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2020 – the year of 5G supremacy

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You’ve read about it for years.

You’ve heard the big build-up over and over.

Depending on where you live, you may even have started to see 5G boxes and towers pop up in your area.

Now is the moment of lift-off for a tech upgrade from which a tantalising number of new industries and opportunities shall cascade.

In this issue, I’ll run you through the most important new developments... how 5G

could grow 60-fold in the next 12 months... and share two new recommendations to help you take advantage of what’s happening.

The big news last week was the government is going to postpone the decision on whether to use Huawei’s network equipment in all of the UK’s 5G infrastructure until after the election. That means no decision until the early part of 2020 at the very least.

The funny thing is that they reported on the story at all. We are so far beyond government procrastination that it is almost laughable. This story has nothing to do with the pace with which 5G is being rolled out.

We are truly on the cusp of something that has the potential to remake the global economy and as you will see by the end of issue, the potential for exponential growth is very real.

More on that in a moment, but the UK government is being caught between a rock and a hard place, because it feels under pressure to obfuscate on making a decision. The US is adamant it does not want Huawei to gain a dominant global position in the 5G infrastructure sector and is willing to curtail information sharing with governments that do allow Chinese 5G kit in government networks.



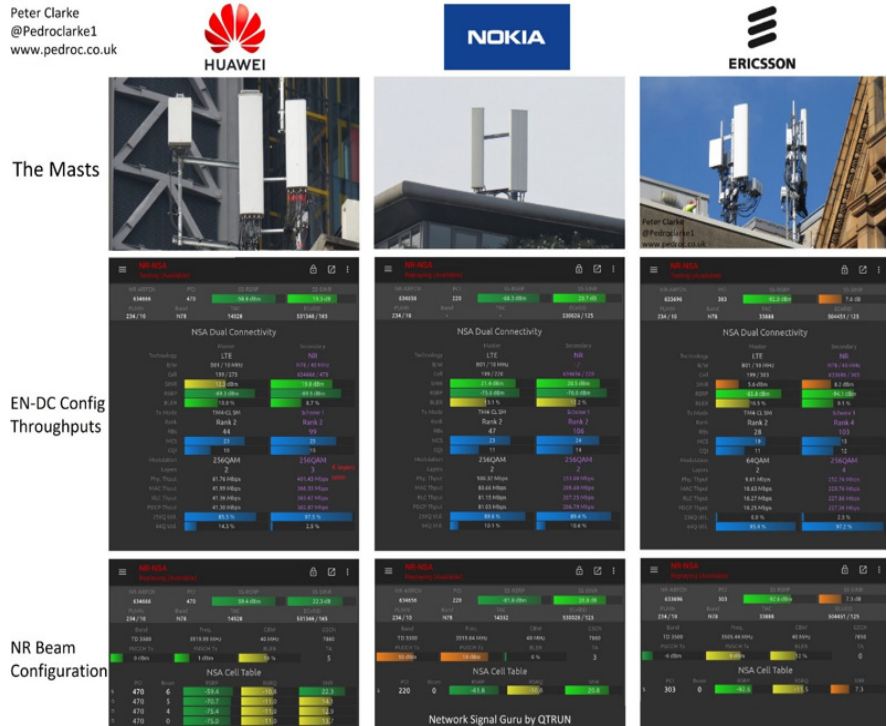
Here is a quote from Michael McCaul, who is the Republican head of the House Foreign Affairs Committee:

“By taking control of critical hardware and software for next-generation technologies like 5G, the Chinese Communist party can increase its ability to coerce international companies, manufacturers, and even entire countries to adhere to the dictates of the CCP. There will be dire consequences should China successfully control and weaponise the global supply chain for technology.”

If that was the whole story, there would be nothing to talk about. However, the reality on the ground is Huawei is already deeply embedded in the commercial reality of 5G network development in the UK.

Just last week it emerged that while O2 has announced both Nokia and Ericsson are its “sole” vendors for 5G network equipment, a number of London locations were running on Huawei’s network during the launch of its offering in July. They have said that this equipment will be replaced, but the bigger point is that Huawei’s works better and delivers a faster, more robust service.

In fact, evidence suggests the Huawei sites are providing better technical performance than either Ericsson or Nokia’s. The above chart is from Peter Clarke’s Twitter account where he is offering side by side comparisons for Huawei, Nokia and Ericsson in London.



