FRONTIER TECH INVESTOR

The Second Coming:

How to make a fortune from Britain's imminent energy boom

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The Second Coming: How to make a fortune from Britain's imminent energy boom

Eoin Treacy, *Frontier Tech Investor*
With extra research from James Allen, *Exponential Energy Fortunes*

You are living through one the greatest times to be an investor in human history.

I know it may not feel like it – there's plenty of bad news in the press – but several world-changing technologies are emerging right now, all of which have the very real potential to make early investors a fortune.

If you want to be one of them, you're in the right place. Welcome to *Frontier Tech Investor*. I'm Eoin Treacy. And I can't wait to help you get in early on some of the tech world's most exciting stocks.

The technology I think is most exciting for Britain, and British investors, is hydrogen. It has a dual tailwind: it taps into the growing need for clean energy systems to fight climate change, and it arrives right when years of pent-up demand here in Britain are being unleashed, after Boris Johnson's election.

I have a strong feeling there is something very special going on right now in the hydrogen sector. For much of the last decade, every time oil prices declined it had a significant knock-on negative effect on renewable energy shares. The logic for this correlation was the dependence on high oil prices to justify the high cost of building and maintaining infrastructure and it was just not viable at low energy prices.

The reality today couldn't be more different for hydrogen. The Brent crude oil price made a new 12-month low over the last few weeks and is barely steady around current levels. Meanwhile, natural gas prices are back close to the lows posted in 2012 and 2016. Normally that would be a death knell for renewable investments but the rationale today is different.

Hydrogen is rallying because with wildfires sweeping the globe, scientists wearing t-shirts in Antarctica and flight shame becoming a global phenomenon, investors are waking up to the idea that the renewables sector really could be a saviour for humanity.

In this report, I'm going to show you what's going on… and how you can potentially profit.

To do that, I've asked resident Southbank Investment Research energy expert James Allen to join forces with me. Usually, you'd have to pay £1,000+ a year to access James' work. But in this report, you'll get his analysis on hydrogen, a critical update on how Britain is a part of the trend – and the top stock (ITM)

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James has recommended to his readers. This isn't a stock we'll be tracking in the *Frontier Tech Investor* portfolio, but this situation is so potentially profitable that I wanted to share James' research with you nonetheless. You'll receive James' latest thinking on the stock free of charge as part of your *Frontier Tech Investor* subscription.

You'll also get my top stock pick for UK hydrogen, Ceres Power – which is in the *Frontier Tech Investor* portfolio.

Before I start… **a quick note on "buy-up-to" prices.**

Hydrogen stocks are flying right now. Many are up 200%+ in the last six months. With that kind of up-move comes volatility. That means you may well have to be patient and wait for your chance if a stock is above its "buy-up-to" price. We're not traders at *Frontier Tech Investor*. We're looking for real long-term wealth creation. If that means being disciplined and waiting for the market to dip before buying – so be it. Please keep that in mind.

"The technology of the future"

That's how Prime Minister Boris Johnson once described hydrogen.

It's easy to see why.

Hydrogen is a superfuel. It is the universe's most abundant element. And it can be used to power almost anything you like. It can replace natural gas to heat the home. (In fact, the gas grid was originally built to use hydrogen.)

Hydrogen fuel cells can power cars, trucks and buses. (As great-grandson of Henry Ford and executive chairman of Ford Motor Company said: "I believe (hydrogen) fuel cells will finally end the 100-year reign of the internal combustion engine.")

They can even fuel planes and rocket ships.

Wilhelm Ostwald, a Nobel Prize winner, said that the hydrogen fuel cell "is a larger invention for the civilisation than the steam machine."

And remember: so-called green hydrogen is 100% emissions free.

So why isn't hydrogen already the lifeblood of the world economy?

That's easy.

For decades, enormous amounts of cheap oil has outcompeted hydrogen.

But as you know… the world is turning against oil.

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Greta Thunberg and the Extinction Rebellion is just one part of this. Yes, the world is moving away from fossil fuels to help combat climate change.

But global dependence on oil was never a good thing.

Oil is scarce. Some countries have it, others don't. It's volatile. It's dirty.

Hydrogen is none of those things. It is clean, abundant and versatile.

That's why the world is turning towards hydrogen in a BIG way.

Indeed, right now, before our very eyes "the new oil" – hydrogen – is being deployed at breakneck speed:

Five months ago, Angela Merkel pinpointed it as playing a central role in "rebuilding" Germany's energy strategy.

Four months ago, the biggest pilot project in history went live in Austria.

Three months ago, Europe's biggest gas infrastructure firm announced it was ploughing one fifth of its revenues into hydrogen.

And recently, we've seen the trend accelerate.

First off, a Fortune 100 company just placed what is to my knowledge the biggest commercial order in the history of the industry, worth $172m.

Second, the world's richest oil company Saudi Aramco took the major step of joining the 'Hydrogen Council'. That isn't surprising –as a former Saudi Arabian oil minister put it, "The day they use hydrogen for transportation, this is the day that oil disappears."

Third, European Commission's upcoming vice president for the Green Deal said hydrogen has a "pivotal" role to play in meeting Europe's climate goals.

And perhaps most urgent of all for British investors, on 2 January 2020 hydrogen was deployed for the very first time in Britain, as part of a major Government-backed project in Staffordshire.

Mark my words: The hydrogen revolution will hand early investors extraordinary profits.

Just consider this…In the second half of last year, a new index of hydrogen stocks made investors 5x more than gold… 6x more money than oil… and 12x more money than the FTSE 100.

But we're just at the beginning.

In fact, I think if you select the right hydrogen stocks, you can expect to make at

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least 10x your money as economies around the world move away from fossil fuels and towards clean, green hydrogen.

Expert forecasts predict hydrogen is set to grow globally into a new $2.5 trillion market as the so-called “hydrogen economy” develops.

All the stocks in this report are set for enormous growth as they become pivotal players in the new global hydrogen-economy.

They are already enjoying enormous headwinds. In fact, in some cases, this means that they have already risen above their buy limits. If that’s the case, then fear not.

As still-small companies, prices are extremely volatile, so it’s likely we’ll see them drop back in due course, giving you the chance to snap up shares while they’re still cheap. I certainly don’t want you to overpay, after all.

But, of course, it could be that the stocks don’t fall. If that’s the case, then keep an eye out for your inbox. Things are moving fast and it’s an extremely fluid situation.

Fuelling a better tomorrow – hydrogen could power your portfolio for years to come

I’m not a climate evangelist but I care deeply about the welfare of our natural habitats and devote a lot of my thinking to the best way to shepherd them for future generations.

What I want to write to you about right now is how it is possible to both think about the welfare of our communal habitat and also make money.

That’s a win-win in my book. And the good news is a small UK company is very well placed to deliver on that promise.

I had one ambition when I first started working. I wanted to see the world’s best diving spots, experience the thriving life of a coral reef first hand, swim with sharks, manta rays, whales and dolphins, and I wanted to get that done before they are all gone.

