplying super-ports with hundreds of potential customers.

## Q118 results demonstrate transformation

Sales increased by 34% y-o-y during Q118 to US\$1.2m. \$2.9m operating losses and recent acquisitions (total cash cost US\$3.8m) were funded by drawing down \$7.6m convertible preferred stock, representing 9.7m new shares, and a further 1.0m new shares issued as part consideration. Our estimates model a funding gap of \$23.0m, satisfied through debt. MagneGas is an early stage company and we would draw investors' attention to our sensitivities section where we discuss issues around financial controls, the extent of the family's control and the MagneGas technology. Management has provided appropriate responses to provide comfort on these issues, in our view.

## Valuation: Trading at a discount to mean

We note that MagneGas is trading at a substantial discount to the mean of our sample of suppliers of industrial gases for both 2018 (0.9x vs 3.5x) and 2019 (0.6x vs 3.3x). While some discount for MagneGas's small market capitalisation is justified, its potential for strong sales growth should partly counteract this. We see scope for significant share price appreciation as the full benefit of the Trico acquisition becomes clear and once management has resolved the financing gap. Like our estimates, this analysis excludes any equipment sales, fees from sterilisation of organic waste streams, or expansion in Europe.

19 June 2018

**Price** **US\$0.42**  
**Market cap** **US\$7m**

Net cash (US\$m) at end March 2018 (before payment of \$1.0m consideration for acquisition) 1.2

Shares in issue 15.7m

Free float 80.5%

Code MNGA

Primary exchange NASDAQ

Secondary exchange N/A

### Share price performance



% 1m 3m 12m

Abs (30.8) (57.6) (97.9)

Rel (local) (32.3) (57.9) (98.1)

52-week high/low US\$20.4 US\$0.39

### Business description

MagneGas is a technology company that has developed a plasma-based system for the sterilisation and gasification of waste. This process generates a hydrogen-based fuel called MagneGas2 as a by-product which is sold as an alternative metal cutting fuel to acetylene.

### Next events

Q217 results August 2018

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**MagneGas is a research client of Edison Investment Research Limited**

## Investment summary

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### **Company description: Plasma arc sterilisation/gasification**

MagneGas is a technology company that has developed a plasma-based system, the plasma arc flow refinery, for the sterilisation and gasification of waste. This process generates a hydrogen-based fuel, MagneGas2, as a by-product which is sold as an alternative metal cutting fuel to acetylene. Management has built up a direct sales network for cutting gases in California, Florida, Louisiana and Texas through a sequence of acquisitions. This is complemented by a network of US distributors. The plasma arc flow system is currently being trialled for the sterilisation of sewage, manure and landfill leachates (waste water draining from landfill sites) in the US and Europe.

### **Financials: Switching focus to gas sales for immediate growth**

Total revenue grew by 34% year-on-year during Q118 to \$1.2m with like-for-like sales rising by 4%. Pre-exceptional operating costs were similar to prior year levels, as costs related to developing the gasification technology were replaced by the costs associated with the additional sales capacity represented by the first two acquisitions. Operating loss, including \$0.6m non-recurring costs, widened by \$0.4m to \$2.9m. The balance sheet moved from \$0.6m net debt at the end of FY17 to \$1.2m net cash at the end Q118, though we note that most of this is allocated to the Trico acquisition. Another indication of the improved balance sheet situation is that at the end of December 2017, current liabilities exceeded current assets by \$1.3m, but at the end of Q118, current assets exceeded current liabilities by \$1.8m.

### **Valuation: Trading at a discount to peers**

Since our estimates are based solely on revenues derived from the sale of industrial gases and associated equipment, we have selected a sample of listed companies supplying industrial gases for our valuation. We note that MagneGas is trading at a small premium to the mean with regards to historical multiples (2.9x vs 2.4x) and a substantial discount to the mean for both 2018 (0.9x vs 3.5x) and 2019 (0.6x vs 3.3x). While some discount for MagneGas's small market capitalisation is justified, its exceptionally strong projected sales growth should counteract this, at least in part. We see potential for significant share price appreciation as the full benefit of the Trico acquisition becomes clear and once management has resolved the financing gap.

### **Sensitivities: Technical and financing risk**

The plasma arc flow system is still being trialled and has not yet been installed on a large-scale industrial basis. While trials have shown that the sterilisation process is an EPA- (Environmental Protection Agency) compliant treatment for pig manure, the equipment has not yet obtained US Department of Agriculture (USDA) subsidised equipment eligibility status. The metal working industry is conservative and therefore cautious about switching to a new cutting gas. As the company is not yet cash-generative it is dependent on securing external finance. During Q118 this was provided from the issue of convertible preferred stock, which was highly dilutive. Further financing is required. Our estimates model a \$23.0m funding gap.

## Company description: Unique green cutting fuel

MagneGas has developed a patented technology for plasma arc gasification of hydrocarbon waste. The technology is used to convert butanol produced from corn into its second generation innovative cutting fuel called MagneGas2. MagneGas2 is sold into the metal working market as a safer, more efficient and cost-effective replacement for acetylene. The company also sells a variant of the gasification technology for sterilising bio-contaminated liquid waste such as pig manure or water draining from landfill so that it can be sold for use as a fertiliser or irrigation purposes rather than incurring a cost on disposal. The gasification units may also be used to convert many types of hydrocarbon-based waste into syngas or biodiesel, both of which can be used as substitute fuels.

MagneGas was founded in 2007. It is headquartered in Tampa, Florida and currently employs almost 80 people. In order to accelerate adoption of MagneGas2 and achieve economies of scale, management has recently acquired several small distributors of metal cutting gases and ancillary equipment in the Greater California and Greater Texas regions, while maintaining a network of distributors elsewhere in the US. Management's intention is to scale up sales of cutting gases and complementary products in the US and Europe so that the resultant profits can be used to help finance R&D on the gasification technology.

Press releases from MagneGas note that customers include a global automotive manufacturing company based in the mid-West US who uses MagneGas2 at two of its sites; a heavy equipment rental company which uses MagneGas2 to repair vehicles; the New York City Department of Transportation; one of the largest recycling and waste disposal companies in the US which uses MagneGas2 in the maintenance and repair of its fleet at six locations; Pinellas County Fire Department in Florida; contractors working on NASA's Kennedy Space Centre; major international bridge builder, Condotte; and a US army contractor for official use on a US army base for fire-rescue needs.