Source: Twitter

Let’s set aside for the moment the fixation with which company is going to supply the network equipment to finish building out the UK’s network. Let’s instead focus on the fact 5G services are already in the market. EE was the first to launch its service in a limited number of cities in May. It has plans to add considerably more cities over the next year.

Vodafone launched in July and has clearly stated it will be providing Huawei routers to domestic customers throughout its network. Three UK launched in August. BT launched its 5G network in October and, at least for the moment, is relying on EE’s network. O2 also launched in October.

My original issue focusing on 5G was published in March 2017 but I thought with the rollout of the network now primed for its

exponential growth phase, it is time to revisit the sector.

How 5G goes 60X

Our existing play on 5G, Cisco System, is also active in the UK and signed a deal last year with the UK government to test a rural 5G network. One of the projects it is active on is in providing a network for the BBC to run radio over in its RuralFirst scheme.

Let’s think for a moment what the scale of the rollout from a small number of nodes to a nationwide network will mean for phone sales in 2020.

Deloitte estimates UK vendors will sell 50,000 5G handsets in 2019 but that is expected to grow to 3 million in 2020. That’s an increase of 60 times the current market within 12 months. Barclays estimates the UK will be £15.7



billion better off by 2025 as a result of 5G.

All of this tells us that regardless of the politics, 5G networks are on the cusp of their full rollout in 2020. Even more importantly, this is a global phenomenon. Commercial rollout has already begun in South Korea, Spain, the UK, Switzerland and the US.

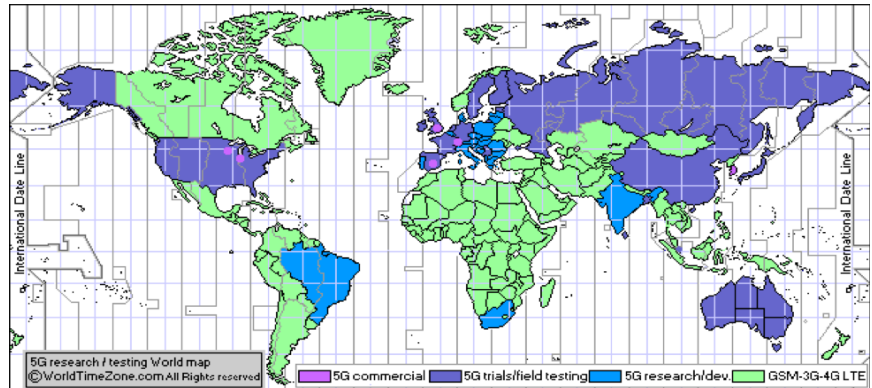
China, however, was the first large country to switch on a nationwide 5G network over the weekend. By 2025 China's 5G market will be larger than the US and Europe combined. Analysts at Jefferies estimate China will have 110 million users by 2020.

Prices are beginning at about the same level as South Korea and while that is cheaper than the price of 4G in China, it is still rather pricey considering the per-capita incomes are so much lower.

Deloitte also had this to say about the global rollout of handset sales:

At the end of 2020, we expect 5G handset sales (15-20 million units) to represent approximately 1 percent of all smartphone sales, with sale taking off in 2021, the first year in which all retailers will sell more than 100 million 5G handsets.

Right now, Samsung and a number of Chinese manufacturers like Huawei, Oppo and OnePlus are the primary suppliers of 5G handsets in the UK. Apple expects to have a 5G-ready handset in the market sometime in 2020.



Source: WordTimeZone.com

The tech boom "holy trinity"

Big, life-changing, bull markets thrive on three primary technologies all delivering step changes in growth at the same time. These are the energy/transportation, communication and finance sectors.

All of these are likely to be deeply affected by the rollout of 5G. That's why it is such an enabling technology. Its existence enables so many more bull market stories to take shape in sectors that will be positively affected by the rollout.

I think of this technological evolution like this: the first phase of the digital revolution was to take the objects we interacted with and transform them into digital products. The second phase will be to take the physical services I engage with and turn them into digital products. This is a process that is already well underway. For example, I used to have to go to a travel agency, now I can book everything online.

However, that process of displacing middlemen is about to get a massive boost from 5G.

The legal and medical sectors in particular are in line for significant disruption.

