



### In this issue:

- Why energy prices are so high – and how that's about to change
- The battle: centralised vs distributed energy
- The blockchain will revolutionise energy

# The grid of the future: how distributed energy will change everything

Eoin Treacy, Investment Director



I recommend you print off this month's issue and stick it on the wall somewhere you can't miss. Keep

it there. You'll want to refer back to it in the coming years.

I'm about to show you how emerging energy technology is going to alter your life, home and finances in the coming decade.

I can say that with certainty because it'll be true for everyone in Britain, whether you invest in this new technology or not.

In this letter I'll show you how. I'm going to explain how an

entirely new way of powering your home – and indeed the whole world – is coming. It's going to disrupt the status quo of the energy industry in innumerable ways, lead to dramatically cheaper energy, skyrocketing demand and a shift away from fossil fuels. It could also be a jackpot for early investors.

Today we're going to explore the changes in detail. This is much bigger than any one particular source of energy – like solar, wind or nuclear. It's about the energy system as a whole, from power generation to usage in your home.

I'll also introduce you to my top

way of investing directly in the industry via the UK stockmarket.

Let's dive in...

## To the energy industry, I am just a number and so are you

I never really realised that until I moved to the US and found that I couldn't possibly come close to approaching the standard of living I previously took for granted without a social security number and a credit score.

It nags at me that the government and corporations only consider my life as a set of metrics and cash flows they can exploit for whatever ends they



wish.

I'm sure you feel that way too. If you want a roof over your head, running water and a well-lit, warm home... you have to cough up a big chunk of your income to a corporation that knows it has you right where it wants you.

We pay for our mortgages or rent. After all, you have to live somewhere! We pay our mobile phone, broadband, water, electricity, gas, council tax, Amazon Prime, Netflix, tuition fees, insurance premiums, gym membership with such regularity that we are no longer viewed as people or even consumers but cash flows that can be totted up and relied upon.

One of the reasons so many people feel a bubbling, but unnamable, rage is because the number of calls on our income are increasing but what we make every month hasn't changed. That's before we even begin to talk about the fact the price of essential services goes up.

Let's take electricity as an example.

We are told that the 134% increase in electricity prices between 2003 and 2015 was because of the high price of oil. The last I looked the price of oil had cratered but electricity is still close to its peak value. When was the last time you saw a meaningful *decrease* in your energy bills?

What I find even more infuriating about having to pay those kinds of prices is that on average energy consumption has gone down. We're using less energy and paying more for it. Crazy.

This is touted as a wonderful victory for the green movement. They even celebrate the fact that high energy prices have limited carbon emissions. Do these people ever think about the people fighting to even keep the lights on? What happens to electricity prices when consumption starts to rise?

High energy prices are not a triumph. They're not saving the world. They're a drain on resources and income. And frankly, in a world where

technology is bringing about dramatically *lower* prices in almost every other industry, it's a big anomaly.

The graphic overleaf highlights the fact that a medium-sized home consumes about £487 of electricity. We also have to consider that we pay about £666 a year for gas which is primarily for heating water. That's £1,153 a year for a medium-sized house.

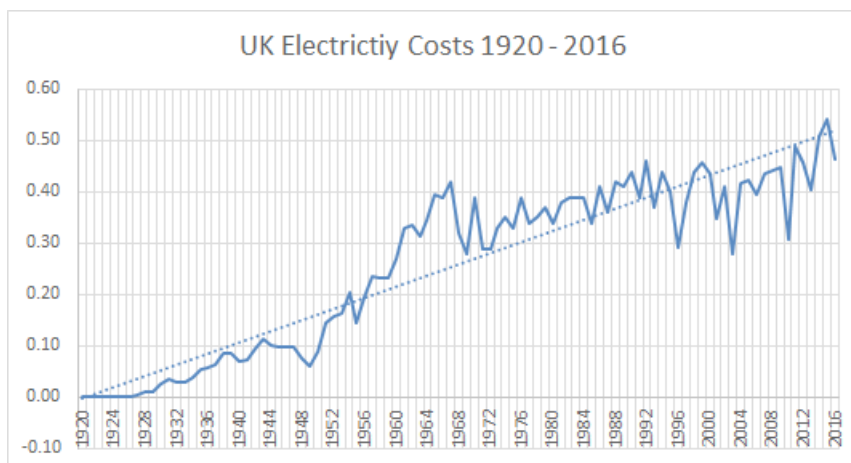
### "You won't like me when I'm angry"

It's a broken system by any means. And I think it has real consequences.