## Technology overview

### MagneGas2 – an alternative to acetylene

**Exhibit 1: MagneGas2 vs conventional metal cutting gases**

Property	Notes
Efficiency	Independent tests conducted by the Edison Welding Institute in the US confirm that it cuts 38% faster than acetylene or propane and 44% faster than propane. As there is less slag in the cut edges, metal parts can be welded together without needing an extensive clean-up. Together with faster cutting speed, this improves the efficiency of metal assembly operations by at least 50%. Additionally, the amount of oxygen required is reduced by 34% compared with acetylene and 31% compared with propane.
Safety	Acetylene is a highly unstable, reactive gas which is prone to explosion. This makes the welding industry the second most dangerous industry group in the US. It is often contaminated with traces of arsine and phosphine gases from the manufacturing process, both of which are highly toxic. MagneGas2 is inherently less explosive, dissipates quickly if there is a leak because it is lighter than air and is not toxic.
Production process - environment	Acetylene production requires substantial volumes of water, while production of MagneGas2 through gasification of waste does not. Management estimates that 3bn litres of water would be saved each year if the metal cutting industry switched from acetylene to MagneGas2.
Production process - safety	Acetylene is manufactured by reacting calcium carbide with water. Calcium carbide is highly toxic and potentially explosive. The by-product formed during the manufacture of acetylene, calcium hydroxide (slaked lime), is harmful to humans if they inhale it or touch it.
Footprint	The gasification technology occupies c 10% of the footprint of conventional acetylene production equipment. This makes it easier to find room to co-locate the equipment on a site such as an automotive manufacturing facility that consumed large quantities of cutting gas.

Source: Edison Investment Research

The company focused initially on the development of plasma gasification equipment to sterilise bio-contaminated liquid waste, but in the process it discovered that the synthetic gas produced as a by-product of the process was a better metal cutting gas than acetylene. It carried out further development on the process to optimise the properties of the syngas and reduce the cost of production. Exhibit 1 compares the properties of the resultant fuel, MagneGas2, with acetylene. Importantly, metal that has been cut with MagneGas2 behaves under stress in the same way as

metal cut using acetylene. This was confirmed during independent tests by Certified Testing Laboratories in Florida. As MagneGas2 has similar properties to acetylene it is easy for users to switch gas type without extensive training. MagneGas2 is produced from a renewable feedstock. Since May 2017 it has been produced from butanol derived from corn. The renewable aspect does not appear to be a significant factor in purchasing decisions in the US, but it may be more significant as MagneGas begins to address the European market.

### Competitive position – MagneGas2 a unique green cutting fuel

MagneGas2 is not the only fuel which is presented as offering superior cutting characteristics to acetylene. The international provider of industrial gases, Praxair sells StarFlame 3 which like MagneGas2, burns at a hotter temperature than acetylene and gives cutting speeds that are 15-50 times faster than acetylene. Like MagneGas2 there is less clean-up required after welding, further improving workshop efficiency. StarFlame is a propane variant with an additive from Chemtane Energy. Baker’s Gas and Welding Supplies in the Detroit area is a smaller player that offers a propane with an additive that produces a hotter flame than acetylene and thus cuts faster.

These alternatives to acetylene are based on propane, which is a non-renewable energy source while MagneGas2 is made from butanol obtained from maize. Management believes that this makes MagneGas2 the only renewable cutting fuel currently available. Our desk research identified Sradco, a Missouri-based engineering consultancy, who has developed a three-stage gasification system that produces acetylene from hydrocarbon waste but this does not appear to be in commercial use. Colorado-based Petrogen has developed cutting torch systems that run on gasoline, diesel and kerosene (paraffin, so could potentially be used with bio-diesel produced for other applications).

In reality the competition is from established suppliers of traditional cutting gases: acetylene and propane, which compete primarily on price. Management currently offers MagneGas2 at a similar price to conventional cutting gases, with the enhanced safety and efficiency benefits providing a differentiator. Improvements in yield from the next generation gas production equipment currently under development (see below), should enable management to undercut the price of conventional cutting gases.

We note that as MagneGas2 fuel represents only 3-5% of sales made by its welding supply operations, these will provide a contribution towards funding the development of the sterilisation and gasification equipment regardless of the competitive position of MagneGas2. However, organic growth within these operations is dependent on securing MagneGas2 sales.

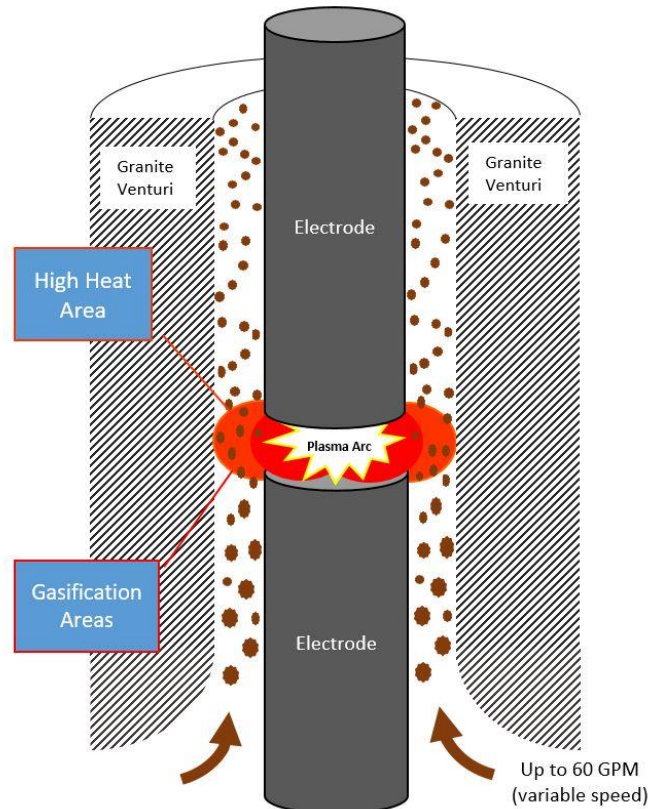
### Gasification technique for making MagneGas2