Every year when I took my holidays, I’d head off on a liveaboard dive boat and sail to remote locales in search of rarely seen sea life. I dived in Sudan, Myanmar, Thailand, Costa Rica, Colombia, Ecuador, Egypt, Australia, South Africa, Mozambique and Mexico.

I’ve hand fed great white sharks, I’ve tickled ragged-toothed sharks, I’ve hunted

with a pack of white tip sharks at night, I've been snorkeling with legions of manta rays, I've tried to keep up as a giant whale shark cruised by and I've hung out with a pair of harlequin shrimp as they divvied up a star fish's leg. The most stunning thing I've ever seen was a cuttlefish mating ritual where their bodies shimmer every imaginable colour (have a look for yourself, here).

I saw my first bleached reef in the southern Red Sea, off the coast of Sudan, in 2003. The reason it stood out to me was because it was the site of Jacques Cousteau's underwater Précontinent II experiment in 1963.

The project was designed to show that it was possible for humans to live underwater for extended periods of time. It was funded by the oil industry who had an interest in developing offshore drilling rigs but the scientific research conducted at the location was on the myriad fish and organisms present on the surrounding reef.

When I visited the wreck of the experiment there was nothing left but a barren hulk. All of the surrounding coral had long since died.

When a coral reef dies, it is the ocean's equivalent of deforestation. The entire ecosystem dies and the affected flora and fauna either migrate or die. The experience of seeing what was left of that reef was disturbing. However, I knew it was inevitably going to happen and that was the reason I had been so keen to see the wonder of coral reefs while I could.

I've been teaching my children to dive since they were young and took them to Cozumel last Easter holiday. The weather was inclement so we had to visit one of the smaller reefs, rather than the best spot. Unfortunately, that reef was completely bleached out.

It was disappointing for my girls because I was hoping that trip would be their first experience of a real coral reef. The reality, however, is the number of truly lively reefs is shrinking all the time and these environments are uniquely sensitive to water temperatures. Too warm and they are literally boiled alive.

I've promised my girls they will see and experience the same natural wonders I did. Now I have to deliver and that's getting increasingly difficult.

The "climate crisis" crisis

My favourite TV shows when I was a child were animal documentaries. Sir David Attenborough's voice still rings in my ears whenever I see the BBC logo. However, it was a series on the destruction of the Amazon rainforest I saw in the mid-1980s that really framed how I would perceive the world.

The completion of the Trans-Amazonian Highway in the 1970s resulted in the pace of deforestation racing ahead. There was real concern at the pace habitats

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were being lost and what the impact was going to be on indigenous peoples and on global biodiversity. By the end of the 1980s an area the size of Great Britain was being cleared annually.

This all came back to mind recently when Emmanuel Macron sought to politicise the fires in the Amazon to boost his environmental credentials. In the last 30 years climate concerns have moved from a niche consideration to form the basis for at least some government policy in almost every country in the world. Politicians now understand voters are motivated by concern for the global climate and will support policies to protect the environment.

The problem with how environmental news is reported is journalists inevitably give in to sensationalism. The recent fires in California are a great illustration. A headline read "California is on FIRE!" The Brentwood fire, for example, was three miles from my house and encompassed 300 acres. The area burning is reported in acres but there are 360 acres in a square mile and California is a large state with an area of 163,696 square miles. Loss of life is never something to trivialise but we need some perspective when we think about how environmental data is reported.

For example, despite the fact that an area the size of Great Britain is being cleared in the Amazon every year since the 1980s, the total land mass of the Amazon has been decreased by 13%. That's still a large land area and it is something that is likely to have consequences for the region and potentially for globally over the coming decades – but it is not a short-term problem.

That's the really big conundrum for talking about the climate. The trend is clear but urgency tends to depend on sensationalism or occasional emergencies. Nothing is going to change until there is a clear rational economic reason to evolve. That's why I am writing to you this month.

There is a world of difference between politics and policy. Grandstanding in front of cameras and announcing pledges to curtain carbon emissions to "save the planet" make for great TV and look good on election campaigns. A sixteen-year old sailing across the Atlantic to berate global leaders for squandering her generation's inheritance is also headline grabbing.

However, anyone paying attention to the pace of global emissions is well aware that the global economy is a long way from meeting even modest targets. Perhaps even more importantly, there are significant concerns about whether the agreed-upon cuts to emissions are capable of having the desired effect of arresting the changes already underway.

Preaching at people does not work. They just switch off. The simple fact of the matter is Brazil is an enormous country with a large population and significant external debts. The massive natural resources in the form of land, timber, oil, iron-ore, coffee and other commodities represent the foundation of the economy despite efforts to diversify over time.

The country's classic solution to placate public unrest is to give people more land

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to grow crops and rear cattle. Every single politician in the last parliament was implicated in the "washing machine" bribery scandal and there is considerable public outrage at how the proceeds of the commodity boom were pilfered and squandered by politicians. The new populist administration is giving people what they want which is a route to a better life.

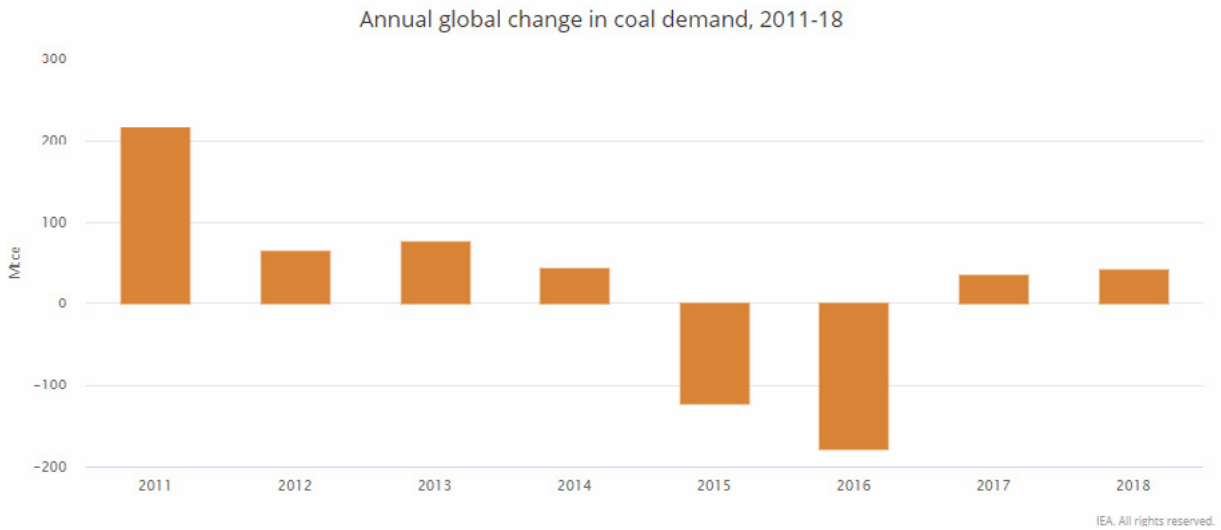
Burning down the Amazon is the price for that policy. This is exactly what has been going on for decades. There is no way Brazilians are going to stop their slash-and-burn policies until their economic conditions improve enough so they don't have to any more.

