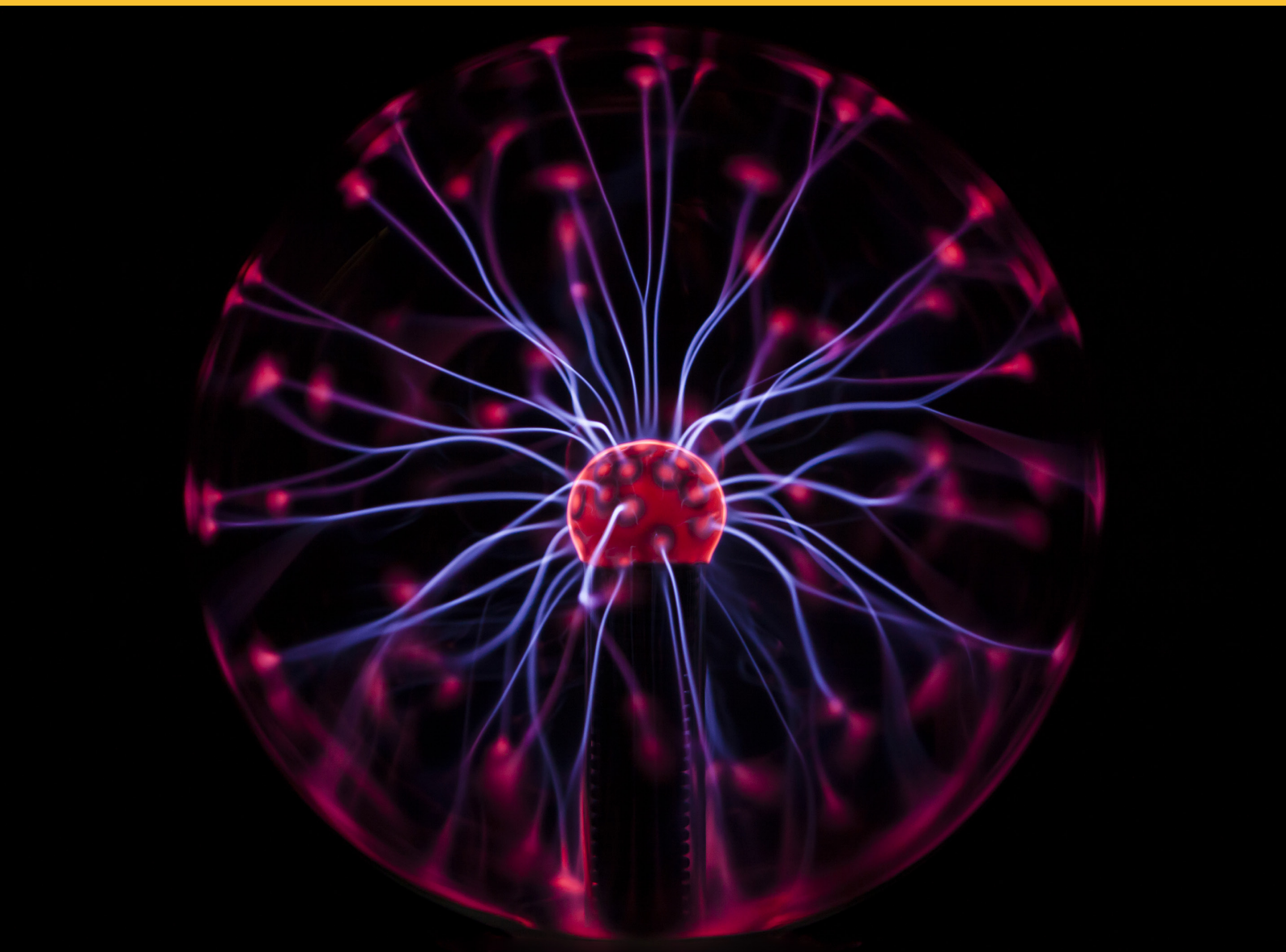
exponential energy
FORTUNES

Exponential Energy Opportunity:

The next Tesla



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The next big thing in energy storage

By James Allen
Publisher and editor, Exponential Energy Fortunes

In the early 1970s, an English scientist called Stanley Whittingham was working in a lab researching alternative energy production and storage.