Everywhere in the media we read about the rise of populism and how that is to blame for the Brexit vote. That is flawed logic. **People are upset at the failure of the status quo to deliver on better standards of living.**

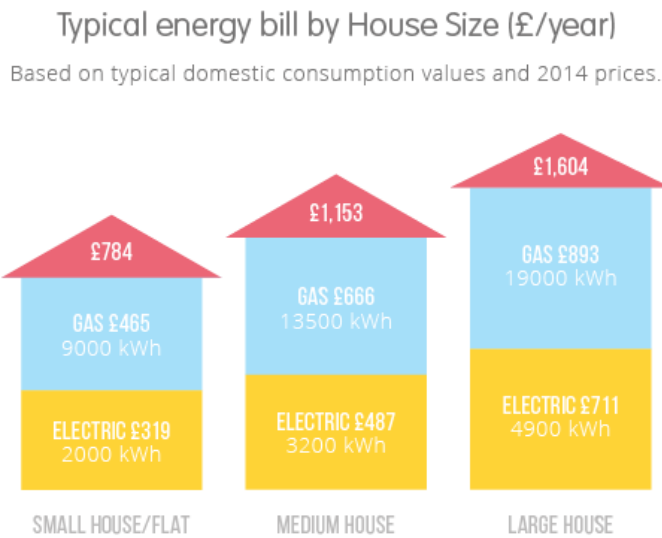
The lightning rod for the dissatisfaction was the EU because people can see billions leaving the country and little returning that is of obvious benefit. That's not populism. That's reactionism to a failed system that has not delivered on the prosperity for all that was promised. It is to be hoped politicians understand that difference.

It doesn't help that people blandly refer to these problems as upshots of capitalism or the free market. That's not true. Real free markets lead to low prices and competition, not rising prices and cartels. Look at the price of food. There's genuine



Source: Government statistics





Source: OVO Energy website

expensive in the UK in the first place.

### Five reasons UK energy is a rip-off

In 2015 the UK had the highest electricity prices in Europe before taxes. That's an extraordinary set of circumstances for a country which as recently as 2004 was a net energy exporter. To add insult to injury, European consumers already pay among the highest prices for electricity in the world so the UK's position at the top of that table represents an ignominious defeat for energy policy. But why is the UK at the top of this table? The answer is nuanced but there are some big reasons.

There are six big energy companies in the UK controlling over 90% of the country's domestic market. Guess how many are domiciled in Britain and run by British people who might have some semblance of loyalty to the British consumer.

EDF Energy is the acronym for Électricité de France, which is majority owned by the French government. E.ON UK is another and is a subsidiary of one of Germany's largest electricity providers. Npower is another German utility. Scottish Power is in fact owned by Spanish utility Iberdrola. That leaves SSE plc, previously known as Scottish and Southern Energy, which is one of the UK's largest utilities but is the only one whose primary business is supplying electricity and gas to the UK public. Centrica, which is another UK company, owns

competition and consumers have an abundance of choice at extremely low prices.

Unfortunately, I don't see a great deal of evidence for that and therefore we have to expect that political turmoil is going to become de rigueur until someone achieves power who understands that the lives of UK citizens matter more to individuals than playing nice just to get along.

We really could be waiting for a while so isn't it time we came up with an idea of how to break free from the cycle?

Government and corporations suckle on the cash flows each of us commit to when we work, live or play and depend on them for survival. But we don't have to blindly submit to that system. It's never been my intention to simply complain about the situation as it stands today but to only write about it when I can see a solution. That's what this letter is about.

What if I told you that in the very near future technology is going to free us from this situation? What if we could turn the ideas we have about energy, finance and even government on their heads? What if we could move away from scarcity and high prices and towards abundant, cheap energy?

That's exactly what's going to happen.

If the promise of energy independence is going to mean anything it will have to fit into the way people live now. It needs to be convenient and it needs to be reliable. The future is not about mass migration to the side of a mountain somewhere so we can huddle next to a wind turbine for power so we can charge our phones. It has to be better than that. And the good news is it is.

To explain what's coming and why it's *better*, we first need to understand why electricity is so



British Gas.

So, the answer is two and one if we only look at electricity.

In our quest to find the reason why UK electricity is so expensive, we can reasonably lay at least part of the blame with the fact that the majority of the nation’s utilities are foreign owned.