Component	% by volume
Hydrogen	45-55
Carbon monoxide	15-19
Acetylene	13-17
Ethylene	7-10
Methane	4-7
Propylene	1
Carbon dioxide	0-1
Source: Company data	

The core technology was originally developed by the current CEO’s father, Dr Ruggero Santilli, for use in rural waste-to-energy applications. A wide range of liquid wastes containing hydrocarbons are passed through a plasma arc where a very strong electric field sterilises the bio-contaminants in the waste without adding chemical disinfectants. In the process, the waste releases a mixture of gases that burn without the emission of pollutants such as nitrogen dioxide. MagneGas is not

unique in offering a plasma gasification technology, but it is unusual because its patented system enables fluid to pass efficiently through a submerged plasma arc. (We note that several of the patents expire in 2018, though others referring to the plasma arc extend to 2029 and 2030.) In sterilisation mode, the waste is passed through the arc the minimum number of times required to deactivate the bio-contaminants. In gasification mode, the feedstock is passed through the arc multiple times to achieve the highest possible gasification rate. The exact composition of the resultant gas depends on the initial waste stream. MagneGas2 is produced from butanol. Its composition is shown in Exhibit 2.

### Exhibit 3: Plasma gasification process



Source: Company data

### Fourth generation gasification unit under development

In October 2017, MagneGas announced that it had completed designing a prototype fourth-generation reactor after four years of work. In this updated design, a much larger area is exposed to the plasma arc. It is expected to extract around 90% of the useful gas in the first pass through the plasma arc, so that the feedstock only needs to pass through the system once or twice rather than the six to eight times in the current iteration. Simulations predict that this will reduce the amount of power required per cubic metre by 75% and increase the gas production rate for the same amount of power by at least five times. This would reduce total production costs by at least 50%, making MagneGas2 significantly more cost effective to produce than acetylene and roughly on a par with the cost of propane. The resultant price advantage should improve profits and give MagneGas an immediate ability to take significant market share in the global cutting fuel market.

Importantly, the next-generation technology will also enable the technology to be used to convert solid material such as waste plastic, bio-mass, wood chips and coal to a useful gas, opening many new feedstock opportunities. Management hopes to have a working small-scale model by the end of FY18 and a full-scale test unit by the end of FY19.



## Using the gasification technology for sterilising liquid waste

The same patented technology is used as for gasification. However, in this mode liquid waste such as sewage or leachate from landfill is passed through the plasma arc the minimum number of times needed to kill any bacteria or other pathogens including E. coli and faecal coliforms. It also breaks down any pharmaceutical residue such as hormones in the waste. The technique may potentially be effective in breaking down toxic polychlorinated biphenyls which were widely used as an additive in electric transformer oils until they were banned. The process meets US Environmental Protection Agency standards for converting the liquid waste from a class B material to a safer class A waste. In one day a single stationary plasma arc flow refinery can sterilise 363k litres of sewage containing 0.8% total suspended solids. The process can be used on agricultural, municipal and industrial wastes to make them suitable for use as irrigation water or fertiliser, both of which have monetary value. For example, it costs €80/tonne to dispose of untreated sewage in landfill, but the treated product may be sold for €20/tonne as the process has little impact on the nutritional content of treated material used as fertiliser. Modest amounts of useful gas are given off as a by-product, which helps off-set the cost of sterilisation. MagneGas has also developed a smaller unit which can be mounted on a pick-up truck and shared by several farms in the same neighbourhood. The production cycle for the equipment is typically six to nine months.

## Using the gasification technology in waste-to-energy projects

Since the fourth generation technology will be able to process a range of pulverised waste materials, once commercialised it may be deployed in Europe in waste-to-energy plants that process waste collected locally and produce heat and electric power for local consumption. As discussed in our [PowerHouse Energy](#) note, gasification is an attractive alternative to incineration as the extremely high temperature process breaks down toxic dioxins and furans, there is no ash to dispose of and any inorganic materials form a glassy slag which can be used as an aggregate for road-building, subject to the appropriate permits. The waste-to-energy conversion efficiency is not comparable with conventional turbines, but this is not a barrier to deployment in this application, as the waste would incur fees of €80/tonne or more if it was sent to landfill, so operators of waste-to-energy plants are able to charge for destroying the waste, in effect subsidising energy production.

## Using the gasification technology for co-combustion

Since MagneGas2 burns at such a high temperature it can potentially be burnt together with coal to reduce toxic emissions from the coal as improving energy generation efficiency. Development of this application has been suspended as the use of coal in power stations is being phased out in favour of natural gas.

## Competitive technology

### Gasification for sterilisation

Our competitive review indicates that Coaltec Energy is the only other company currently manufacturing gasification equipment for the sterilisation of leachates and manure. It has developed a system for producing a fertiliser material from cow manure. This can process up to 200 tonnes of raw manure each day. Coaltec appears to be at a similar stage to MagneGas, in that it is working on projects to prove the technology.

### Gasification for waste-to-energy projects

We note that there are dozens of companies globally developing waste-to-energy gasification equipment, some of which use plasma arc technology to achieve the high temperatures required. Exhibit 4, which is not intended to be exhaustive, lists those companies which appear to have operational projects. We note that some projects have failed because of issues securing large

volumes of waste and transporting it over a long distance to supply a single large-scale plant. Since MagneGas's equipment is small scale, it can be located close to a source of waste, circumventing this problem.