He was, to be precise, looking at how to make and develop a fully functioning rechargeable battery.

Rechargeable batteries had been around for decades when Whittingham first got to work. But they were bulky, lead-acid cells – the kind still found in many cars today.

Although the disposable carbon-zinc batteries that power your remote control were prevalent, replacing them after each charge of an energy-hungry device such as a computer was frustrating and expensive.

Early research had suggested that the highly reactive metal lithium could be used to store energy, although no one had yet worked out how to make it happen at room temperature without the risk of explosion.

No one, that is, until Whittingham.

Whittingham and his team discovered that lithium ions held between plates of titanium sulfide could allow the ions to move back and forth between the positive and negative contacts, creating electricity.

Other entities including General Motors, Sohio and the US Argonne National Laboratory were developing lithium-based batteries at the same time, but only Whittingham's invention worked at room temperature.

His design of a titanium disulfide cathode and a lithium-aluminium anode would eventually result in the first commercial lithium rechargeable battery.

In fact, it provided the basis for modern lithium-ion batteries.

Lithium-ion batteries are now found in everything from mobile phones, laptops and, most significantly of all, electric vehicles.

Indeed, the basics of the battery technology discovered by Whittingham nearly 50 years ago are the beating heart of all the advancements of Elon Musk's company Tesla… the acceleration and range of the EV cars; the solar-powered charging stations dotted throughout US and UK cities; the powerwall for homes; and the facilities he's building to store solar power.

Indeed, power grids that are based on inconsistent power sources like wind or solar power are beginning to rely on Tesla's massive lithium-ion batteries to store energy for

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times when demand exceeds output.

But here's the thing.

Lithium-ion batteries have fundamental flaws… critical problems that shrewd investors can now leverage for explosive gains…

One company I've discovered in fact uses a patented technology that…

1. Costs a tenth as much as a lithium-ion battery to store the same energy

2. Generates about 36 times as much energy as Tesla's 14KWh Powerwall 2 lithium-ion home storage battery in about the same space

3. Expands into a market that's two to three times the size Tesla's core market

… plus, they already have test facilities underway, with more demand from customers than they can currently handle.

The name of the company is 1414 Degrees. It's a small company based in Adelaide in South Australia.

After months of anticipation, its shares finally listed on the Australian Securities Exchange (ASX) on 12 September. .

So how does it all work?

Low costs = high PROFITS

Applying the lessons of Whittingham, Tesla and all major battery and device manufacturers need ever-increasing quantities of "rare earth" metals such as cobalt, nickel and lithium. But as demand increases, their costs are skyrocketing out of control.

The price of cobalt is around £67,000 per tonne, having hit near ten-year highs in March. It's up fourfold since the beginning of 2016.

Nickel is around £10,600 per tonne, having recently hit its highest level in more than two years.

Lithium, the other main components in Tesla's battery chemistry, has also seen significant increases in price, it soared by more than 200% in 2016 and 2017. .

Rather than use cobalt, nickel or lithium to make batteries, 1414 Degrees has developed a storage device that uses silicon, the second most abundant element in the Earth's crust. It's primarily found as a major component of common sand.

It's so abundant, it costs only £800per tonne and has actually remained pretty steady over the past few years, rising and falling only gently.

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Plus, silicon is so efficient and dense, that less than a metre cube can store enough energy to power a large UK home for a month.

1414 Degrees' chairman, Kevin Moriarty, says the company's process can store 500 kilowatt hours of energy in a 70-centimetre cube of molten silicon – about 36 times as much energy as Tesla's 14KWh Powerwall 2 lithium-ion home storage battery in about the same space.