These protected sectors have been immune to technological disruption for a long time but the reality is much of what doctors and lawyers do is to collect a fee for filling out a form. The digital world is changing that and the introduction of augmented reality means there will be less and less need to visit a GP or solicitor.

That's how we will experience 5G on a personal level, but perhaps the biggest disruption will be in how companies will interact with quick mobile networks to greatly increase the scale of their cloud services. Today, many people can work remotely because they have access to databases via broadband that allow them to manipulate, record and share data without ever setting foot inside the company's HQ.

The heavy lifting in terms of calculation takes place on the server but we can access the full range of what it can achieve remotely. With 5G the range of what is going to be possible to achieve through a distributed network will balloon.



Cloud services currently allow us to access our email and apps from our phone. However, the advent of 5G will put super computers and quantum computers at our fingertips.

These are services that are currently only really available to academics and data-driven companies. The range of questions people have been able to ask via the web has been limited, by access to computing availability, as well as the ability of services to deal with the quantity of data available.

We are the same stage today as before the introduction of the personal computer. At the time many experts couldn't understand how anyone would want to have a computer in their homes. The same is true today of supercomputers and predicative algorithms.

However, what if it could tell a new mother when her child was going to get sick and what to do about it? What if the sensors in my home could monitor for signs of depression or substance abuse and help parents intervene early to help their teenagers?

How about helping a young person better understand what they need to do to fit into their first job? How about a tailored assistant that coaches and prods us along in furthering our career goals?

How about a marriage counselor, which advises you when it's time to play nice? How about a personalised medical assistant to let you know which foods to

avoid based on your individual genetic profile? The computing power for these kinds of services exists today but individuals do not have access to it. It is incredibly cost prohibitive to run that kind of service from one's home but ultrafast reliable connectivity will bring access to these kinds of services within our grasp.

You might not even want any, or all, of them. However, we need 5G to offer the connection speeds for these kinds of services to function seamlessly.

Every company, no matter the size, wants to know how to reach more customers, how to provide them with the best possible service, how to boost engagement with products, how to anticipate problems before they arise and how to develop new products that meet unidentified needs.

The promise of 5G is not only in the availability of services but in the quantity of data that will be delivered about every consumer, business and the built environment. This is even more important for companies with significant pieces of physical property.

For example, it is much better to know a major piece of machinery is under stress before it breaks down rather than after. That is most particularly true of the airline industry where planes fly millions of miles over the course of an in-service lifetime and safety is at a premium.

In the oil sector, having internet-connected wells with highly sensitive sensors means real-time

action on pressure, gas mixes, fluids, heat and metal strain can all be monitored remotely, which would greatly expand on the ability to monitor operations intelligently.

5G will completely alter how data is delivered and will overlay a digital lattice on the physical world. The buildout of the network will enable the placement of trillions of sensors in every possible location. That will enhance the ability to interact with physical objects.

It will also, through the provision of data, create an environment where we can interact with an enhanced digital replica of the world via augmented reality. The introduction of data-driven analytics and deep learning creates a fractal experience where the depth of knowledge about any particular part, place or function can be drilled into to deliver information and insights.

At the other extreme, one of the services we use every day but never think about is traffic lights. They are the ultimate in silent authoritarianism.

We are all conditioned to understand green means go and red means stop, with a little wiggle room on either end. However, traffic lights are just a piece of machinery we built to make traffic flow easier.

It's hard to imagine that 5G will alter how they function but with more connectivity. Cars will be able to communicate with one another and with the built environment.



That's not something that relies on autonomy, the only thing holding it back is access to enough bandwidth to handle the data. The idea of the green wave is not new, where every light turns green just as you approach – it has been talked about for decades.

It has always been considered to be too technically difficult to achieve but the advance in sensors, connectivity and deep learning make this kind of technological leap possible because they can all interact over 5G.

Here is one of the greatest ironies. There have been experiments with green waves in a number of European cities such as Amsterdam and Copenhagen for bicycle traffic but officials have been less enthused by applying this to cars.

In the UK any real exploration of a green wave was been previously curtailed by government because it would reduce fuel consumption and therefore taxation. With increasing concentration on emissions, that view is starting to change.

Now let's think about the fact that half of the US will have access to 5G in 2020. Cisco is still benefiting from that trend but I am recommending two new investments.

Forget the arguments about spying and state interference. Those are a side show. The real point of contention is that Huawei and other Chinese firms have almost 50% of the global market

share for these vital pieces of equipment to build the network. If they can sustain a position above that level, China gets to dictate what the international standards for 5G will be.