The second reason is because of government regulation. By closing coal-fired power stations, relying on the volatile cost of imported gas, turning its back on nuclear and mandating the construction of early generation wind and solar power, the UK’s energy landscape has changed

isolated incidents but occurred in a large number of the world’s major oil fields. In conjunction with the arrival of millions of new emerging consumers on the global stage, that contributed to a run-up in the price of oil. Since long-term natural gas contracts in Europe are often tied to the price of oil, the cost of importing gas surged right along with oil even though the UK has a deregulated gas market. Even today, after a major decline in oil prices from the peaks a few years ago, the price is still well above where it was in 2003 before the commodity bull market had started.

That leads me to the fourth reason UK electricity prices are

in their pockets but inflation doesn’t show up in the official statistics. That is exactly why your bills have increased but your paycheque hasn’t.

The fifth reason is perhaps the most important. Our energy system – with big, centralised power stations pumping energy via the national grid to homes and businesses – is becoming hopelessly out of date. A centralised system makes it easier for a handful of players to form a cartel, leading to high prices and little real choice.

What we need is a *decentralised* system – one that allows thousands of different energy sources to compete all at once, in a genuine free market.

Something that allows for a “nanogrid” like an array of solar panels on your roof to pump energy into the same system as a huge wind farm... or even better, sell that energy directly to a nearby business or neighbour. A true interactive, non-centralised free market in energy.

That’s what we need. And that’s what we’re going to get.

Partially it’s already under way. In 2014 Ofgem launched an investigation into the profiteering of “Big Six” firms. The upshot of that investigation heaped criticism on the utility sector and resulted in a backlash against their errant ways. It also lent support to smaller, more localised power supply. Since then, localised power (nanogrids and microgrids) has jumped from 1% of total power supply to 10%. But that’s just the start.

**Our energy system - with big, centralised power stations pumping energy via the national grid to homes and businesses - is becoming hopelessly out of date.**

considerably over the last two decades. The net result being that the cost has increased in much the same way it has in countries like Germany and Spain.

The third big reason electricity is so expensive in the UK is because we have moved from being an energy exporter to importer in the last 15 years. That has resulted in a major transition for the economy because we are at the mercy of external forces to feed our power stations.

The decline in the Brent oil fields’ output, coupled with the rising cost of production, were not

higher than elsewhere: inflation. Economists don’t like to include the price of commodities in their measures of inflation because they are volatile and therefore inconvenient. For most of the time commodities are highly cyclical so the price goes up but then comes down so excluding them from inflation measures washes out over the course of the year and makes little difference. However, when commodities trend higher, and they are still excluded from the inflation measure, which is exactly what happened in the last decade, what we get is stealth inflation. People find they have less money



## The big switch

The UK is now home to a growing number of small independently run power suppliers. Many rely on renewable energy such as wind, hydro or solar. As I've written to you previously, the south-west has significant geothermal resources which are likely to be tapped for electricity generation as the requisite technology becomes more widely available. At the same time, solar and wind technologies are improving all the time.

In one of the first issues of *Frontier Tech Investor* I wrote to you about SolarWindow. The company announced in early September it is moving to production of its spray-on solar cells, aiming to turn high-rise buildings into power plants within the decade. The evolution of the wind market is based on bigger is better, which is why Dong Energy now claims it can build offshore wind farms with no subsidies. The basis for that claim is founded on the size of the turbines it will be building, which are on a scale never seen before.

The Baywind Energy Co-operative was the first energy co-op in the UK and was modelled on similar initiatives in Scandinavia. It is owned by its approximately 1,200 members who benefit from the power produced and the excess profits are invested in local environmental programmes. When the group wanted to beef up its output, it decommissioned five of the original six turbines and invested in two new high-powered turbines which are

owned by the co-op's successor High Winds Community Energy Co-operative.

How do subsidies fit into the equation?

Feed-in tariffs are perhaps the most widely understood of the government's attempts to influence uptake of renewable

true independence but it is a step in the right direction. The important piece of information in this story though is not about how ambitious the project is but the fact that each solar panel will work out at a cost of £1,250.

Of course, the real reason Mass Capital, which is a part of ABN Amro Bank, is pursuing this

## Right now, Maas Capital is investing £1 billion with the aim of putting 800,000 solar cells on top of council houses

energy among households. Before we get to the benefits we should look at how much of a distorting influence they have had on the market. First off, the initial terms were so generous when the programme launched in 2008, when oil prices were north of \$100, that they were scaled back in 2009, again in 2011 and again in 2012. The uptake for both residential and large-scale solar was enthusiastic and profits so large that the utilities were in uproar at the cost. There are now an increasing number of companies offering free solar installation and electricity just because they make their profits from the feed-in tariff. They can achieve this by going for scale.