Put another way, he says the company can build a 10 MWh storage device for about $700,000. The 714 Tesla Powerwall 2s that would be needed to store the same amount of energy would cost AUD$7 million before volume discounts.

That's exponentially better.

1414 Degrees' thermal energy storage system (TESS) stores electrical energy by using it to heat a block of pure silicon to melting point – 1,414 degrees Celsius.

It discharges through a heat-exchange device such as a turbine, which converts heat back to electrical energy, and recycles waste heat to lift efficiency.

Indeed, the high melting point allows for high efficiency energy recovery. That means energy stored within it can be released with very high efficiencies. The TESS can store electricity, and 100% of electricity you put in will be stored in there. It can also burn biogas, or gas. That has about an 85% efficiency of energy converted from the gas.

"Blow batteries out of the water"

If the words of Moriarty are anything to go by, silicon storage could "blow lithium batteries out of the water".

It's easy to see why.

The fact silicon is abundantly available means it's sustainable and affordable. It is also non-toxic and completely recyclable.

As silicon doesn't require a lot of space, it's extremely scalable. If you want to have more storage, you just add more silicon, or make a bigger container of silicon.

By way of comparison, as batteries are a chemical cycle, there is a certain amount of energy lost every time you charge and discharge. That also means batteries have a limited life, because their capacity declines.

In effect, lithium-ion batteries suffer from ageing, as you will all know from the batteries in your phones or laptops. The capacity of batteries falls over time until it eventually runs out altogether.

While Tesla's lithium-ion batteries last around 10 years, 1414 Degrees says its TESS lasts for around 20-30 years.

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What's more, at the end of a typical battery's life, you're left with materials that potentially contain contaminants, and that are difficult to dispose of.

However, at the end of TESS's life, the elements inside the thermal store are still there and haven't been physically changed. In fact, the silicon can be reprocessed and reused, while the box that holds it is also recyclable, and the elements in it can be reused.

Batteries have other shortcomings.

They are very good at putting out very quick response energy, but they struggle because of heating and other issues with providing a lot of electricity over a long period of time. They're much better at providing quick bursts.

They can only store energy for a certain amount of time – weeks, at most. As soon as the charging source is removed, they start to lose the charge.

That might not be a problem if they're paired up with solar or wind to iron out the peaks and troughs of daily use, but less useful if they're meant to cover for longer-term demand.

They don't consistently behave the same way and the energy density of lithium-ion – how much energy can be packed into a particular volume – is currently limited. Hence the large-sized batteries being put into electric vehicles today.

This is not to say that batteries are bad, only that they won't be enough alone to reach the required electricity storage capacity to back up intermittent renewable production in the future.

Bloomberg New Energy Finance forecasts more than $100 billion will be invested in energy storage by 2030, transforming how grids operate.

There remains a gap in the market for a scalable, cost-effective, safe, geographically unlimited energy storage option, one that is suitable for longer timeframes than lithium-ion batteries and lasts a lot longer.

And it is in this gap that 1414 Degrees is looking to dominate.

As said, silicon can be heated and cooled any number of times. It doesn't decline in capacity. It's cheap, plentiful, and has a very high energy density. It can store a lot of energy in a very small space. It can be located anywhere.

All this is good enough, but the best thing about silicon storage is that it isn't just competing in the electricity storage market; it has its eyes on a much bigger market, where the likes of Tesla's batteries and hydropower don't – actually, can't – compete in at all...

Bigger market = bigger GROWTH

When we think of "energy", we usually mean "electricity", and that's where most battery companies such as Tesla have focused their business models.

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However, looking at the numbers, there's a market that's potentially much, much larger…

In Australia, where 1414 Degrees is based, industrial heat is about 33% of total energy use in Australia – larger than electricity at 27%. Transport is just under 40%.

In Europe, heating and cooling are about 50% of total energy compared to just 18% for electricity and 32% for transport.