But there is a major challenge standing in the way:

Growth = pollution

The world's biggest coal burners are all in Asia. Global demand for coal is still on an upward trajectory and that is despite everything we have done domestically to tax fossil fuel consumption and to encourage economising.

The International Energy Agency reports that although global coal demand retreated in both 2015 and 2016, it has gone right back to growing again over the last couple of years.



Source: The International Energy Agency

One of the primary reasons coal demand retreated in 2015 and 2016 was because of the shuttering of US coal-fired power stations. Natural gas is now so abundant that it outcompetes coal as a fuel for power generation.

That transition led to large numbers of coal miners going bust in 2015 and 2016

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and that contributed to a one-time drop in global demand growth numbers. Once those bankruptcies had occurred global demand growth for coal ticked back up.

The impact of natural gas on the US's emissions is hugely ironic. The country refused to take part in the Kyoto Protocol, the Doha Amendment or the Paris Agreement but it is one of the only countries to have met the criteria for these agreements because it has allowed capitalism to take precedence over regulatory overburden.

The fact that the US is the only country in the world which is dominated by private sector ownership of mineral rights, which are not encumbered by massive royalty payments to government, means it has a clear incentive to pursue profit and, by extension, efficiency to maximise that profit.

China and India have the world's largest populations, some of the world's highest growth rates and neither is anywhere close to being energy self-sufficient. They not only have to provide for greater energy consumption as living standards improve, but they have to achieve that at the lowest possible cost.

Every dollar spent importing energy is a dollar lost which could have helped boost domestic growth. Right now, the answer to that conundrum is coal. It is cheap, abundant and both China and India have domestic supplies but it is massively polluting. However, when it comes to jobs and growth, air quality takes a back seat.

India is following the same policies China did to achieve growth and as a result now has the most polluted cities in the world with particulate levels well ahead of most of China's cities. That's not exactly something to boast about, but it is the price of economic development – which is essential when 600 million people are under the age of 25 and looking for education, jobs and opportunities.

Regardless of what we do here and how strongly we feel about the global climate, there is going to be no improvement until we see a change that is so compelling that it makes coal completely uneconomic.

Therefore, the only way to get to a position where the world embraces alternative sources of energy and develops a newfound care for the environment is to ensure the case for cleaner alternatives is completely beyond reproach.

Today, we are not there yet but I believe the solutions on offer today are very close to hitting the big time, which is why I am writing to you about this now.

The rise of the hydrogen fuel cell

Economics is on the side of reform because the laws of supply and demand are strongly supportive of increasing uses for natural gas. There is a good reason for that. It is dirt cheap and there is plenty of it about.

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The limiting factor behind a global price for natural gas has always been the absence of a global trading network. Historically, the only way to transport gas was with a pipeline, which meant it was impossible to move across oceans. Today, the growth of the liquefied natural gas (LNG) market is creating a global market for the commodity for the first time.

In November last year Qatar announced it is going to increase supply of LNG by 64% to 126 million tonnes a year. Australia is already producing in the region of 70 million tonnes a year while export growth in the US and Russia is also significant.

This supply growth is keeping a lid on prices and increasing the viability of natural gas as feedstock for power stations. It is also beneficial as domestic pipeline networks are created which will bring heating and cooling services to homes all over Asia.

The simple message here is that the creation of natural gas pipeline networks in Asia's major cities will probably do more to mitigate the growth of carbon emissions in the atmosphere than anything we do in the West to curtail our burning of fossil fuels.

The simple economics of any commodity market are when the price of a vital resource declines, demand increases. That is exactly what we are now seeing. New use cases for natural gas continue to appear. For example, efforts have been underway for the last couple of years to commercialise technology to turn natural gas directly into food for animals.

This kind of activity is only viable because natural gas is both abundant and cheap. Perhaps the most significant emerging application for natural gas is in the hydrogen sector.

Today natural gas is primarily used to fuel power plants, to fuel heating and cooling units, to run clothes driers and for cooking. The newfound abundance of the commodity means it will now also have a viable use case in the transportation market. That will be achieved through the build-out of a hydrogen-fuelled network which is already underway in Japan and California.

Hydrogen is a clean burning fuel and natural gas is the primary feedstock for creating it today. Steam methane reforming is the primary method in the US used for the production of hydrogen using a methane source, usually from natural gas.

The process uses heat and steam in the presence of a catalyst to create hydrogen, carbon monoxide and carbon dioxide. Therefore, it does not deliver on the panacea of a carbon-free fuel cycle but it does produce half as much carbon dioxide as burning gasoline through the entire fuel cycle.

The most important point is while natural gas is likely to be the primary driver of the growth of the hydrogen fuel cell sector in the near term, it is not necessary for

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the sector to be sustained. Improvements in using renewable technology such as solar to create hydrogen are happening all the time.

That holds out the prospect in future of delivering a fully carbon neutral solution to producing hydrogen, which is the reason behind supporting the sector in the first place.

The big benefit of hydrogen fuel cells is that they are much more efficient that internal combustion engines with a lot less energy lost during the conversion process. They are also reliable, only produce water emissions and can be used in conjunction with batteries as range extenders for transportation.

They do require additional fuelling stations to be installed but the refuelling process is relatively similar to that for internal combustion vehicles and takes about five minutes to complete. That's important because recharging batteries takes at least a half an hour and that is an inconvenience many people are unwilling to accept.

There are some who would argue the emissions produced from manufacturing battery-driven vehicles are slightly more than for a hydrogen fuel cell vehicle, but if the hydrogen is produced in a greener fashion, that argument falls very much in favour of the fuel cell.

As far as I can see, the biggest argument about whether one should support battery or fuel cell driven vehicles is about the cost of refuelling and the longevity of the battery. Most electric car batteries don't last very long and the better batteries tend to be expensive.

However, Tesla has produced technology where batteries installed in the Model 3 are designed to last 300,000 to 500,000 miles. The company also claims to be close to fielding a battery that can go 1 million miles without losing charging capacity. As that technology is rolled out, it will remove the argument about the durability of batteries.

The cost of refuelling is significantly lower in an electric vehicle, and hydrogen costs are going to be driven by the efficiency with which the element is produced. Nevertheless, existing fuel cell vehicles get excellent fuel economy at about 66 miles per gallon for the Toyota Mirai.

That works out at about $0.33 a mile whereas the cost to refuel a Tesla Model 3 is about $0.037. It is therefore almost 90% cheaper to refuel an electric vehicle.