#### Exhibit 4: Gasification equipment

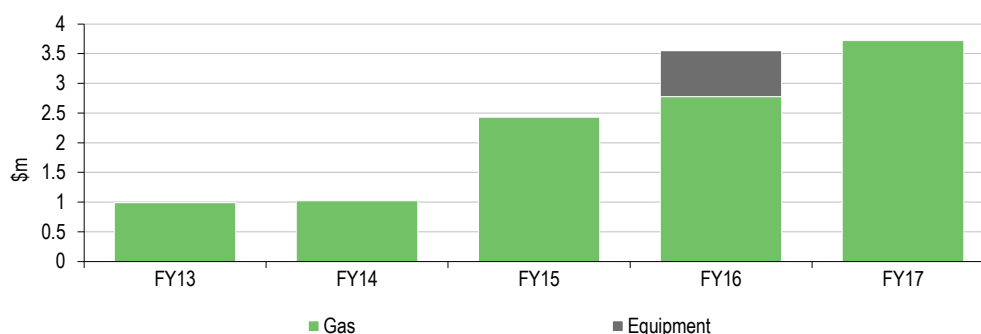
Heading Left	Plasma	Status	Size	Feedstock
Advanced Plasma Power	Yes	Pilot in Swindon, UK	20tpd	Municipal solid waste and commercial/industrial waste
AlterNRG/Westinghouse Plasma	Yes	Commercial operation in China, India and Japan. Tees Valley project closed 2016	24-150tpd	Municipal solid waste water sludge, hazardous waste
ArcSec Technologies	Yes	Pilot under construction in Alabama	11 acre site	Multiple waste streams
Chiinook Sciences	No	16 projects over the last 14 years	N/A	N/A
Covanta	No	Demonstration plant operational at its Tulsa, Oklahoma waste-to-energy site	375tpd	Municipal waste
EQTEC	No	Operational projects in Europe and India	20-100tpd	Primarily biomass
GeoPlasma	Yes	Contract for project in Florida terminated prior to completion	180tpd	Municipal waste
Hitachi Metals/Westinghouse Plasma	Yes	25tpd plant operational in Japan. 150tpd plant commissioned in Japan but closed because of problems with waste contracts	25tpd and 150tpd	Municipal waste and dried sewage sludge
InEnTec	Yes	Operational at landfill site in Oregon.	N/A	Municipal waste
PEAT International	Yes	National Cheng Kung University, Taiwan	3-5tpd	Multiple waste streams
Plasco Energy	Yes	Project in Ottawa was cancelled because of lack of government funding. Company placed in administration.	<405tpd	N/A
PowerHouse Energy Group	No	Pilot on Merseyside, UK	C 3tpd	Shredded plastic, tyre crumb
PRM Energy Systems	No	Over 20 systems in commercial operation in the US, Europe, and South-East Asia	20-2,000tpd	Biomass including sewage sludge
PyroGenesis	Yes	Operational on US Navy aircraft carrier	<5tpd	Multiple waste streams
Shell Global Solutions	Data	Over 20 coal gasification plants in operation	2,000tpd	Coal, biomass

Source: Edison Investment Research

## Commercialising the technology

### Sales channels already established in the US

Exhibit 5: Revenue FY13-17



Source: SEC filings. Note: Equipment sale in FY16 was to Green Arc Supply.

### Initial footprint in Florida

MagneGas first introduced its renewable metal cutting fuel in 2010 through third-party US distributors. In 2014, management decided to start selling the gas directly. Potential customers prefer to purchase their cutting gases and cutting equipment from the same supplier, so management acquired a local company, ESSI, which already sold the range of products required. The ability to offer a differentiated product such as MagneGas2 facilitates introductions to new customers who will also purchase complementary products. Between 2013 and 2017 total sales

(including other cutting gases and cutting tools) grew at 39% CAGR. This compares very favourably with the conventional cutting gas market which management estimates had a CAGR of only 2-3%. Sales of complementary products are significant. Management estimates that it makes \$33 ancillary sales for each \$1 of MagneGas2 sold. It has taken steps to expand the portfolio of complementary products eg adding calibration gases to the offer in July 2016 and cutting tools in May 2017.

### Expansion into Texas and California, the top two markets for cutting gases

Industrial gases are heavily used in the shipping, rail, oil and gas industries, by utilities, in super-ports, for demolition and for construction of heavy infrastructure. This means that Houston and the San Diego/Long Beach/Los Angeles corridor are the number one and number two markets for industrial gas in the US and California and Texas are largest markets in the US by state. The Houston area is booming as petroleum and natural gas markets continue to recover after Hurricane Harvey. San Diego has the potential to be one of the key markets given the proximity to Coronado Island and the massive US military presence, as well as a wide range of utility, commercial shipping, rail, logistics and infrastructure operators in the bay area. Management estimates that the Greater California market has the potential to generate in excess of \$100m revenues annually for MagneGas. MagneGas acquired sales outlets in both of these key markets during the first four months of FY18. Management intends to make further acquisitions in these regions, providing it can do so without incurring too much share dilution, as the recent acquisitions were funded through the issue of preferred stock.

#### Exhibit 6: Development of US sales channels

Date	Event
October 2014	Acquisition of ESSI in Florida for \$3m cash. Annual revenues of c \$2m
May 2016	Complete Welding and Cutting Supplies appointed as regional distributor for Mexico and Southern California
June 2016	Berger Welding Supply of Indiana appointed as regional distributor, giving access to major automotive manufacturer
July 2016	ESSI site opened in Lakeland, central Florida
October 2016	Holston Gases appointed as distributor for Tennessee and mid-South states
Jan 2017	ESSI site opened in Sarasota, Florida
March 2017	Distributor Green Arc Supplies installs a gasification unit. Purchase price \$775k, royalty of \$0.02/cubic foot of gas
Q417	Expansion of ESSI sales force
Jan 2018	Acquisition of Complete Welding in San Diego, Southern California for \$745k. \$0.7m annualised revenues. C 100% expansion of Complete Welding sales force short term
Feb 2018	Acquisition of Green Arc Supply with two locations in Texas, one in Louisiana. Consideration of \$2.3m, \$1.0m payable in cash, the remainder in shares
April 2018	Acquisition of former distributor, Trico Welding Supplies, in Northern California for \$2.0m (gross) completed
April 2018	Expansion into Pasco County, Florida, giving access to Covanta operations in the region

Source: Company data

### Improving profitability of direct sales operations

The combined scale of operations following the recent sequence of acquisitions gives MagneGas stronger purchasing power, thus improving margins, and also helps it pursue larger national accounts. We note that in March 2018, MagneGas signed its first multi-year industrial bulk gas contract, emphasising its enhanced market profile. Having a direct sales operation in a region with a high density of current and potential customers helps profitability by making it worthwhile to install gasification technology in the area rather than shipping the gas from the production facility in Florida, thus significantly reducing logistics costs. There is already a MagneGas2 production facility at one of the company's locations in Texas. Management also intends to install one in the California region. Increasing turnover in one location also helps improve profitability as gas cylinders, which cost several times more than the gas they contain, are used and refilled more quickly, reducing the cylinder/gas overhead. This project will incur minimal capex as MagneGas will redeploy equipment that became surplus to requirements when it switched to using butanol as feedstock, thus



substantially improving production efficiency. In addition, management intends to develop its own plant in Florida for filling cylinders with non-proprietary gases so it can save costs by purchasing these in bulk. Management expects that this plant will become operational by the end of FY18 and should improve gas margins by 10-15pp.