Here in the UK…

"Heat remains the single biggest reason we use energy in our society. We use more energy for heating than for transport or the generation of electricity."

In fact, the heat requirement in the world is two to three times that for electricity.

Indeed, it's easy to underestimate the sheer volume of energy used globally to produce heat. From district heating to industrial food processing; greenhouses to manufacturing paper; beer brewing to textile production; every process uses energy to make heat. Generation of heat can account for up to 92% of the total energy requirements for industry, services and households.

In industrial processes alone Australia uses over 53 GWh of natural gas per annum, much of which is used to produce heat.

And this is exactly where 1414 Degrees has its sights on…

Because of the unique properties of silicon, the company's storage systems are able to store both electricity and heat, for on-demand power as well as heat, steam to drive turbines, and many critical industrial applications.

In fact, unlike other energy storage solutions, 1414 Degrees' TESS can supply useful clean heat or steam for these processes without the need to convert back to electricity at all.

This form of energy will replace the need for gas and other electricity sources to be converted to heat or steam. Clean, cheap heat for industry, process heating, district heating, agribusiness and more.

Industry runs day in day out, which means 1414 Degrees' TESS will be in more or less constant use if they can gain a foothold in this market, greatly increasing efficiency and returns.

That's why this unique startup is already installing its patented technology across Australia in a variety of industrial applications where batteries simply couldn't do the job.

Lithium-ion batteries simply don't have the heating revenue to help spread the costs. Just like hydro storage, they are "electricity-only" storage, while 1414 Degrees' TESS storage system has two outputs: electricity and heat.

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So, 1414 Degrees already has a technology that's cheaper and better, and is poised to enter a market where it has little in the way of competition.

But that's not enough for it to be a true exponential disruptor.

The Exponential Business Model

One of the things I like most about 1414 Degrees is the potential it has to generate recurrent earnings. It's looking to generate long-term revenues based on leasing or licensing its devices as storage demand grows worldwide.

The reason the company can do this is that its devices are very long-life devices. It wants to capture operating and maintenance, long-term monthly payments through 10, 20 years, and more if needed. That is going to be the aim of the company.

1414 Degrees has already been approached by industrial firms from all over the world that like the idea of high temperature because they need heat and steam for processing raw materials even more than they need electricity.

Although 1414 Degrees is also aiming its storage devices at wind and solar farms – just like lithium-ion battery makers – to help them store surplus energy for later use, its main focus is on industrial heat and steam, which has increased the size of the potential market by a factor of two, and in Europe by more than that.

The industrial applications for the TESS are nearly endless, from water companies wanting to turn the gas from its sewage treatment works into stored electricity and heat to sell back to the grid, to engineering firms providing energy efficiency solutions to industries. All these types of firms have already approached 1414 Degrees.

1414 Degrees' solution encompasses the entire energy use spectrum and displaces fossil fuels for the purpose of electricity generation as well as the fossil fuels used to supply heat.

The TESS can take in electricity from anything from solar or wind farms, from biogas, or even straight off the grid. Companies can then use the heat or electricity exactly where it is needed. It could even arbitrage the market, by storing electricity when the prices are very low on main grid, which is the early hours of the morning, and then release it when there's a strong demand during the early evening.

Products and plans

So far 1414 Degrees has a working prototype. With help from government subsidies, the company built a demonstrator plant two years ago. But the company has four modular TESS designs as variations on the prototype, which it is looking to install and test in real-world industrial applications.

- The TESS-GRID design specification will be for bulk energy storage at very high current flows and supply of electricity and heat for long periods. The device is aimed at providing energy security in electricity markets with substantial renewable

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generation. This is the product that will compete with large-scale storage alternatives including large-scale battery installations or pumped hydro, by supplying heat as well as power to maximise efficiency.

- The TESS-IND is designed for medium scale industries and residential developments requiring reliable electricity and heat energy from renewable generation. The product has interest from consumers ranging from poultry producers, food processors, agribusiness, packaging manufacturing, industrial laundries and resorts.