It's important to highlight these competing factors because fuel cells are unlikely to compete with batteries on cost when it comes to mobility. I think that's what many people concentrate on but it is not even half the story.

I have a strong belief we are going to see a hydrogen fuel cell economy evolve because the cost to produce the element is falling all the time and it is inevitable we are going to see uses appear for it.

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That is exactly what we have seen with low-cost natural gas and it will be exactly the same with hydrogen.

So, how do we play this trend?

I have previously recommended Tesla as an investment and I have held on to my conviction that it is a company with a bright future ahead of it, despite some rather damning commentary from other analysts. The fact is battery technology continues to improve and range anxiety is rapidly receding as an issue for consumers.

The challenge for batteries relates to future use cases rather than what we have been accustomed to. Elon Musk has alluded to that himself when he said that an autonomous vehicle would be an income-producing asset because it would drive others around when we not needing it ourselves.

The longer a vehicle is driving around, the more time it will take to charge the battery. That's where a range extender comes in. That's particularly true of haulage vehicles which have to transport heavy goods long distances.

Hybrid fuel cell/battery vehicles would have significant range advantages over batteries alone. The good news is there is room for both solutions in the emerging transportation landscape because the tolerance for internal combustion engines is wearing thin.

Again, economics is going to play a role here too. The simple fact is many existing auto manufacturers are unlikely to survive the onslaught from electric vehicles on a simple total cost of ownership argument. The only way they are going to survive is by providing superior products with a clear rationale for ownership.

It's even truer of the world's merchant marine fleet which is already beginning to experiment with fuel cells. The International Maritime Oraganisation 2020 ruled from 1 January 2020 that marine sector will have to reduce Sulphur emissions by over 80%. These are a small step towards tackling the emissions of the global shipping fleet.

The economics of shipping and the slim margins they work on mean the progress towards a global standard for zero emission shipping is going to be long and torturous. Bringing down the cost of propulsion with fuel cells would be a major innovation that would meet many of the goals of the environmental movement in a single swoop.

The power demands of data centres are an ideal use case for fuel cells because they represent about 2% of the US's energy consumption. They require total reliability because they need to provide services on a 24/7/365 basis.

Once fuel cells are installed, they can provide energy at a rate below that of the electrical grid. When eBay opened a data centre in 2013, it installed a 6MW fuel cell and added an additional 3.5MW in 2015.

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Microsoft redesigned one its data centres to run on the gas mains flowing directly into the server where they drive the fuel cells. By streamlining the process, Microsoft estimates it will double the efficiency of the data centre. This is exactly the kind of virtuous circle that can drive a bull market because it creates a no-brainer argument for sales to grow.

Let me summarise…

There is clear evidence that we are dealing with a warming environment particularly in the world's oceans. The desire of billions of people to achieve a better standard of living is driving degradation of the habitat we rely on.

Reporting on this issue tends to be emotive, driven by political avarice and often motivated by a desire to raise taxes but that does not obviate the evidence of warming.

Coal burning, deforestation, coral bleaching, shipping emissions, power and transportation emissions all contribute to lower standards of living for everything on this planet.

The only way we are going to solve for these problems is through delivering an undeniable use case. Natural gas is a partial solution because it enables the hydrogen fuel cycle.

Future innovation will dispense with the need for natural gas. The good news is a small UK company is a world leader in providing next generation fuel cells to fuel the evolution of this sector.

And that brings me to…

My recommendation

Ceres Power's steel cell technology is being deployed across a range of industries. It's scalable, patent protected and is likely to be a major beneficiary of the growth of the global fuel cell industry.

The company is headquartered in Horsham and its new manufacturing facility just opened in Redhill outside of Croydon. It currently employs 240 scientists and engineers in the UK and has deployed a capital-light business model where it licenses its technology to third parties with a view to collecting royalties.

The innovative hook powering the company's growth is its modular SteelCell technology. These slim fuel cells are manufactured from widely available materials and all that is needed to create a larger fuel cell is to stack them one on top of another.

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It's taken 16 years to develop this technology and the company flirted with bankruptcy back in 2012. However, some changes to the board and a fresh focus on commercialisation are fuelling a turnaround for the company and it is now on the cusp of mass adoption of its solutions.

Because the SteelCells are manufactured from steel and ceramics, they are cheap to build. That contributes to the efficiency of the end product because it keeps costs under control.

Here is how the company claims efficiency can be improved with its technology:

> *Current efficiency of 35-40% from traditional centralised power generation can be improved to around 50% without the transmission and distribution losses that occur through the grid. Efficiency can be improved further to > 90% if a Combined Heat and Power (CHP) system is used for heating water.*

To date the company has strategic partnerships with both Nissan and Honda to supply intellectual property and knowhow for their fuel cell programmes.

It has also been working in conjunction with Cummins and the US Department of Energy to develop larger examples of its fuel cell stacks; it has accepted an investment from Weichai Power, selling a 10% stake in 2018; and it has also signed another partnership agreement, this time with Robert Bosch GmbH. The company's partnership with Bosch brings with it large-scale manufacturing prowess, which will also provide the full commercialisation of the company's SteelCell technology.

In July 2019 it announced a partnership with Doosan, a South Korean fuel cell manufacturer in a deal worth $10 million. In September, Bosch announced a $230 million investment in Nikola trucks which relies on Ceres fuel cells.

The kinds of deals struck follow a three-stage process. They first agree on joint product development and an engineering service. Second is the licence system and manufacturing terms for tech transfer. Third, royalties flow as products are sold.

Following this model, the company sees potential for $1.03 billion in revenue by 2025 as demand for decentralised power, electric vehicles and clear power data centres increases.

The company's first product was released last quarter with a launch by Japan's Miura Co. with a SteelCell in a combined heat and power system for commercial use which aims to capture heat that would otherwise have been wasted. The system achieved 50% electrical efficiency in initial testing, with potential to reach 90%.

The company issued £20 million in additional share capital in 2018 with Bosch taking its holding up to 4.4% of the company for a spend of £9 million.

Revenues more than doubled in the year to March 2019 for the fourth year running and are expected to be meaningfully higher when 2019 figures are

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reported. This is a clear signal that the path to commercialisation is well on its way to fruition.

The long-term goal is for the fuel cells to find their way into power plants, business centres, data centres, electric vehicles and homes. The agreement with Weichai Power particularly highlights the end use of deploying SteelCells as range extenders for electric vehicles.

It broke up out of a four and half-year base formation in 2017 as it cleared the psychological 100p level in emphatic form. It popped above 200p for the first time in September last year and has been consolidating above that level since. My 12-month target is 300p and 3-year target is 400p.

The risk as with any company trying to commercialise an exciting new product is that it will take longer than it imagines to get to market or another company will swoop in with a better option. Considering the investment from partners Ceres has been getting, I don't consider that a large risk but it is a risk nevertheless. The more successful fuel cells become, the greater the risk is of much larger companies attempting to move into the market.