## **Distributors treble minimum purchases of MagneGas2**

In November 2017, MagneGas announced that its three largest cutting gas distributors, Holston Gases in Tennessee, Haun Welding Supply in New York State and AWISCO in the New York metropolitan area, had all agreed to significant increases in MagneGas2 purchases. This represents a minimum three-fold increase in sales from these distributors from Q417 onwards. Now that Green Arc in Texas, which has its own MagneGas2 production equipment, is part of the group, management intends to secure new distributors in the Mid-West US who can be supplied from this facility.

## **Preparing for European launch**

The European Union (EU) is an attractive market for MagneGas because of the Renewable Energy Directive that sets a binding target of deriving at least 20% of energy requirements from renewable sources by 2020. The EU is also, according to management estimates, the second largest market for industrial gases globally. For the last 10 years, the company has been working with Berlin-based Infinite Fuels, a developer of alternative energy production equipment that reacts biomass with electricity to produce useful hydrocarbon fuel from bio-wastes. MagneGas is in the process of forming a JV with Infinite Fuels, completion of which is dependent on the latter securing c €2m equity finance which is a requirement for it to receive a €6.0m (US\$7.2m) grant from the European Commission. If successful, this will cover much of the start-up costs of launching production and sales of MagneGas2 in Germany. Management expects that this funding will act as a catalyst to attracting additional capital in Europe.

In addition to the activity with Infinite Fuels, management is evaluating setting up operations at one or more European super-ports ie Rotterdam, Amsterdam, Antwerp, Marseille, Hamburg, Copenhagen, or Calais. Each of these locations has several hundred potential users of MagneGas2, all of which are larger than the current largest single client. Super-ports in other regions, eg Dubai, Japan, Singapore and South Korea, are also near-term targets. We note that MagneGas is already actively marketing its products and services in Houston and Los Angeles. Management estimates that the potential client base in a single port area could be addressed from a team of three to five people, cost less than \$1m to set-up and generating multiple millions of dollars of EBITDA a year. Such an operation would be wholly owned by MagneGas.

## **Launching commercial sterilisation projects**

### **Agriculture**

Between 2014 and 2016 MagneGas undertook a pilot study at the largest pig farm in Indiana. This verified that the process works at scale to eliminate E. coli and faecal coliforms, has a beneficial impact on total suspended solids, which is a parameter used to assess the quality of waste water and meets EPA standards. Importantly, it enables hog manure to be treated as a class A rather than class B waste so it can be used as a high-nutrient, low-odour fertiliser. Management is currently in the process of establishing a commercial pilot treating pig manure in North Carolina. Starting in Q119, it intends to monetise the technology through providing a sterilisation service and sales of manure feedstock and reclaimed water. Management estimates that there are 1,700 hog farms in the local area, collectively producing 15m tons of waste each year, which represents an attractive potential market.

In Q417, MagneGas formally launched an 18-month pilot with one of the largest dairy farms in Florida. The primary purpose of the pilot is to evaluate the efficacy of the sterilisation process for cow manure. It is jointly funded by the USDA through a \$432,000 grant, which represents 50% of the pilot costs and is a key step to obtaining USDA subsidised equipment eligibility and gathering sufficient data to move ahead with commercialisation within the agricultural industry. This grant builds on the hog industry study. In May 2018, MagneGas achieved its first major milestone on the project by giving a successful live sterilisation demonstration at the farm to representatives from the USDA, the Dairy Farmers of America, the International Dairy Journal and other independent dairy operators, as well as local government representatives. MagneGas will continue to submit results from the pilot to the USDA for the remainder of the project's duration.

In December 2017, MagneGas announced it had received a preliminary order for a sterilisation unit to be delivered into the southern Italian market in FY18. The unit will be used primarily for the sterilisation of agricultural waste. The transaction may be structured as a service contract with MagneGas receiving revenues as waste is processed. Management expects the project to be funded in part by an Italian grant designed to support waste reduction and carbon emission reductions. This order follows on from one for a small sterilisation unit from an Italian client who has verified that MagneGas's sterilisation process positively impacts chemical oxygen demand in landfill waste water and the client intends to scale up the project.

### **Landfill leachates**

In July 2017 MagneGas announced that one of its distributors in Italy had completed several years of using the technology to reduce the chemical oxygen demand of leachates and had placed a \$140k order for sterilisation equipment. MagneGas will sell the distributor components that will be assembled according to MagneGas's instructions. The finished unit will be installed at a purpose-built facility that will treat leachate in return for a disposal fee, which may potentially be shared with MagneGas. Following an initial period of operation, MagneGas and its distributor intend to deploy the technology on multiple sites for treating leachates throughout Italy later in 2018. The technology significantly reduces the disposal costs of landfill wastewater and represents a strong value proposition for landfill operators. Since much of the EU regulation regarding leachate is standardised, this presents a very large addressable market across much of the EU landfill industry.

### **Sewage treatment**

A northern California municipality is currently evaluating a proposal for deploying the technology in a waste water sterilisation programme. If successful, this would represent the first for public-private partnership in the US for waste-water sterilisation, realising revenues by the end of FY18.

### **Launching commercial waste-to-energy projects**

MagneGas is in discussions with an international medical manufacturing company. It has demonstrated that its gasification technology can convert contaminated ethanol, which is one of types of medical waste produced, into a useful fuel. This gives a route for potentially reducing the cost of MagneGas fuel by 20-25% by taking the waste ethanol as a feedstock. The volume of gas potentially produced from processing all of the waste ethanol produced by this medical manufacturing company far exceeds the amount of cutting gas that MagneGas could sell, so management has plans to convert the remainder to bio-diesel using a catalytic process. Management notes that this medical manufacturing company has another 30 types of waste stream which could potentially be pulverised and converted to useful gas in the next generation of gasification equipment (see above).