- The GAS-TESS is being developed to combust waste gas and store the energy for recovery as electricity and heat. The unit charges from highly efficient gas burners. The GAS-TESS market is waste management utilities and other entities requiring efficient waste gas disposal with flexible energy supply.

- The TESS-STEAM is being designed for industries with a high demand for heat compared to electricity. It will incorporate a high efficiency steam generator for industries seeking to replace gas or other energy sources with renewable energy. The TESS-STEAM market includes cardboard manufacturers, poultry processors and steam turbine electricity generation.

The company has already won several small contracts to supply small-scale pilot versions of TESS devices to industrial users.

These comprise storage devices for SA Water, NSW poultry processor Pepe's Ducks and corrugated packaging group Auscor. It's also doing a feasibility study for a large Victorian water treatment company.

Right now, the company is focusing on getting these large scaled-up versions working, which will allow it to produce the specifications and allow it to make further sales. Indeed, commissioning of GAS-TESS model commenced at the Glenelg Wastewater Treatment Plant in April 2019.

However, the company's plans don't stop there. It is using the funds of the initial public offering (IPO) to build a 13.3MWh TESS-GRID test cell, which the firm hopes to commission in the first half of 2019, to prove the concept at scale before it can be commercialised later.

Marketing and opportunities

As for its marketing efforts, although it's been contacted by a lot of companies all around the world, 1414 Degrees plans to initially focus its marketing efforts in Australia where it can easily access sites. However, it has plans for expanding offshore, including in North America, China, Europe, where the markets are many times the size of Australia.

I think there'll be a very fast expansion offshore once the firm has proven the technology in Australia.

In fact, there are huge economic and financial opportunities in solving the issues of industry worldwide, and their needs for heat, as well as their requirements to try and reduce emissions by reducing their fossil fuel consumptions.

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Europe is a particularly attractive market for the company, especially considering many European countries generate their heat from fossil fuels and have set targets to have fully decarbonised their heat market by 2050.

The company has huge opportunities in the biogas markets, including in wastewater treatment. The world has a lot of sewage, and a big need to process it.

Right now, there are not a lot of means people have for actually using the methane that's generated by sewage. 1414 Degrees is already developing a system to take the methane from the waste water treatment plant owned by SA Water. This burns methane off the digesters, heats the silicon, which can be turned back into heat or power as required.

This device it's working on with SA Water could revolutionise the wastewater industry worldwide. The company has already been contacted by utility companies elsewhere in Australia and overseas in this technology. This may lead to a lot of generation from gas that is currently just wasted or flared off.

In 2016, Frost & Sullivan projected a global water market of $625 billion, with wastewater treatment equipment contributing $29 billion in sales to utilities and utility wastewater treatment suppliers worldwide. The biogas market is a huge untapped market as a whole, currently with few storage solutions.

As mentioned, the company also has a comprehensive IP management strategy. It owns patents granted in the US, China, New Zealand and Australia. Further patents are pending in these and other jurisdictions.

What's more, the company is fiercely protective of its significant in-house know-how. In fact, when the company rolls out its technology to customers, it will make sure it retains the operating and maintenance contracts so that only company representatives can open up and work the machines.

Capital raise

The company has spent a decade and around AUD$15 million developing its silicon storage technology. To date, it has largely been funded by individuals, families and private fund managers, along with federal and state governments.

Up to now, the company hasn't really generated much in the way of revenues, bringing in just AUD$300,000 last year amid a total net loss of AUD$4,270,000 It's effectively a startup company yet to properly commercialise its technology.

It has three key projects in place: the collaboration with SA Water to integrate energy generation from biogas waste with storage at the Glenelg Wastewater Treatment Plant in Adelaide's west; an installation into the existing operations of national poultry grower, Pepe's Ducks; and a recent contract worth AUD$3 million to build a pilot device for Austcor Packaging.