Right now, Maas Capital is investing £1 billion with the aim of putting 800,000 solar cells on top of council houses, primarily in the north-west, within five years. It aims to save families about £240 a year on their electricity bills, which isn't

programme is not out of the goodness of its heart but to profit from the UK government's feed-in tariff for solar cells. By going for scale, it can achieve a much lower cost than individuals – so even though the feed-in tariff has collapsed in value since its heyday in 2008, it can still be valuable if the cost of the solar cell is low enough.

The second point about this outright support for renewables is that the cost of paying the feed-in tariffs was passed on by the utilities to customers, which was an additional influence on the high cost of electricity for UK consumers. Instead of making energy cheaper, it made it more expensive. Madness!

## The economics of the new grid: improving efficiency, falling costs and increased demand

Today the cost of installing a solar panel on your home ranges



from £4,000 to £7,000, depending on your location. That equates to between £1.33 and £2.33 per watt in the first year, but solar cell panel efficiency is improving all the time and the panels have a 20-year life cycle. However, data from the Office for National Statistics highlights an important point. Wages need to be paid, panels don't install themselves and companies know you are making money from the feed-in tariff so they have no incentive to cut their prices. However, despite these obstacles the actual median cost of installing panels declined 11.64% between March 2013 and March 2017 based on real world installations.

The other important point is that because of scaling it is much cheaper on a cost per kilowatt basis to install a larger system. In March 2017, an array with capacity of 4-10kW cost 16.5% less than an array of 0-4kW or £1,434 per kilowatt versus £1,667 for a smaller project of 1-4kW. That means the bulk of the installation fee is taken up by the cost of employing people to do it and the upfront cost for the panels.

Today Tesla charges a total of £11,800 for a 14kWh battery designed to meet all the needs of a family home. Powervault on the other hand is a privately held UK company and produces batteries specifically tailored to cater to its domestic market, which comes in at a lower price point than its US competitor (somewhere around £3,335 for a 4kW battery, which is about the same size as a washing machine). In fact, the company has been in the news over the

last few months for teaming up with Nissan to recycle batteries no longer fit for locomotion but more than capable of storing domestic power.

Five years ago, the best solar panels on the market could deliver efficiency rates of 17.8%. Today that figure is 23%. At that rate, it will be close to 28% by 2022. That means the argument for not having solar cells on every roof is getting progressively more difficult to make. In a decade, there will be no argument.

What about intermittency I hear you say?

Well we have a battery for that. Global battery manufacturing capacity is set to double by 2021 to 278 gigawatts per annum. That's enough storage capacity to put a 4kW battery in 69.5 million homes. Of course, many of those batteries will go in cars; but even then, we are talking about massive new capacity and a secondary market will quickly evolve, such as the one Powervault is now building with Nissan.

As efficiency improves, manufacturing capacity expands, familiarity increases and costs will come down. Within a decade, having a solar array fitted with a domestic battery will be as routine as ordering a new boiler or having a satellite dish installed today. It's a dizzying mess when you think about all the competing forces that are vying for a slice of not only the UK's but the global energy market. If I am

both consuming and generating electricity, we can expect that my needs and demands will fluctuate with time. That means I will be both contributing and drawing from the grid.

That's true regardless of what type of grid we are talking about, national/local or micro. What about everyone else? What happens when every house has windows covered in solar cells (again, check out SolarWindow for more on that), when every roof is covered with solar cells? When everyone is both contributing to and drawing on variable resources? What about in winter when energy consumption rises or summer when we all pile into our cars for a Sunday jaunt around the countryside?

Let's get local. If the future of energy is to evolve as we imagine, we need to come up with a way to record publicly how much we contribute or draw from the grid on a net basis so that I know how much of my electricity you are using and vice versa. If I am to manage my personal utility network effectively, that is something I both need to know and have fast and convenient access to.

## Introducing: the grid of the future

That's where smart grids come in. They really are nothing like anything we are accustomed to today. In fact, this situation is uniquely suited to the evolving blockchain network. You may be familiar with the blockchain as the "distributed ledger" that



allows bitcoin to operate. But it has much broader uses than that. It offers some particularly appealing characteristics, particularly in a world of decentralised energy systems, and micro, nano and local grids.