## Management

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MagneGas's strategic direction and growth profile has been transformed by the appointments of CEO Ermanno Santilli in June 2012, replacing his father, Dr Ruggero Santilli, and CFO Scott Mahoney in December 2016, replacing Dr Santilli's daughter, Luisa Ingargiola. Prior to joining MagneGas as executive VP of international relations in 2009, Ermanno was employed by Ingersoll Rand Company between 2003 and 2009, most recently as vice president of climate control business, global rail and aftermarket. In this capacity he oversaw a department that generated over \$270m sales and \$80m operating income, managing sales, business development, product management, warehousing and dealer development. He also drove development of new business and rail markets in Australia and India. Scott brings 17 years of financial and distressed situation management experience. Prior to joining MagneGas, Scott was CFO of Phoenix Group Metals, an auto core supply and automobile recycling company based in Phoenix, Arizona. He has also served in several entrepreneurial roles in the oil industry, raising over \$200m in equity and debt capital for previous projects in the Permian Basin, Eagle Ford, Williston Basin Rockies and mid-continental US and managing 13 acquisitions in the sector. Luisa Ingargiola and Dr Santilli's wife, Carla, who previously served as directors, Luisa as executive VP of capital markets and Carla in a non-executive role, have recently stepped down from the board.

## Sensitivities

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- Data from the trials at a pig farm in Indiana confirmed that MagneGas's sterilisation process meets or exceeds the Rule 502.32 time and temperature requirements for making swine manure Class A waste. The data were sufficiently encouraging for the USDA to provide a grant towards a follow-on trial at a dairy farm. This pilot project is a key step to obtaining USDA subsidised equipment eligibility and is scheduled to complete in FY19. Meanwhile, MagneGas is focusing on building up sales of cutting gases and complementary products. MagneGas has not secured EU approval for use of the plasma arc flow system in liquid waste sterilisation.
- Since MagneGas2 is relatively new to the metalworking market it may take time for the industry to adopt it. MagneGas is addressing this by focusing on regions such as California and the Houston area, where customers are less resistant to change, and by selling MagneGas2 alongside conventional cutting gases and other welding supplies. Management notes that MagneGas2 is currently c 3-5% of all sales. This proportion is beginning to increase now that Complete Welding, Green Arc and Trico are part of the group and benefit from making sales calls with experienced MagneGas sales people. Management expects that it will increase further once there is a production facility in California, enabling sales team to offer lower prices. We note that customers such as the major automobile company will have undertaken their own validation of MagneGas2 prior to adopting it.
- Development of the fourth generation plasma arc flow system needs to be completed so that MagneGas2 can be manufactured more profitably.
- The plasma arc flow system is still being trialled and has not yet been installed on a large-scale industrial basis for waste-to-energy projects.
- Operating permits are required before units can be installed for either MagneGas2 production or deployment for waste sterilisation applications or waste-to-energy projects.
- As the company is not yet cash-generative it is dependent on securing external finance. During Q118, this was provided through the issue of Series C preferred stock, which is highly dilutive. 9,303 preferred warrants were exercised and, along with 115 outstanding preferred shares converted into 9.7m shares of common stock. Management estimates that it could draw down another \$10-11m cash through recourse to Series C preferred stock, representing a maximum

of another 30m shares of common stock, though it is evaluating alternative funding routes which would be less dilutive. It has stated its intention to decelerate its rate of making acquisitions, which were funded during Q118 through drawing down Series C preferred stock and the issue of new shares of common stock, in order to minimise dilution.

- According to the SEC filing, as of 31 March 2018, there were 0.5m common stock equivalents (options, warrants, convertible secured debentures and convertible preferred stock) outstanding. This is not materially dilutive.
- The Santilli family collectively hold 100% of Series A preferred stock. This gives them the ability to delay or prevent a change in ownership of the company or its assets, including the IP. It also enabled the company to proceed with a 1:15 reverse stock split in January 2018 without the cost and delay of a circular to shareholders. The family does not have a material holding of common stock. As noted previously in the section on management, until recently, three members of the Santilli family held board positions. The departure of family members Luisa Ingargiola and Carla Santilli from the board of directors emphasises MagneGas's growing maturity as a listed company. In the hypothetical event that the Santilli family created a vehicle to reacquire the assets and IP, while the Series A preferred stock would enable the family to vote for this move, the independent directors should be able to block this.
- The Q118 SEC filing notes that management has concluded that, as of end March 2018, the company's internal control over financial reporting was not effective because of the reliance on a few people to fill multiple roles and responsibilities and a limited number of accounting personnel. CFO Scott Mahoney notes that, since his appointment in December 2016, he has made changes which bring the company's process in line with SEC requirements, but has not yet invested in the external examination required to confirm that the financial processes are now compliant.

## Financials

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### Q118 performance benefits from acquisitions

Total revenue grew by 34% year-on-year during Q118 to \$1.2m. Stripping out \$110k from the San Diego acquisition and \$156k from the Texas acquisition, like-for-like sales grew by 4%. Gross margin declined from 42% to 35% because of GAAP treatment of acquired inventory, which marks the value up to the current retail price, though there was some benefit from better pricing and terms on some products related to higher volumes. Management expects margins to trend back to prior year levels as the acquired inventory is worked through, which it estimates will take place during Q218 and Q318. Operating costs were distorted by \$0.6m consultancy and integration costs related to the three acquisitions, rising by \$0.4m to \$3.2m. The year-on-year reduction in pre-exceptional operating costs reflects substantially lower R&D costs as the company has switched focus from technology development to selling cutting gases and associated products. (We note that it no longer leases property from the Santilli family.) Operating loss, including the \$0.6m non-recurring costs, widened by \$0.4m to \$2.9m. Q117 benefitted from \$0.8m positive movement in the fair value of derivative liability, so net loss widened by \$1.2m to \$3.0m.

### Cash flow and balance sheet

After adjusting for non-recurring costs and the distortion introduced by GAAP accounting described above, net cash used in operating activities during Q118 reduced from \$1.5m to \$1.2m y-o-y. Investing activities included \$2.8m cash for acquisitions, of which \$1.0m was pre-payment for Trico in San Francisco, \$1.0m was the cash element of the consideration for Green Arc Welding in Texas (the remaining \$1.3m was satisfied through the issue of 1.0m new shares), the remainder for Complete Welding in San Diego. \$0.6m was invested in capital equipment – primarily gas cylinders.