It now needs to show that a larger TESS installation could work at scale before power engineers and energy market regulators would consider connecting it to the grid.

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As such, it raised AUD$16.3 million in its IPO. The funds are needed for product development and for the installations at the commercial sites. The IPO will enable the company to build the demonstrator plants and prove that its designs work.

Although AUD$15 million had already been invested into this company as seed investment, not a penny of this was sold into the IPO. All the seed investment is staying in the company, and all the funds of the IPO will be going towards taking the company forward.

Future sales

So far, the company hasn't needed to employ a salesforce. All its commercial opportunities have come to the company, not the other way around.

It has had enquires for silicon storage systems as large as 1,000 MWh to store energy from solar farms and wind farms, for district heating and power from a European local government and for heat and power in a new industrial park in South Australia.

The company is expecting commercial orders to immediately follow some or all of these initial installations or pilots.

As soon as the companies are satisfied with the commissioning process, they are likely to place orders for larger and further installations. They will in turn drive the ability for 1414 Degrees to take orders from other sites.

The company itself expects that within about 12 to 24 months it'll have a healthy order book of sales. Once it has its production lines in place, and its pre-orders for equipment, it expects to be able to produce the units on a monthly basis, more or less.

Risks

As an early-stage business with a limited operating history, an investment in 1414 Degrees carries a high degree of risk. It's speculative for sure.

The company is unlikely to generate significant revenue until it has commercialised its TESS technology following the completion of the pilot trials. And even after it starts bringing in revenue, there's no guarantee it will actually generate a profit.

The company has already entered into several contracts with a few customers in Australia, which are vital to the growth of the pilot schemes and therefore future growth of the company. If these third parties fail to perform their obligations under the initial or final project agreements, 1414 Degrees' operational performance could be adversely affected.

Then there's the TESS technology itself. There's no guarantees that 1414 Degrees will be able to successfully develop the technology or be able to build and commission the pilot TESS units at the commercial sites.

Maybe the technology simply does not perform in the same way outside of the company's

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demonstration trials, which could delay the development and commercialisation of the technology and the company's marketing and distribution of the TESS.

It certainly won't be straightforward to integrate the TESS technology into the customers' existing facilities at each site, especially as the use, extraction and application of the heat, for example, will differ for each customer installation.

What's more, although a successful commissioning at any site will provide operational assurance, there is no certainty that 1414 Degrees will be able to generate income or capital growth from the TESS units. It might be more difficult than the company expects to gain traction in a complex and evolving energy system and to win new customers.

Then there's the funding. The company may be forced to raise additional capital from equity or debt markets if it turns out that it needs more money to follow its existing strategy or if it wants to exploit other opportunities down the line. Such funding might not be on particularly favourable terms or even available at all, meaning business performance could be badly affected.

Although 1414 Degrees has done a great job in shoring up its intellectual property by getting a patent for its thermal energy storage and retrieval system, it is not applicable to all jurisdictions and in fact is still pending in Europe and India. The firm is therefore open to third parties including potential competitors entering the market by infringing or misappropriating the company's intellectual property within certain jurisdictions.

However, given the nature and scale of the technology, a certain amount of engineering and fabrication effort would be required to develop competing systems.

Lastly, 1414 Degrees is not the only company in the energy storage town. There might not be other companies developing silicon-based storage technologies, but there are a range of other technologies currently available and in development that offer alternatives, particularly in electricity storage.

Although the heat market has little in the way of competition right now, the market may be entered by globally focused competitors with significantly more access to capital and resources in the future.

Conclusion

Yes, there are risks. But the rewards are enormous.

There are literally no other technologies out there that offer the kind of large-scale energy storage opportunities that 1414 Degrees provides.

Not only does 1414 Degrees' TESS device offer a compelling alternative to Tesla and lithium-ion batteries for storage of electricity, but the company is actually moving into a much larger market for storage of industrial heat in which lithium-ion batteries don't compete at all.