There is no way the US is going to let that happen because then it really would mean allowing backdoors into systems over which it does not have full design control over. That means the US network is going to be built without the help of Chinese products and there is a clear programme of influence underway to get as many countries as possible to walk away from Chinese equipment.

That puts one small US company in an ideal position to take a major chunk out of the US's 5G infrastructure spend. However, there is a lot of work that needs to be done before we are in a position to realise the potential of this market.

So far, telecoms operators are rolling out partial networks in some cities but Gartner estimates there will 224 million connections by 2023. That means we are literally on the cusp of exponential growth.

That company is Akoustis Technologies, my first recommendation in this month's issue

This company manufacturers in the US, is headquartered in North Carolina and is already trialling its 5G 5.6MHz modems with some of the largest telecoms companies in the country.

The company has \$25 million in outstanding debt and its bonds are not due to mature until 2023. Even then, the company has \$30 million in cash so the debt burden is not a challenge in the short term.

So far, the company has generated minimal revenues from its technology and since inception has lost \$67.5 million. However, the rollout of 5G and the potential for its routers to gain wider appeal in both phones and network connections is where the potential for revenue growth is focused.

In order to connect to the internet today, phones are accessing about 40 different bands. 5G is going to enable about 100 bands. That means the radio frequency (RF) filter the phone uses has to be massively upgraded to handle the demands of balancing the best band to connect on.

Back in 2014 when there were fewer bands used and speeds were slow, there was about \$0.75 worth of filters in a smartphone. The earliest versions of 5G phones coming out this year have about \$24.50 worth of RF filters. Now consider how many 5G phones are going to be sold when the network is up and running and Apple brings out its 5G-enabled handset.

Akoustis has 24 patents and another 54 pending wholly focused on bulk acoustic wave (BAW) technology. The company is vertically integrated to fulfil every aspect of manufacture domestically in the US and without having to rely on any



other company. It has patents in everything from platform substrates, to piezo materials, to acoustic devices and manufacturing, to packaging, to RF filters and the system running the products.

One of the most important factors is the company is a minnow compared to the two big US players in BAW processors. These are Qorvo and Broadcom. Akoustis' board is stuffed with people who used to work for Qorvo.

The CEO Jeff Shealy, VP of business development David Aichele, chief product officer Rohan Houlden, co-chairs Jerry Neal and Art Geiss, and director Suzanne Rudy all held senior positions at RFMD which was Qorvo's forerunner or worked directly for Qorvo.

Start adding these points together and what we have is a company that was incorporated by former Qorvo employees in 2014 and went public in 2015. It took what it knew about the filter market for mobile devices and routers from Qorvo, set up its own company, secured patents and has just fielded its first prototypes.

This is the definition of a scrappy little company that is willing to take on firms more than 500 times its size, in the case of Broadcom. That also give us an idea of the size of the potential market for a company like this.

The global leader in supplying routers for phones and networks is Qualcomm. It has a 5G modem in the market and is in the

process of launching its next one which will have the ability to broadcast at frequencies up to 5 gigabits per second.

When I visited Qualcomm a couple of years ago, the only thing they wanted to talk about was the strength of the patent pool and the number of engineers the company employs. The clearest near-term catalyst for a pop in Akoustis' shares would be the announcement of a relationship with Qualcomm. That could see the share double in short order but it is the least desirable outcome.

Instead it would be better from the perspective of a medium-term investor to see the uptake of the company's technology by some of the tier 1 phone manufacturers. That would transform the finances of the company and put it on a sustainable profit path which could see the share multiply many times over.

The risk with a company like this is in the sales department. Akoustis is spending millions on product development and has best-in-class products for the market it is pursuing but it needs to make sales.

The fears of China taking over certification of 5G equipment are not about to disappear but competition to capture this market opportunity is fierce. If it fails to secure orders to cover its costs, it will need to come back to the market for additional financing in about 12 months and that would weigh on the share.

I recommend buying Akoustis Technology up to \$10. It closed at \$8.38 on Friday 1 November and my 12-month target is \$16.

If the share realises the potential for growth 5G represents, it is likely to be a more than \$2 billion company within three years. At today's market cap that

<p>Action to take: Ticker: AKTS US Price as of 05.11.19: \$8.15 Buy up to: \$10.00 Market cap: \$248.17 million 52-week high/low: \$9.00/\$3.40</p>	<p>Buy Akoustis Techonology</p>
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represents a price of \$65.67.