MagneGas raised \$7.6m (net) through drawing down preferred stock, resulting in a \$1.5m increase in cash to \$2.1m. Of this, \$1.0m is allocated for the balance of the consideration for Trico. With cash-burn at \$240k/month according to management estimates, further financing will be required during H218. If necessary, this can be satisfied through further drawn-down of Series C preferred stock.

The balance sheet was strengthened significantly during the period, moving from \$0.6m net debt at the end of FY17 to \$1.2m net cash at the end Q118, though we note that most of this is allocated for the Trico acquisition. Part of the Point Financial Promissory Note agreed in November 2017 was repaid, leaving \$0.2m (net of \$0.1m debt discount) outstanding for payment by end November 2018. The only other material debt remaining is \$0.5m relating to the sale and lease back of gas cylinders. Importantly, at the end of December 2017, current liabilities exceeded current assets by \$1.3m but at the end of Q118, current assets exceeded current liabilities by \$1.8m.

On 16 January 2018, MagneGas effected a 1-for-15 reverse stock split intended to increase the per share trading price so as to satisfy the minimum bid price requirement of \$1.00 per share for continued listing on the NASDAQ Global Market.

## Estimates

Our model treats revenues from equipment sales, fees for sterilising waste and any benefit from expansion into Europe as upside. It is based on the following assumptions:

- **Revenues:** For FY18, we note that MagneGas announced monthly revenues of \$1.06m in April following completion of the third acquisition and that it is currently running at an annualised rate of \$14m/year ie \$1.2m/month. We assume it remains at \$1.2m/month for the remainder of the year. Noting the investment in sales people in both the established Florida base and acquisitions and the expansion of the Florida operation into Pasco County, we model a 20% increase in the current annualised rate for FY19.
- **Gross margin:** We model this dipping to 25% in Q218 to reflect the GAAP treatment of inventory acquired as part of the Trico transaction, rising to 42% for the remainder of FY18, which was the Q117 level. For FY19, we assume that margins rise to 50%, reflecting the benefit of having an in-house gas-filling capability in Florida, a gasification plant producing MagneGas2 in California and better prices for conventional industrial gases arising from bulk discounts. Any benefit from using waste ethanol as feedstock is treated as upside.
- **Capex:** The current gas production equipment has capacity to support a \$50m revenue base. However, additional investment is required in gas cylinders to support growth in sales. We model \$2.7m capital expenditure in FY18 of which c \$2m is for cylinders and the remainder for the refilling plant in Florida and \$2.0m in FY19, primarily for gas cylinders.
- **Working capital:** We assume that the inventory marked up to artificially high levels by GAAP acquisition accounting will have all been sold by end of FY18 and model inventory days at 100, receivable days at 60, payable days at 55.
- **Financing:** We assume that both the \$100k promissory notes to two directors and the \$452k note payable to Point Financial outstanding at the end of FY17 will be repaid in full by end FY18, leaving only minimal financial leases. Our estimates model a funding gap of \$23.0m. Since management has stated that it will avoid recourse to the remaining funds available under the Series C preferred stock, we model this funding requirement as satisfied through debt.

## Valuation

<b>Exhibit 7: Peer multiples</b>					
<b>Company</b>	<b>Market cap m (\$)</b>	<b>EV/sales last (x)</b>	<b>EV/sales 1FY (x)</b>	<b>EV/sales 2FY (x)</b>	<b>CAGR* (%)</b>
AIR LIQUIDE SA	55,433	3.0	2.9	2.8	3%
AIR PRODUCTS & CHEMICALS INC	36,404	4.5	4.1	3.8	9%
KOATSU GAS KOGYO CO LTD	522	0.5	-	-	-
LINDE AG	42,673	2.5	2.5	2.3	3%
MAXIMA AIR SEPARATION (1)	68	2.0	-	-	-
PRAXAIR INC	45,571	4.8	4.4	4.2	6%
SOL SPA	1,160	1.7	-	-	-
TOHO ACETYLENE CO LTD	100	0.3	-	-	-
<b>Mean</b>		<b>2.4</b>	<b>3.5</b>	<b>3.3</b>	<b>-</b>
MAGNEGAS CORP	10	2.9	0.9	0.6	113%

Source: Bloomberg, Edison Investment Research. Note: Prices at 16 May 2018. \*Year 0-Year 2.

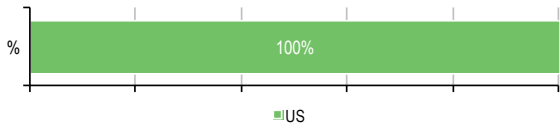
Although we expect MagneGas to start generating revenues from the sale of sterilisation equipment or provision of sterilisation services towards the end of FY18, these sources are treated as upside to estimates. Consequently, our estimates are based solely on revenues derived from the sale of industrial gases and associated equipment. We have therefore selected a sample of listed companies supplying industrial gases for our valuation. We note that MagneGas is trading at a small premium to the mean with regards to historic multiples (2.9x vs 2.4x) and a substantial discount to the mean for both 2018 (0.9x vs 3.5x) and 2019 (0.6x vs 3.3x). While some discount for MagneGas's small market capitalisation is justified, its exceptionally strong projected sales growth should counteract this, at least in part. While there is potential for significant share price appreciation as the full benefit of the Trico acquisition becomes clear, this is being held back by the commentary in the most recent SEC filing noting substantial doubt about the company's ability to continue as a going concern.