The first is to ensure total transparency. We all have access to the blockchain; I know how much I use and export on to the grid and so do you. There is no room for equivocation and it means we each can play to our individual strengths. I live in a sunnier or windier microclimate than you, while you work from home and are therefore use less energy for transportation. We each participate with the energy market just as we always have but without the intermediary of a utility company. In short, the network will no longer be held hostage to the desires of utilities that are subject to the whim of investors only concerned with quarterly earnings. Nor will we need to pay for the multi-million-pound salaries of utility company CEOs.

Another big benefit is security. Russia and North Korea have been probing the security of the US's and UK's utility networks. That is a major consideration for all of us because it is inevitable that in any future conflagration, and let's not kid ourselves that we have seen the end of war, that the utility network will be targeted. Against that threat, the argument for pursuing the liberalisation of the electricity network and handing the reins of control over to regular people is a promising strategy. In fact, it is

the energy equivalent of a larger force adopting guerilla tactics by not allowing an opponent the opportunity to take out a large stationary target.

In Brooklyn, New York, we have a working example of how a peer-to-peer electricity network can work for the welfare of the entire community. Here is a quote from a New York Times article about the initiative:

*In New York, the Brooklyn microgrid is conceived to work with the conventional grid, which is in the midst of a reboot under Gov. Andrew M. Cuomo's directives to make it more flexible, resilient*

with blockchain this can be achieved without the need for a central controller – we get to do it on a peer-to-peer level. That reduces the costs associated with the network, which is a bonus for everyone.

As this market for local co-operation and a two-way network evolves, the national grid is going to come under increasing stress. This means there is going to need to be a substantial upgrade of both capability and capacity. As recently as April this year the UK was producing so much renewable energy that the grid was having difficulty accepting it all.

## With Microgrids communities become power stations and the grid becomes more like phone networks than a traditional electricity network.

*and economically efficient while reducing greenhouse-gas emissions. That effort, known as Reforming the Energy Vision, or REV, includes encouraging the development of microgrids and more active community participation.*

What this in fact suggests is that when we spin the evolution of microgrids out beyond very local considerations, communities become power stations and the grid becomes more like phone networks than a traditional electricity network. In other words, we get to both make and receive calls except with electricity. How it differs is that

It requires two gigawatts less than it did in 2015 and all the time renewable capability is growing.

The answer utility and network management companies have so far followed has been to buy smart meter companies. Here is a section from one of Bloomberg's reports on this growth market:

*Smart meters and data analysis deals include Iberdrola's investment in Innowatts and Centrica's acquisition of Rokitt Astra. Enel acquired demand-side response provider EnerNOC, while National Grid invested in Enbala Power Networks.*



*EnBW's takeover of Winsun will broaden its residential solar offering.*

And this:

*Rollout of smart meters will require a large investment by EU utilities - about 4.5 billion euros to monitor electricity in France between 2014-21 and 11 billion pounds for power and gas readings in the U.K. from 2013-30. The costs will directly or indirectly be borne by end customers. The rollout of smart meters will help utilities increase revenue and cut costs. EDF expects to generate up to 10.3% pre-tax nominal return and Enel targets a 300-400 bps spread over the weighted-average cost of capital.*

*Smart meters can help energy suppliers cut costs associated with manual meter readings, offer more tailored, time-of-use tariffs and sell new services (demand response, energy management) that take advantage of intra-day energy metering. Still, this could be partly offset by reduced energy consumption. (04/13/17)*

Smart meters are an integral part of the evolution of a distributed network, where not only individuals but major corporations attempt to benefit from blockchain technology. In our enthusiasm for the libertarian ideal of freedom from being considered merely as a cash flow, we should also consider that the corporations have no intention of merely disappearing. They will fight

tooth and nail to retain their dominant market position. Either way, smart meters are an integral part of the equation.

### Introducing this month's pick

That's why I believe Smart Metering Systems is the company you should be looking at as a way of benefiting financially from this evolution without personally going out and installing solar panels.

and connection through to the procurement, installation and management of meter assets, data collection, and ongoing energy management solutions. This breadth of service makes us incredibly unique in our industry. There are no other organisations in a position to offer all of these services simultaneously.

If the future evolves as I expect, then every house will need a smart meter. We will all have

## If the future evolves as I expect, then every house will need a smart meter.

It started out in 1995 as a small gas metering company but has benefited considerably from the government's smart meter rollout. The share listed in the UK in 2011 and is part of the AIM 100 Index with a market cap, at the time of writing, of £594 million. In 2016, it made acquisitions in the maintenance, services, software and data security sectors to establish itself as an end-to-end supplier and servicer of smart meters. With 750,000 meters under its control, the company can collect data on a half-hourly basis, which cuts costs for utilities and allows consumers increased flexibility. As the company claims on its website.