Heat, let's not forget, is half the world's energy requirement, being two to three times the size of electricity.

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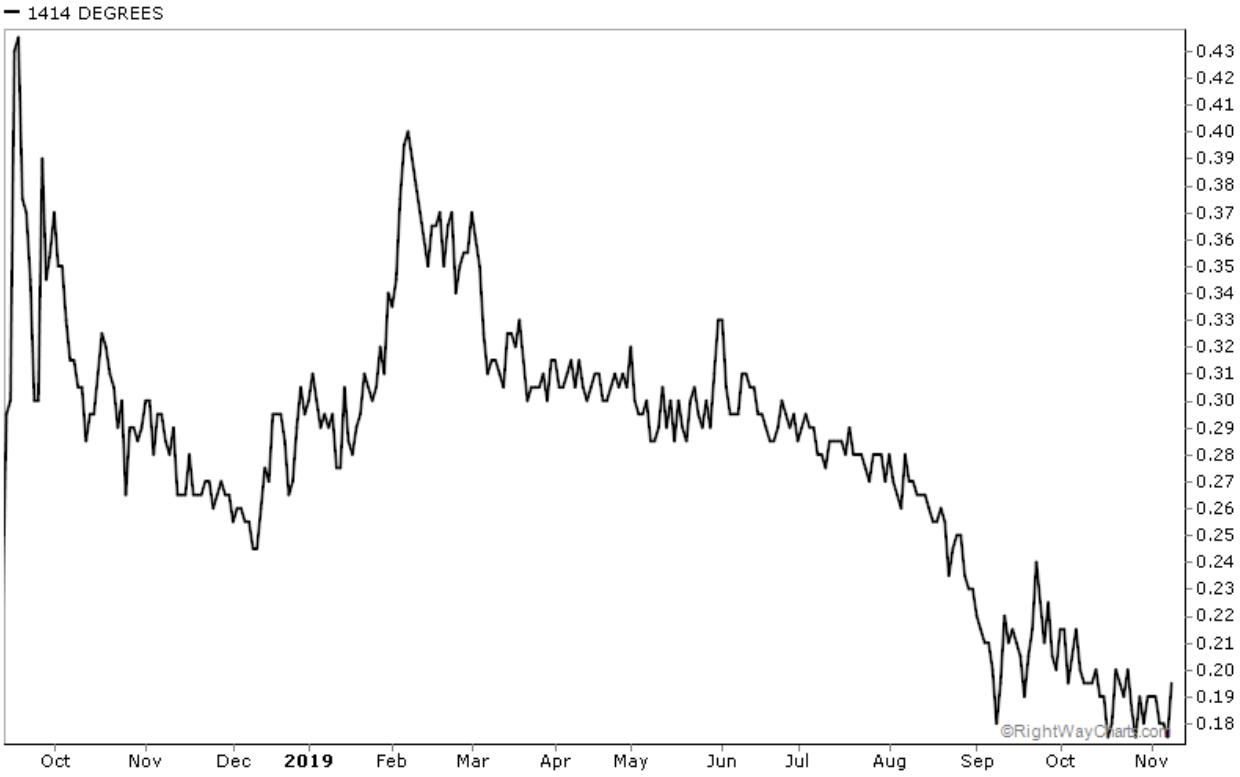
Action to take: BUY 1414 Degrees (ASX: 14D), current market price AUD $0.19. Buy up to AUD $0.45. If the stock is trading above our recommended buy-up-to price, DO NOT BUY. Remember to use limit orders.

Name: 1414 Degrees
Ticker: ASX:14D
Current price: 04/11/2019: $0.19 (AUD)
Market cap: $32.77million (AUD)
52-week high/low: $AUD $0.18 / $0.41 (AUD)

The shares are available for UK investors to purchase on broker Interactive Investor (ii.co.uk or 0345 607 6001).



All the best,

James Allen
Editor, *Exponential Energy Fortunes*