Now, I want to share another way to play this rollout...

So let's turn our attention to cryptocurrencies. I said earlier that 5G is an enabling technology that is going to enable exponential growth in energy/transportation, communication and finance.

The transportation sector can be altered by relatively modest changes like the green wave or by deploying full autonomy for all vehicles which is obviously much more ambitious. Communications are central to 5G but it is in finance where some of the most profound changes can take place.

The evolution of technology enhances the productive capacity of underserved portions of society. Whether that is by providing more free time because of labour-saving devices, electric light to read by various methods of spreading news or strengthening the flow of information. That has allowed for the end of slavery, the ongoing work to achieve equality of the sexes and greater acceptance of minorities.

In other words, technology's long-term effect is to democratise opportunity for creative outlets.

That's also the central promise of blockchain/tangle and cryptocurrencies. The sector has the potential to unleash massive global productivity enhancements.

The technology bull market that is now underway is focused on

Technology's long-term effect is to democratise opportunity for creative outlets

Wall Street and Silicon Valley but for the first time the scope for the investment opportunity is truly global in nature. That's why so many people are excited about cryptocurrencies, which is why when we look at all technology trends together this is likely to be the biggest bull market in history.

On the crypto front, I am also recommending you buy IOTA

We have shared analysis on this cryptocurrency before, including a full report from my colleague Harry Hamburg. Read the report to get details on how to buy and store IOTA securely.

[You will find the report here.](#)

I have to admit I have a soft spot for IOTA. It's designed to solve so many of the immediate questions that arise when it comes to full commercialisation of cryptocurrencies. It has much reduced transaction fees, aims to have free micro payments, the network gets faster with increasing usage and it does not rely on miners.

All of that suggests it is going to be of much greater use for companies than others that are now being proposed. The big piece of news about IOTA and its application to the industrial sector came in July when a joint venture with STMicroelectronics (STM) was announced.

IOTA's tangle will be integrated with STM's STM32Cube expansion software so that each of the company's chips will be IOTA enabled for future applications.

For context, STMicroelectronics is the largest semi-conductor manufacturer in Europe. It has over 100,000 customers worldwide. And is a tier-1 supplier to the likes of Apple, Bosch, Cisco, Continental, HP, Samsung, Sony and Western Digital, among others.

Its STM32 microcontroller can be found inside iPads, AirPods, MacBooks, Sony Playstations, Nintendo's Switch console and a plethora of other consumer devices.

In and of itself, this is big news but it has not done anything to support the IOTA price.

Part of the reason for that is because there are currently no compelling commercial applications for IOTA that make it a must-have. The promise of what is possible is in the future. The number of companies offering exposure to tangle integration continues to expand but the one missing ingredient is urgency.

5G's rollout brings much needed urgency to the IOTA market. The increase in bandwidth, lower latency and greater potential will increase usage. That's simple economics 101.



The challenge with Internet of Things applications is ensuring they are secure but also that they can potentially create a business use case on their own. Creating an environment where sensors can pay for themselves is where the growth of the internet-enabled machine or machine part goes parabolic and that is what the tangle offers.

I don't expect this to be immediately reflected in the IOTA price but it is increasingly likely that the network potential of 5G will be priced into the asset as the large number of commercial agreements the IOTA Foundation has formed approach commercial utility.

My forecast for IOTA's share is that within a year it will be trading at least \$1. At the time of writing it is trading at \$0.275057 and I recommend buying up to \$0.30. It's been ranging between \$0.23 and \$0.30 since July so it is accurate to state it is currently about mid-range.

There is the chance that the price will trade back down to the lower side of the range and potentially even exceed the lows. However, if IOTA comes close to achieving even a fraction of its market

potential with the advent of 5G-enabled apps, there is a good chance it will trade significantly higher.