We can now provide a complete service from beginning to end. Everything from project managing the installation of the gas and/or electricity supply

apps to track energy usage and to alert us when the best time to use appliances is, to tailor how and when we charge our car, how our home battery is performing and how much we have left over to sell back on to the market.

Smart Metering Systems has been growing revenues at an impressive rate since its initial public offering (IPO). Total revenue was £27.9 million in 2013 and was £67.2 million in 2016. Asset management is the company's largest source of revenue but installations remain on an impressive growth trajectory, which should feed through into additional management revenues over time while its energy management segment began to kick in revenue from 2015. Gross profit has been above 60% every year since 2013 and above 70% in 2015, which



highlights the point that this is a high-margin business.

The company initiated a dividend in 2012 and has been growing it steadily at more than a 20% rate over the last three years. However, the share price has been rising faster than the dividend so the yield is only 0.62%.

So how much can this market grow over the coming few years? According to this report from the Department for Business, Energy & Industrial Strategy:

*As at 30 June 2017 there were 6.66 million meters operated in smart mode by large energy suppliers in domestic properties across Great Britain. Overall, this represents around 14 per cent of all domestic meters operated by large suppliers.*

*As at 30 June 2017 there were 594,500 (55,700 gas and 538,700 electricity) nondomestic smart and advanced meters operating in smart mode or with advanced functionality by large energy suppliers. This represents almost one quarter of all nondomestic meters currently operated by large energy suppliers.*

Therefore, more than 85% of households do not have smart meters, which represents an attractive growth market for the company.

The share has been trending higher in a reasonably steady manner since its IPO and has paused mostly below 700p since August. I rate Smart Metering Systems a buy up to 900p, which is my 12-month target. If the energy market evolves as I expect, I believe 1,200p is a reasonable three-year target. That means the company could also be an attractive takeover candidate for a larger utility considering the scope for growth represented by the company.

The risk is that the company's growth rate is not sustainable or that government support for the renewable energy sector is withdrawn for whatever reason. As a high-growth company, there is also the risk that it overextends in terms of its acquisitions or that an interloper comes in to compete more effectively. There are no signs of any of these factors right now but they are risks nonetheless that an investor should take account of.

## Introducing: the Jevons paradox – why we'll use MORE energy in the future, not less

Let me introduce you to William Stanley Jevons.

In his 1865 book *The Coal Question*, Jevons correctly pointed out that increasing technological innovation makes consumption more efficient but did **not** result in lower consumption. It actually results in more usage. This is an incredibly important point. And it's highly relevant today.

I would argue such impressive leaps in energy efficiency over the last decade – in everything from LED light bulbs to batteries, to solar, wind and geothermal electricity generation as well as more fuel-efficient cars – are all in direct response to the higher price of energy. In other words, higher prices influence behaviour. However, the opposite is also true. Lower prices influence behaviour. It's economics 101. More supply leads to greater demand. Now let's address the chart overleaf

This chart highlights the fact that energy consumption has been declining since 2006. It's an awfully big question whether that is mostly because of the slow recovery from the global

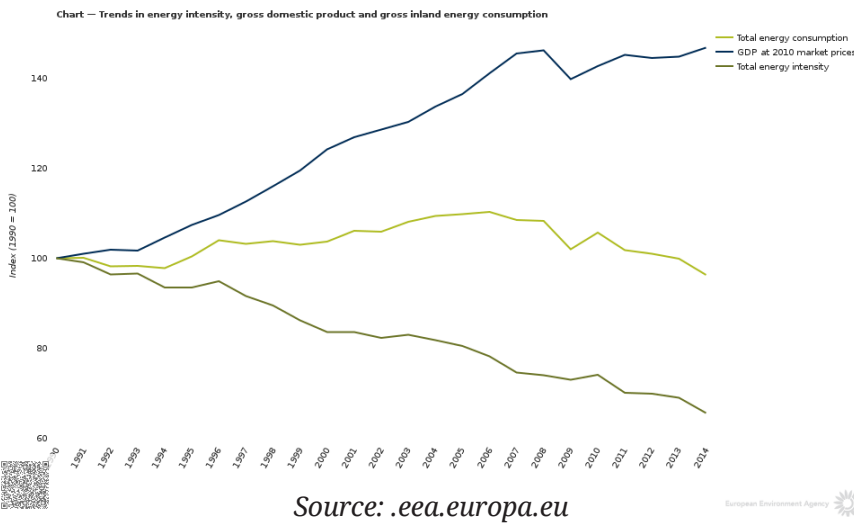
<b>Name:</b>	<b>Smart Metering Systems</b>
<b>Ticker:</b>	<b>SMS LN</b>
<b>Closing price as of 02.10.2017:</b>	<b>735.5p</b>
<b>Dividend yield</b>	<b>0.61%</b>
<b>Buy up to:</b>	<b>900p</b>
<b>Market cap:</b>	<b>£659.42 million</b>
<b>52-week high/low:</b>	<b>740.5p/456p</b>