The company is well capitalised so it is unlikely to need to raise money in the short term, but capital requirements for development-stage companies do also represent risks of dilution for existing shareholders, so that is something to bear in mind.

Action to take: buy Ceres Power
Ticker: CWR LN
Price as of 20.02.20: 508.00 GBp
Buy up to: 460p
Market cap: £779.19 million
52-week high/low: 530.00p/137.02p

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The UK company at the heart of the hydrogen boom

As soon as this year, the British government is going to be forced to take drastic action to address a national emergency.

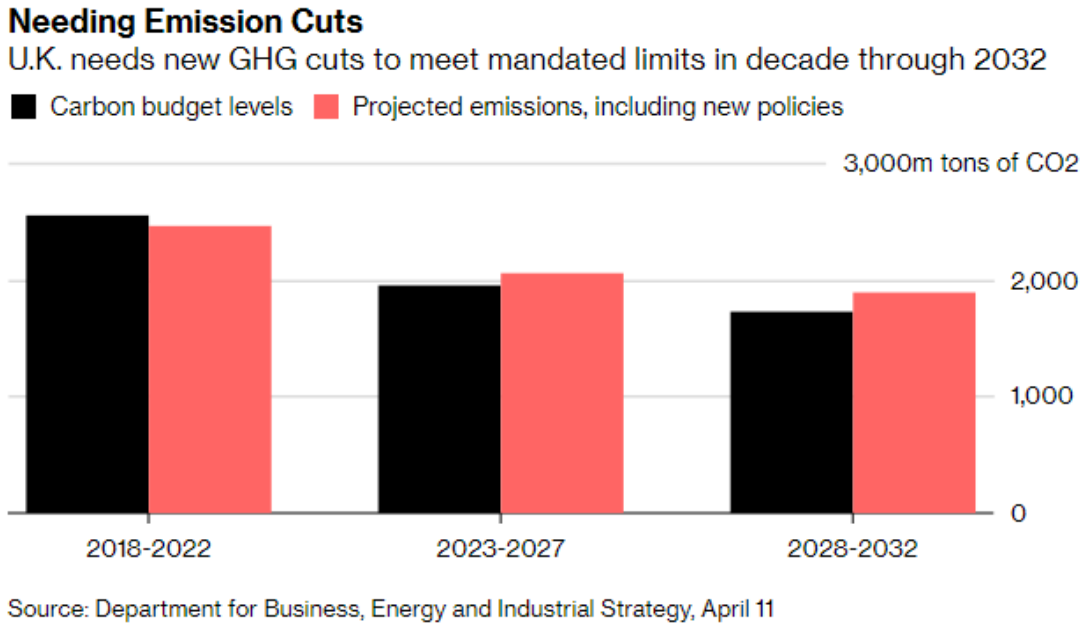
The emergency is not about Brexit, austerity or the NHS, or any of the other huge difficulties faced by our islands at the moment.

You could argue it's something potentially far more devastating and with even wider implications.

The emergency concerns climate change.

Specifically, how Britain is going to meet emission targets through 2032.

Quite simply, we're on track to miss the mandated limits in carbon emissions in the decade through 2032.



Last year, the government confirmed it not only remains on course to miss its carbon targets for the mid-2020s onwards, but the shortfall against the UK's legally binding carbon budgets has actually worsened.

The report by the government's department for Business, Energy and Industrial Strategy (BEIS) revealed that while the UK is on track to comply with the current third carbon budget, which runs from 2018 to 2022, it is expected to miss the fourth and fifth carbon budgets by a wider margin than previously expected, based on current policies.

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In fact, the BEIS said there were "projected shortfalls against the fourth and fifth carbon budgets of 139 and 245MtCO2e respectively", suggesting the country will miss carbon targets for the 2023 to 2027 period by 5.6% and then miss the budget for the 2028 to 2032 period by 9.6%.

For a government that has long talked up its green credentials, this is terrible news.

That's because, with the expected "emissions gap" worsening since last year's official update, it's clear that the government's current UK policies – which include the Renewable Transport Fuel Obligation, vehicle efficiency policies, F-Gas rules, the Renewable Heat Incentive, the Energy Company Obligation, and smart meters – aren't working, or at least not working fast enough.

What's more, the decarbonisation challenge faced by the government actually *increased* in the subsequent months, after the UK adopted a more ambitious net zero emission goal that's fully in line with the Paris Agreement.

Missing the targets is not an option

What all this means is that the government needs to find a way – or ways – to cut greenhouse gas emissions by a whole lot more than it's doing at the moment.

Let's be clear: missing the targets is not an option for the government.

No government will want that on its record, especially one that has talked such a good game on climate change.

But it's more than PR.

By missing the targets, the government will be at risk of legal action under the Climate Change Act 2008, which says ministers must plan to meet UK carbon budgets.

The act obliges ministers to set out how the UK will meet its goals. Section 13, below, says the government "… must prepare such proposals and policies as [it] considers will enable the carbon budgets… to be met."

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Proposals and policies for meeting carbon budgets

13 Duty to prepare proposals and policies for meeting carbon budgets

(1) The Secretary of State must prepare such proposals and policies as the Secretary of State considers will enable the carbon budgets that have been set under this Act to be met.

(2) The proposals and policies must be prepared with a view to meeting—
  (a) the target in section 1 (the target for 2050), and
  (b) any target set under section 5(1)(c) (power to set targets for later years).

(3) The proposals and policies, taken as a whole, must be such as to contribute to sustainable development.

(4) In preparing the proposals and policies, the Secretary of State may take into account the proposals and policies the Secretary of State considers may be prepared by other national authorities.

Section 13 of the Climate Change Act 2008.

So what will the government do?

To answer that, we need to delve back into the Climate Change Act 2008.

You see, tucked away in section 17 of the act is another interesting requirement, namely that it has to take obtain advice from the so-called Committee on Climate Change (CCC) and to take account of that advice (see paragraph 4, below).

17 Powers to carry amounts from one budgetary period to another

(1) The Secretary of State may decide to carry back part of the carbon budget for a budgetary period to the preceding budgetary period.
The carbon budget for the later period is reduced, and that for the earlier period increased, by the amount carried back.

(2) The amount carried back under subsection (1) must not exceed 1% of the carbon budget for the later period.

(3) The Secretary of State may decide to carry forward the whole or part of any amount by which the carbon budget for a budgetary period exceeds the net UK carbon account for the period.
The amount of the carbon budget for the next budgetary period is increased by the amount carried forward.

(4) Before deciding to carry an amount back or forward under this section, the Secretary of State must—
  (a) consult the other national authorities, and
  (b) obtain, and take into account, the advice of the Committee on Climate Change.

(5) Any such decision must be made no later than 31st May in the second year after the end of the earlier of the two budgetary periods affected.

Section 17 of the Climate Change Act 2008.

Established 11 years ago under the Climate Change Act, the CCC is a cross-party group of MPs that's right at the centre of UK climate policy.