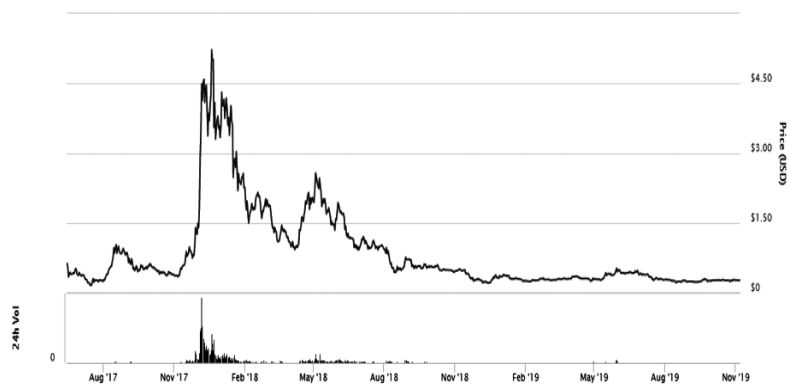
It is never appropriate to describe any investor trading in cryptocurrencies as conservative but a more prudent course of action would be to wait until IOTA does in fact break above \$0.30 to initiate a long position.

My recommendation is to own IOTA, despite the fact it has not yet broken out, because when cryptos move, they really move.

All the best,

Eoin Treacy
Investment Director, *Frontier Tech Investor*

Action to take:	Buy IOTA
Ticker:	MIOTA
Price as of 05.11.19:	\$0.275057
Buy up to:	\$0.30
Market cap:	\$764.53 million
52 week high/low:	\$0.558546/\$0.209035



Medical

Company	Ticker	Rec Date	Price Then	Price Now	Gain/loss %
Autodesk	ADSK	19/07/17	\$108.83	\$151.27	39.00%
Illumina	ILMN	05/09/17	\$207.22	\$303.68	46.55%
Becton Dickinson and Co	BDX	08/05/18	\$221.35	\$260.70	19.85%
Canopy Growth Corp	WEED :CN	21/03/18	C\$33.11	C\$26.51	-19.93%
Advanced Oncotherapy	AVO	03/07/18	48p	38.00p	-20.83%
Aurora Cannabis	ACB-T	19/09/18	C\$12.35	C\$4.72	-61.78%
Genus Plc	GNS :LN	02/07/19	2682.00p	2792.00p	11.56%

Technology

Company	Ticker	Rec Date	Price Then	Price Now	Gain/loss %
Garmin	GRMN US	02/08/16	\$55.75	\$94.23	81.27%
Cisco Systems Inc.	CSCO: US	31/03/17	\$33.80	\$47.48	50.92%
Microsoft	MSFT	01/08/17	\$73.04	\$144.55	103.26%
Northrup Grumman	NOC US	07/11/17	\$301.66	\$340.67	15.62%
Intel Corp	INTC	06/06/18	\$57.03	\$57.61	3.73%
Activision Blizzard	ATVI: US	02/10/18	\$83.29	\$55.71	-32.67%
Tesla	TSLA	06/11/18	\$346.41	\$317.47	-8.35%
Science Apps Int	SAIC	07/07/16	\$58.20	\$82.19	48.99%
Alphabet	GOOG: US	04/12/18	\$1,093	\$1291.37	18.15%
Visa	V US	08/01/19	\$136.06	\$178.95	32.07%
ZUORA-A	ZUO	05/02/19	\$21.39	\$14.48	-32.30%
Avast PLC	AVST LN	02/04/19	285.20p	423.40p	54.46%
Meituan Dianping	3690 HK	03/09/19	HK\$73.55	HK\$79.65	8.29%
Akoutis	AKTS US	05.11.19	\$8.15	\$8.15	0%
IOTA	MIOTA	05.11.19	\$0.275057	\$0.275057	0%

Energy

Company	Ticker	Rec Date	Price Then	Price Now	Gain/loss %
Ormat Technologies	ORA on NYSE	06/06/17	\$58.79	\$75.19	29.63%
Sherritt International Corp	S CN	06/02/18	C\$1.18	C\$0.24	-79.66%
Oxford Biomedica	OXB -L	05/03/19	669.00p	564.00p	-15.70%

Moonshot

Company	Ticker	Rec Date	Price Then	Price Now	Gain/loss %
SolarWindow	WNDW	07/04/16	\$3.96	\$2.41	-39.14%
Alkane Resources Ltd	ALK: AU	06/09/16	AU\$ 0.31	\$151.27	39.00%
Superconductor Tech Inc	SCON	03/04/18	\$9.60	\$0.22	-97.70%

For the full portfolio including live prices, please visit the *Frontier Tech Investor* subscriber area. [You can view that by following this link.](#)

Risk warning

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