figures accurate as of last market close: 02.10.2017

### Five-year performance:

2012 +155.08% | 2013 +28.35% | 2014 +30.99% | 2015 -15.70% |  
2016 +64.87% | 2017 (HY) +29.09%





market in the UK.

Another important point is that the services sector’s energy consumption has been static for 46 years despite the fact it is now the most important part of the economy; representing 80% of total output.

If we assume that the Jevons paradox holds, then what could support it? Where is increasing demand going to come from? One answer would be transportation. It’s a big energy intensive industry today, so how we move people and goods around is going to be the lynchpin for the energy intensity of the economy in future.

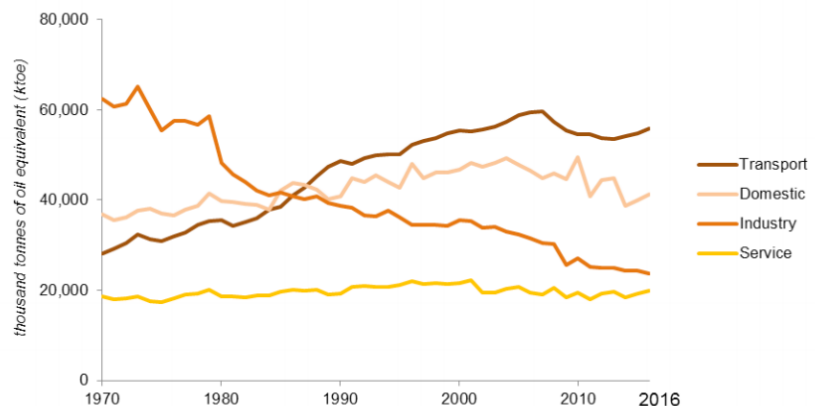
Batteries are much more energy efficient than internal combustion engines. For example, a 320Wh/mile Tesla Model S uses about one third as much energy as regular car. The caveat is that getting the electricity into the battery is not yet as efficient as getting gasoline into a car. That is where domestic energy supply is going to play a key role.

financial crisis or whether the efficiencies achieved through technology have been so great to affect demand. The strongest likelihood is that it is probably some combination of the two. That’s why the evolution of both electric vehicles and autonomous vehicles is so important. If we look at other markets in similar circumstances, low prices create additional markets. By solving for abundant energy, we are going to end up with a surge in demand. The number of vehicles is likely to increase because we will free the transportation model from needing to have a driver for each vehicle. The next time you hear someone rush to proclaim victory in achieving emissions goals, it is important to remember that those gains were achieved in falling demand environment. When demand begins to increase, meeting those emissions goals is going to be highly dependent on uptake of renewable resources in the domestic market.

since the 1970s as companies become progressively more efficient about controlling costs and because heavy industry migrated to cheaper locations. Meanwhile transportation’s energy consumption has continued to trend higher while the domestic sector has been trending lower since 2006. More importantly, the relative importance of the domestic sector has increased relative to the industry sector in the UK. That means what domestic consumers choose to do is going to have an outsized impact on the direction of the energy

Energy consumption by industry has been collapsing in the UK

Chart 1.04: Final Energy Consumption by Sector



Source; BEIS ECUK Table 1.01



Today we rely on utilities to generate power by whatever means and transport it via high tension cables to where we are. The input costs range from fuel to plant and machinery, wages and pensions, maintenance, etc. When we look at gasoline we are reliant on a comparatively small number of large producers, a global transportation network and massive refining capacity; all of which survives because of economies of scale. As technology improves and battery efficiencies are delivered both by economies of scale and technological innovation, the argument for developing a wholly domestic market is a no-brainer. And we all get to play our part.