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In fact, in policy circles, its analysis defines the discussion.

In the decade or so since it was set up, the CCC's advice has been followed much more often than not. That's because the government runs a tangible risk of a judicial review if it does not follow the CCC's policy advice.

What this means is that it's worth closely following what the CCC says to get an early steer on likely governmental policy.

And it's here – on the paths the government should take to speed up the UK's emissions cuts – that the CCC has been clear.

In fact, according to the CCC, there's one particular gaseous substance that could form the backbone of any substantive efforts to cut emissions across energy generation, transportation, industry and heating.

That substance is hydrogen.

Hydrogen offers climate change hope

In fact, in its last report in May last year, the CCC mentioned "hydrogen" a total of 141 times, which was quite something considering the report was 270 pages long.

Hydrogen, in fact, was one of the central themes to emerge from the CCC report, which said it could contribute to the UK actually ending its contribution to global warming within 30 years by reducing national greenhouse gas emissions to zero by 2050.

Hitting the new stiffer target will require a "significant low-carbon hydrogen economy", the report said, as the gas is the one alternative energy solutions that cuts across all systems.

After all, hydrogen has the unique potential to change the way we use, store and balance energy.

Unlike natural gas, for example, hydrogen is a zero-emission fuel as it emits only water when burned. Either you convert natural gas into low-carbon hydrogen, or you convert excess renewable energy into a hydrogen gas.

For instance, as hydrogen-fuelled cars produce water vapour instead of greenhouse gases from their exhaust, the CCC said all new cars and vans should be electric or run on fuels such as hydrogen by 2035 at the latest.

The committee also suggested hydrogen as a potential alternative to natural gas that could be piped by adapting the current transmission network for use in periods of peak electricity and heating demand.

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Indeed, studies have found that converting the UK to hydrogen gas could be £150 billion to £200 billion cheaper than rewiring British homes to use electric heating powered by lower-carbon sources.

What's more, hydrogen heating would be the least hassle for energy customers because very few appliances would need to be replaced.

In fact, the existing gas grid would need only minor upgrades because it was actually originally designed for hydrogen before the North Sea boom provided a flood of cheap natural gas to burn instead.

The plan is a crucial part of efforts to cut carbon from heating, which makes up almost a fifth of the UK's total carbon emissions, because hydrogen produces only water vapour and heat when burned – with no carbon emissions.

Although the government has already proposed a ban on gas boilers in all new-build homes from 2025 – a ban made at the response of the CCC, I might add – there's a much bigger problem of converting the 23.9 million existing properties heated by natural gas, meaning radical alternatives such as hydrogen are needed.

UK set to spend half a billion euros per year on the hydrogen economy

"By 2050, a new low-carbon industry is needed with UK hydrogen production capacity of comparable size to the UK's current fleet of gas-fired power stations," the CCC said in its May report.

Digging deeper into the numbers, the technical report backing up the headline CCC report predicted that between 6 GW and 17 GW of electrolyser capacity (electrolysers produce hydrogen by using an electrical current to split water molecules into both hydrogen and oxygen) will be required in the UK by 2050, depending on energy demand and utilisation rates.

This prediction implies the country will need to build up to 567 MW of electrolysis per year for 30 years.

Considering each megawatt of electrolyser capacity costs about €1 million, that's over half a billion euros that will need to be spent in the UK per year on average for 30 years to get to zero emissions.

For the so-called hydrogen economy in the UK, that's huge.

Although the CCC report was focused on 2050, the government will have its analysis at the forefront of its mind when it also considers how to meet its carbon budgets out to 2032.

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Window of opportunity

The government is considering the CCC report and, with a history of respecting the advice from the independent body, is expected to adopt most or all of its recommendations. That could see it implement policy to back multi-billion pound investments in the hydrogen economy.

When it will do so is not clear, however. There is currently no policy framework for hydrogen in place and the timing of any decision-making is not known yet.

However, the CCC said the government "should legislate as soon as possible" and that its target is "only credible if policy to reduce emissions ramps up significantly".

What's more, MPs on the influential Business, Energy and Industrial Strategy Committee have said the rules should be changed as soon as 2020 to allow hydrogen into the natural gas grid.

In fact, it is now the most urgent task of any government to put in place the policies needed to rapidly decarbonise our economy over the coming decades.

Lawmakers from across the political spectrum are in agreement: hydrogen can significantly reduce the nation's greenhouse gas emissions and help transition to a low carbon system.

Quite simply, the UK is looking to replace natural gas sooner than many will expect, leaving us with a window of opportunity right now to take advantage before the government presses "go" on its plans.

Plans already taking shape

The good news is that the industry isn't moving from a standing start.

One pilot hydrogen project, named HyDeploy and run by Keele University in northern England, is already up and running, and aims to blend a volume of as much as 20% of hydrogen with normal gas supply. The project is currently serving 30 university faculty buildings and 100 domestic properties in the local area.

If small-scale testing is successful, this could then be rolled out with live public trials across 1,000 properties in northern England from summer 2020 before a larger commercial scale rollout in 2023, at the earliest.

Blending hydrogen across the whole of the UK could save 6 million tonnes of carbon every year, or the equivalent of removing 2.5 million cars from the roads.

Many of Britain's grids are already replacing metal pipes with plastic, which helps prevent leaks, improve safety and can also allow the transport of different gases including hydrogen.

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In transport, too, progress is already well under way, with fleets of hydrogen-fuelled vehicles already on our roads. After all, hydrogen-powered cars are seen as being far better for the environment in terms of emissions than those running on petrol, as when you burn hydrogen, it produces steam, meaning only water is the by-product.

But with such a ramping up of hydrogen facilities across industry, energy and transport expected over the coming years, a huge pick-up for a range of UK-listed companies will take place.

But there is one stand-out hydrogen company that will, to my mind, benefit particularly.

It has been growing steadily for a few years, manages its finances well for a small growth stock, and is seeing deals increase in both number and size.

What's more, it's actually supplying the kit behind the ground-breaking project at Keele University, putting the firm in prime position as the project is scaled out.

Its name is ITM Power and it's listed on the AIM market in the UK.

ITM Power – the UK-listed hydrogen trailblazer

ITM Power is a leading supplier of hydrogen production plants, so-called electrolysers, including complete hydrogen refuelling stations. Its electrolyser technology is already being taken up in consumer and industrial applications. As said, it's supplying the electrolyser system to the HyDeploy project mentioned above.

The AIM-listed company's power-to-gas business provides proton exchange membrane (PEM) storage systems that allow customers to convert excess electrical energy into hydrogen for injection into the gas grid or storage for vehicles.

The group's clean fuels solutions come in the form of modular hydrogen stations to recharge fuel cell vehicles.

It currently has eight hydrogen fuelling stations across the UK. Two more are under construction and they have planned and financed another three.