**Exhibit 8: Financial summary**

Accounts: GAAP, Year-end: December, US\$000s	2015	2016	2017	2018e	2019e
<b>INCOME STATEMENT</b>					
Total revenues	2,431	3,552	3,719	11,564	16,800
Cost of sales	(1,474)	(2,018)	(2,217)	(7,488)	(8,400)
Gross profit	956	1,534	1,503	4,076	8,400
SG&A (expenses)	(8,697)	(10,479)	(11,664)	(11,872)	(13,284)
R&D costs	(342)	(679)	(172)	(347)	(504)
Other income/(expense)	0	0	0	0	0
Exceptionals and adjustments	(484)	(1,856)	50	0	0
Depreciation and amortisation	(558)	(651)	(673)	(636)	(665)
Reported EBIT	(9,125)	(12,130)	(10,956)	(8,779)	(6,053)
Finance income/(expense)	(29)	(52)	(15)	(738)	(1,244)
Other income/(expense)	12	50	(2)	0	0
Exceptionals and adjustments	(730)	(5,338)	(52)	0	0
Reported PBT	(9,871)	(17,470)	(11,024)	(9,517)	(7,297)
Income tax expense and exceptionals	0	0	(4,974)**	(930)**	0
Reported net income	(9,871)	(17,470)	(15,999)	(10,447)	(7,297)
Basic average number of shares, m	0.3*	0.3*	0.7	13	16
Basic EPS (\$)	(37.07)	(52.74)	(22.22)	(0.8)	(0.5)
Adjusted EBITDA	(8,083)	(9,623)	(10,333)	(8,143)	(5,388)
Adjusted EBIT	(8,641)	(10,274)	(11,006)	(8,779)	(6,053)
Adjusted PBT	(8,658)	(10,276)	(11,022)	(9,517)	(7,297)
Adjusted EPS (\$)	(32.51)	(31.02)	(15.31)	(0.71)	(0.46)
Adjusted diluted EPS (\$)	(32.51)	(31.02)	(15.31)	(0.71)	(0.46)
<b>BALANCE SHEET</b>					
Property, plant and equipment	6,005	6,403	6,865	14,030	15,421
Goodwill	2,109	2,109	2,109	2,109	2,109
Intangible assets	493	437	412	366	321
Other non-current assets	779	27	352	352	352
Total non-current assets	9,386	8,975	9,739	16,858	18,203
Cash and equivalents	5,320	1,616	587	11,194	1,019
Inventories	2,362	1,616	739	3,168	4,603
Trade and other receivables	373	443	390	1,901	2,762
Other current assets	320	226	198	198	198
Total current assets	8,375	3,901	1,913	16,461	8,581
Non-current loans and borrowings	552	620	584	23,556	23,529
Other non-current liabilities	0	0	0	0	0
Total non-current liabilities	552	620	584	23,556	23,529
Trade and other payables	425	416	1,717	1,743	2,532
Current loans and borrowings	8	9	579	27	27
Other current liabilities	2,159	8,002	954	772	772
Total current liabilities	2,592	8,428	3,250	2,542	3,331
Equity attributable to company	14,616	3,829	7,819	7,221	(76)
Non-controlling interest	0	0	0	0	0
<b>CASH FLOW STATEMENT</b>					
Profit before tax	(9,871)	(17,470)	(11,024)	(9,517)	(7,297)
Net finance expenses	0	0	0	738	1,244
EBIT	0	0	0	0	0
Depreciation and amortisation	558	651	673	636	665
Share based payments	509	347	425	0	0
Other adjustments	2,420	8,515	3,024	(182)	0
Movements in working capital	852	(682)	2,114	(3,915)	(1,506)
Interest paid / received	0	0	0	(738)	(1,244)
Income taxes paid	0	0	0	0	0
Cash from operations (CFO)	(5,533)	(8,640)	(4,788)	(12,978)	(8,138)
Capex	(757)	(1,425)	(129)	(2,710)	(2,010)
Acquisitions & disposals net	0	0	(325)	(5,045)	0
Other investing activities	(88)	(55)	(0)	0	0
Cash used in investing activities (CFIA)	(845)	(1,480)	(454)	(7,755)	(2,010)
Net proceeds from issue of shares	6,596	6,422	5,008	8,919	0
Movements in debt	0	0	0	22,448	0
Other financing activities	40	(5)	(795)	(27)	(27)
Cash from financing activities (CFF)	6,636	6,416	4,213	31,340	(27)
Currency translation differences and other	0	0	0	0	0
Increase/(decrease) in cash and equivalents	258	(3,703)	(1,030)	10,607	(10,175)
Currency translation differences and other	0	0	0	0	0
Cash and equivalents at end of period	5,320	1,616	587	11,194	1,019
Net (debt) cash	4,760	987	(576)	(12,390)	(22,538)
Movement in net (debt) cash over period	N/A	(3,773)	(1,563)	(11,814)	(10,148)

Source: SEC filings, Edison investment Research. Note: \*Adjusted for reverse share split. \*\*Deemed dividend.

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<b>Management team</b>	
<b>Ermanno Santilli: CEO</b> Mr Santilli worked for over 15 years with Fortune 500 brands such as Club Car, Bobcat, Thermo King and Trane in Ingersoll Rand Company. He successfully stewarded global and international businesses with diverse teams of sales, marketing, engineering, sourcing, finance, and distribution. He joined MagneGas in 2009 as executive VP of international relations and replaced his father as CEO in June 2012.	<b>Scott Mahoney: CFO</b> Mr Mahoney has 17 years of finance and executive management experience and has held positions at several public and privately held companies in the banking, energy and recycling industries. Prior to joining MagneGas, Mr. Mahoney served as CFO of Phoenix Group Metals a recycling company which he grew through various acquisitions. He has also served as CFO of several oil and gas companies and as vice-president of JP Morgan Chase. He was appointed in December 2016.
<b>Jack Armstrong: Executive vice president of strategic alliances</b> Mr Armstrong has over 20 years of experience in the capital markets. He was a managing director at Piper Jaffray, head of trading at ThinkEquity Partners and recently the senior vice president of the corporate client group at Northland Capital Markets assisting companies in strategy and capital raises. Over his career, Mr Armstrong has worked with senior level management at several of the largest investment companies through the process of raising an estimated \$5bn of funds over his career.	<b>Richard Conz: Vice president of engineering</b> Mr Conz has more than 30 years of engineering, programme management and new business development experience including 28 years with Raytheon. His expertise includes component and system level design, integration and test, production, deployment and maintenance of complex electro-mechanical systems. He is well-versed in engineering processes, strategy development and project scoping, planning, execution and budget/resource management throughout the entire programme.
<b>Principal shareholders</b>	
Renaissance Technologies Carla Santilli Robert Dingess Virtu Financial Global Alpha	(%) 1.4% 1.2% 0.8% 0.7% 0.6%
<b>Companies named in this report</b> Air Liquide (AI:FP); Air Products and Chemicals (APD:US); EQTEC (EQT:LN); Koatsu Gas Kogyo (4097:JP); Linde (LIN:GR); Maxima Air Separation (MAXM:IT); PowerHouse Energy Group (PHE:LN); Praxair (PX:US); PyroGenesis (PYR:CN); SOL (SOL:IM); Toho Acetylene (4093:JP)	

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