**My prediction is that in the not too distant future we will have a situation where it is as cheap to fuel an electric vehicle on an all-in cost basis as it is to fuel an internal combustion engine-powered vehicle.** At that point, we get a paradigm shift in perceptions and that is before we even begin to think about the changes in market dynamics autonomous vehicles will have. The simple answer is we are going to need a lot more energy and the good news is we will have the liberty to do it ourselves because costs are coming down all the time.

With abundant cheap energy, single family homeowners will be in a particularly benign environment while apartment dwellers and terraced houses will have less rooftop real estate to use. Additionally, the industrial sector will still likely

be using a lot more electricity than it can produce. If we look further ahead, the need for natural gas will be questioned by an abundant energy future as well, so it will only be used in chemical applications where electricity is inappropriate. This scenario fits squarely into the Jevons paradox which holds that as technology improves, price comes down and demand rises. That is exactly the scenario I envisage. Electricity is the fuel of the future and getting it to everyone who needs it from the myriad sources it will be created from is going to require a massive upgrade of the electrical grid.

## Crypto roundup

Sam Volkering

### Here's what the head of the IMF thinks of crypto

Jamie Dimon continues to claim bitcoin is a fraud. By the way he's been claiming that for about four years now. Not working out so well for him is it? But hey, if he continues to claim it, he might eventually be right... but probably not.

He's not alone either. Mohamed El-Erian, former head of fund giant PIMCO, thinks it should be worth half as much.

Ray Dalio, billionaire and founder of the world's largest hedge fund Bridgewater Associates, says it's a bubble according to his firm's criteria.

And then there's the head of the International Monetary Fund (IMF), Christine Lagarde. She recently came out and said,

*... in many ways, virtual currencies might just give existing currencies and monetary policy a run for their money. The best response by central bankers is to continue running effective monetary policy, while being open to fresh ideas and new demands, as economies evolve.*

Uh, hang on a second...

That sounds remarkably *positive* about cryptocurrencies. Probably because Lagarde's words last week were positive. The head of the IMF told the world's central banks, "it may not be wise to dismiss virtual currencies."

There's likely another agenda here from Lagarde. Perhaps bitcoin is going to make it into the SDR. Perhaps the IMF is getting ready to launch its own cryptocurrency.

Either way it's proof that some of the world's most powerful people recognise there's a revolution in play – and that to ignore it is at your own peril.

### Play nice to play at all

While some of the world's heavyweights of finance have their say, some of the world's regulators are also trying to figure out cryptocurrencies.

And their best course of action is to find a way to licence crypto



operators. And their first point of call is bitcoin exchanges. Japan has licencing regulations in the works. The US is also putting steps in place to licence operators. In fact most large economies are finding a way to regulate, licence or simply outlaw bitcoin and crypto operators.

Even over the weekend South Korea decided it would follow in the footsteps of China and outlaw initial coin offerings (ICOs).

Now some people might see this all as bad news for crypto. Not us. In fact, regulation might be a good thing – dependent on its motives, that is. You see if regulators can make entering the world of crypto “safer” for the average person, that’s a good outcome.

If they simply regulate to protect consumers, that’s okay. If they can convince the person on the street (who knows nothing about crypto) that this is something they should get into, that’s a huge

result. Of course if they regulate because of the threat to their power base, that’s not so great.

But even if they try to regulate to protect their own interests, that’s fine. We’ve seen in China, India and South Korea just what impact outlawing crypto has to its value... absolutely nothing.

### Nothing will stop this train

As we’ve mentioned, over the weekend South Korea decided to ban ICOs. This comes hot on the heels of China banning ICOs and shutting down crypto exchanges across the country.

The China ban lead to “bitcoin fugitives” fleeing to Hong Kong in order to continue operations outside of the controls of China.

It’s very likely the South Korea ban will see an exodus of crypto entrepreneurs as well. South Korea’s reasoning is that bitcoin

and crypto needs tight controls. That’s likely because crypto is a threat to its tight controls over its citizens.

You’d also think that with China’s hard stance and now South Korea, crypto markets would take a hit. Well, not really.

There were dips in the fiat-converted price of crypto. But bitcoin is once again close to its all-time high and Ethereum is still trading over US\$300. In fact almost all crypto across the board have been edging higher in spite of governments’ hard stance on their crypto revolution.

We think these crypto bans won’t last long. In fact it’s our view that some nations will soon come out in full support of a burgeoning crypto and ICO ecosystem. When those moves come we expect the fiat-converted prices to soar again.

#### Risk warning

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