Having expanded over the last five years, it is currently developing a larger production facility in Sheffield. Once complete, it will have five times the manufacturing space as ITM's current home. Marry that with a decade of industry experience, an established expertise and a growing project pipeline, ITM looks set to ride the hydrogen wave.

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Products and projects

ITM's projects range from hydrogen refuelling stations in fuel garages for cars, a civic project for Birmingham's bus network, a refining plant in Germany, energy storage for tidal energy and clean hydrogen supply. It is involved in so many parts of the hydrogen industry that, as hydrogen becomes a more popular choice, it will benefit across the board.

One of the best-looking things about ITM is the project pipeline it is building up.

It now has eight hydrogen "solutions" installed across the UK. Two more were under construction, including the largest one yet for the Birmingham bus fleet. Another three are financed and in the design and planning phase.

It generates revenue from multiple sources, including from consultancy, design, grants, fuel sales and – the biggest contributor – construction contracts, many of which are field leading.

For example, ITM has installed the first "under the canopy" charging station alongside normal petrol pumps. This is at the Beaconsfield service station on the M4, one of the busiest in the country.

It has also built and operates the largest PEM electrolyser in the world. Basically it's a 10 MW hydrogen refinery.

It was also the first company in the world to generate hydrogen using energy from tidal power.

This is crucial because one of the problems with current electric vehicles is that they are actually quite carbon intensive to make. The batteries in particular need a lot of fossil-fuelled electricity to make.

If ITM can produce hydrogen from renewable sources like tidal, so-called "green hydrogen", it would accelerate the decarbonisation of road transport, with ITM leading the charge.

Gas blending project now fully operational

I said above that ITM Power is involved in the ground-breaking HyDeploy project at Keele University, the first live pilot project to inject zero carbon hydrogen into a gas network to heat homes and businesses.

HyDeploy is a £6.8 million project funded by UK energy regulator Ofgem and its ultimate goal is to "establish the potential for blending up to 20% hydrogen into the normal gas supply" in order to reduce carbon dioxide emissions.

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Well, the hydrogen for the pilot project is being produced by an electrolyser – which uses an electrical current to split water molecules into hydrogen and oxygen – supplied by ITM.

As of early 2020, the pilot trial is fully operational, injecting up to 20% of hydrogen into Keele University's existing natural gas network, feeding 100 homes and 30 faculty buildings.

If a 20% hydrogen blend was rolled out across the country it could save around 6 million tonnes of carbon dioxide emissions every year, the equivalent of taking 2.5 million cars off the road. That's why this project is so exciting.

No wonder that ITM Power CEO Graham Cooley described the HyDeploy's pilot project as a "very significant step.

"The increased use of hydrogen to decarbonise heat via the gas grid will perform a critical role in helping the UK to fulfil its ambitious climate change obligations," Cooley said.

"Indeed, the Committee for Climate Change has indicated that the UK will need between 6 GW and 17 GW of electrolysis in the next 30 years to store renewable power and provide renewable heat."

This prediction above implies the country will need to build up to 567 MW of electrolysis per year for 30 years.

As I explained above, considering each megawatt of electrolyser capacity costs about €1 million, that's over half a billion euros that will need to be spent in the UK per year on average for 30 years to get to zero emissions.

For the so-called hydrogen economy in the UK generally, and ITM specifically, that's huge.

Remember, MPs on the influential Business, Energy and Industrial Strategy Committee have said the rules should be changed as soon as 2020 to allow hydrogen into the natural gas grid.

If the HyDeploy trial proves successful, then a positive outcome is that much more likely.

Shell partnership

What's more, the firm has also recently renewed its partnership with Shell for vehicle refuelling, which had been in place since 2015. So far, ITM has installed three refuelling stations in Shell garages in the UK. Three more are funded and planned: in Derby, as well as two in London. The new agreement will run until 2024 so we can expect to see more new projects like these in the UK.

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But it doesn't stop there. Shell, with ITM power, is building the world's largest hydrogen electrolyser. The project, called "Refhyne", enables hydrogen to be made from electricity rather than natural gas. This facilitates the use of more renewable electricity, reducing the carbon footprint of the company, which is a key goal for obvious reasons.

This is obviously a big success in its own right, but will also serve as a reference point for future bids into the industry.

ITM is also in partnership as a fuel supplier to Green Tomato – a UK taxi company that uses environmentally friendly cars for its taxis – and London's Metropolitan Police.

Green Tomato is a leader in the green-taxi field in the UK. These relationships can tell us as much if not more than just balance sheets and income statements at this early stage in the company's growth.

But the company isn't just focused on the UK. In fact, it has also made its first sale of four 250 kW electrolyser systems to three different customers in Australia.

Australia is a clean tech leader and so a crucial market for hydrogen companies. It's a positive sign to see ITM making its first steps into that market.

In fact, around the world, ITM has built a reputation for excellence that is clearly carrying weight with major consumers.

German chemicals giant Linde takes 20% stake

No wonder, then, that late last year it announced it would form a joint venture with German chemicals giant Linde, which – and here's the best bit – will also take a 20% stake in the firm.

Linde, ITM said, had made a firm commitment to buy £38 million of company shares as part of wider plans to raise at least £52 million. The rest of the fund-raise was placed with certain existing ITM shareholders and new institutional investors.

ITM shareholders were also offered the opportunity to acquire shares through an open offer that raised up to an additional £6.8 million.

The cash raised will be used to enhance the manufacturing capabilities of ITM, particularly for the development and production of large-scale 5MW electrolysers; to facilitate product standardisation and manufacturing cost reduction; to fund its initial financial contribution to the JV and to provide working capital and balance sheet strength to support the delivery of the contract backlog and opportunity pipeline.

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As for the 50/50 joint venture with Linde, that will focus on delivering green hydrogen to large-scale industrial projects, principally those with an installed electrolyser capacity of 10 MW and above, the company said.

Be clear: the investment and joint venture with Linde is brilliant news.

As well as a sign of the continued strength of ITM Power, it also shows an increased emphasis placed on hydrogen as part of the clean energy transition.

In fact, the chemicals firm is just the latest Tier One industrial gases major to move into the hydrogen energy sector. The two sectors are natural fits for each other and Linde, like all the other gas firms that have made similar investments, is just positioning itself today for tomorrow's growth.

Linde, of course, recognises that hydrogen is a massive part of the clean energy transition.

Financials

A look into the books reveals that ITM's revenue has grown steadily since 2014, from £1.13 million to £4.6 million. The year ending April 2019 saw a 40% increase from 2018 alone, when it was £3.3 million. That kind of revenue growth is incredibly exciting, and reflects ITM's unique position at the forefront of the UK electrolyser market.

Operating losses increased once again though, as the company invested to "significantly scale up facilities, resources and production capacity". Given how I feel about the hydrogen industry's trajectory, I'm happy to see ITM investing heavily for the future, even if current finances take a hit.

And since this announcement, the company has begun the retrofitting of its "world's largest" renewable hydrogen factory in Sheffield. It will be ITM's global manufacturing HQ, capable of manufacturing 1 GW (1,000 MW) of electrolyser capacity per year.

So it means what it says – it is investing wholeheartedly in the future growth of the company, and in the current investor climate, it's easy to see why this has been beneficial for the share price. Investors love growth, and hydrogen is the ultimate growth story. ITM's investments are an appropriate reflection of that.

On the commercial side of things, average project size is up from £3.5 million to £6 million, reflecting strong demand for larger systems as the hydrogen fuel and energy storage markets continue to grow worldwide. ITM expects to begin production in the spring of 2020.

Its fuel contracts number 33 now, up from 20 in the previous year. This has resulted in increased revenue from fuel sales – £370,000 up from £160,000.

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This stat more than any other perhaps, shows the reality of the growth in the hydrogen story last year.

Over 100% growth in hydrogen fuel used from ITM's refuelling stations for road-based vehicles gives an indication of how quickly fuel cell vehicles are becoming mainstream, as long as the vehicle manufacturers can produce enough cars to keep up.

At the end of the 2019 financial year (in April), its pipeline stood at £379 million, a dramatic increase from £240 million the previous year.

Growth in the business is strong, and the increased spending reflects that.

I fully expect the investment in new projects and manufacturing capabilities to pay off over the next few years.

In any case, the fact that ITM power is loss-making is far more the result of being in a very young industry than any product or business failures of the company.

With momentum increasing in the hydrogen market, that should be the start of a great period when ITM can finally capitalise on all its hard work over the last decade.

Risks

There are a few main risks and factors mitigating against widespread hydrogen adoption, which could affect the share price of ITM moving forward.

Firstly, the main risk affecting all green energy companies is that regulation doesn't move quickly enough to give businesses the confidence they need to invest. We don't know exactly when the UK will firm up its policies on hydrogen and although I expect this will take place in 2020, there's a chance it might not happen until the early or mid-2020s.

Secondly, Brexit is a key risk. If trade relations with the continent fray and worsen, ITM could lose out to European competitors. Or EU funding could fall away. At this stage, it's anyone's guess what will happen.

There is also a risk that in the event of a wider global downturn, the financing on which the company still relies could be less forthcoming. If interest rates go up, its indebtedness will become more of a problem.

It also has a few competitors, including Hydrogenics and McPhy Energy, while Siemens and Thyssenkrupp are two of the larger global players.

However, in my eyes none of these other companies are as well positioned to capitalise on the hydrogen boom as ITM.

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On a wider level, the hydrogen sector will be hit if battery electric vehicles (EVs) become significantly more competitive. Hydrogen-fuelled cars are competing for market share with EVs as petrol vehicle usage fades. There looks to be plenty out there for both hydrogen and battery EVs, but should an unforeseen super-development occur in battery EVs, they could become by far the better option.

What's more, more testing is needed to ensure hydrogen is viable on a commercial scale, while questions remain on the cost of switching to the fuel. Renewable energy and batteries may even curb the need for green gas.

A plan by distributor Cadent Gas Ltd to build a hydrogen network across about 20% of Britain to heat homes and supply industry would require about £20 billion. Costly but not that costly, especially not set against the alternatives.

Buy now before the government presses go

The stock is on somewhat of a tear right now, rising from 50p in late October to a latest price of around 160p. It's up 90% so far this year alone.

But I think it is on the verge of a move to £2 and beyond, potentially even above £10 one day.

After all, the forces are beginning to align for hydrogen, which will spur huge demand for ITM's products in all manner of applications from industrial settings – in refineries or steelmaking plants, for example – to renewable energy sites and from the petrochemicals industry.

Based on the CCC report, ITM expects spending on electrolyser technology in Britain alone will be roughly £500 million a year every year for the next 30 years.

That's 100x more than its current revenue, meaning tapping just 10% of the UK market would increase revenues by 10x.

But it gets better…

Expert forecasts predict hydrogen is set to grow globally into a new $2.5 trillion market.

To do so, it will need companies like our innovative developer from Sheffield.

If ITM tapped even 1% of that revenue, it'd grow its revenue by more 500x from where it is today.

Remember, ITM looks set to be a prime beneficiary of rising demand for low carbon hydrogen.

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These are exciting times for ITM, make no mistake. It is seeing good progress from its flagship 10 MW refinery project and is set to reap the benefits of the CCC aspirations to make the UK zero emissions by 2050 and its recognition that PEM electrolysis will be an integral part of the new energy mix.

The firm is also set to open a much larger new factory over the next year.

Remember, the UK's influential CCC has already made clear the UK is going to need millions and millions of pounds worth of the equipment that ITM makes.

Invest now before the government confirms it.

ITM update (EEF 07/02/2020)

The issue of cost also dominated the talk by Lucas Bertrand, a business development manager of our very own ITM Power.

This was a session I was particularly looking forward to attending, so it was pleasing to see it attracted one of the biggest audiences of the programme, a good sign for how the UK-based manufacturer of hydrogen solutions including electrolysers has made itself a big player far beyond its Yorkshire HQ.

Bertrand's session concentrated on how ITM was looking to bring down costs by scaling up – specifically by opening a 1 GW per year electrolyser manufacturing plant in Sheffield's Bessemer Park.

This will be the world's biggest electrolyser factory, no less, with the site consolidating ITM's manufacturing. The factory, which will fully open in the summer, will comprise a product assembly plant and a stack manufacturing hub, some of the processes for which will be semi-automated.

ITM's offering needed to grow quickly in response to rapidly growing demand for large-scale industrial electrolyser systems, Bertrand said.

These changes would mean ITM's average system price was set to fall from around €1,000/kW to under €500/kW in 2025, with the average order rising in response from three to 20 over the same timeframe.

Producing green hydrogen at these costs will make it competitive not only against so-called grey hydrogen, which is extracted from gas with CO2 emissions, but also against other low-carbon sources as well as fossil alternatives. This would send a number of projects in ITM's direction, Bertrand said.

Walking away from Bertrand's talk I was left in no doubt that ITM was perfectly positioned for strong growth going forward.

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The green hydrogen market is growing faster than many people expect and I believe it will be a multi-billion dollar industry because of its growing economic competitiveness.

Source: editor's own photo

France, of course, is a leading player in the race for the so-called hydrogen economy. The French government recognised back in June 2018 hydrogen's role in the great decarbonisation quest, unveiling "Plan Hydrogéne" to support the nation's nascent hydrogen industry with €100 million in funding.

Although it was wonderful to see that foresight laid out in its full glory at HyVolution, where it was clear a hydrogen value chain is flourishing in France, the momentum for the element is global, too.

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Action to take: buy ITM Power PLC
Ticker: ITM: LN
Price as of 20.02.20: 161.50 GBp
Market cap: £765.72 million
52-week high/low: 170.00p/ 19.23p
Buy up to: 100p