INVESTORPLACE

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HOW TO CASH IN ON THE BIGGEST BATTERY BREAKTHROUGH IN A CENTURY

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The Next Great Battery Breakthrough

Walk the streets of any major U.S. city for a day and you're bound to see two of the greatest technological achievements of our age.

One is the Apple iPhone XS, the latest and greatest smartphone produced by the world's top phone maker. Featuring a superfast new semiconductor chip, an amazing digital camera, and cutting edge video display, the iPhone XS is a modern marvel.

You're also sure to see technological achievement #2: The Tesla Model S.

One of the world's most impressive electric cars, the Model S can accelerate from 0 to 60 miles per hour in just 2.5 seconds. Car critics gush over Elon Musk's creation. They say the Model S has disrupted the transportation industry more than any other car since the days of Henry Ford. A fully appointed Model S will set you back more than $130,000.

Most would agree the phones of today are light years ahead of the phones from 20 years ago.

Most would agree Tesla's Model S is light years ahead of the cars from 20 years ago.

And in every way but one, today's phones and cars are light years ahead of where they were in 1998.

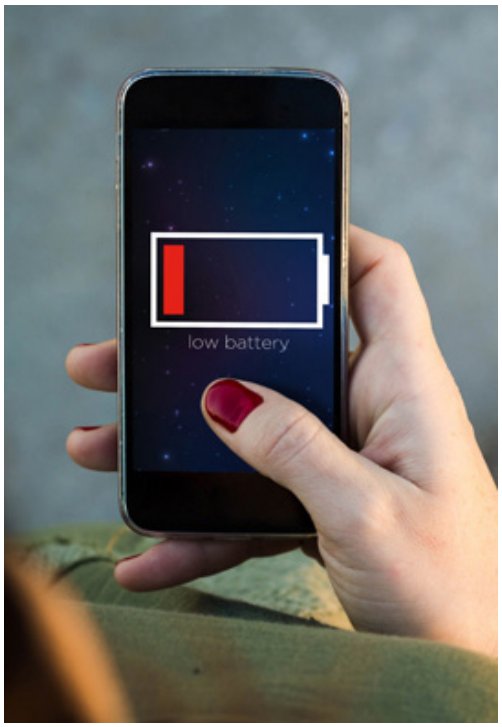
However… today's amazing new phones and cars are using relatively outdated technology in one critical component… one that limits their use, causes big user headaches, and makes them archaic in an important sense.

Today's phones and cars – and all the other amazing electric devices in the world – **use batteries that are in the Stone Age** in comparison to their computing power, wireless connectivity, and software.

Despite all the advances people like Elon Musk and Steve Jobs have led, this sight is all too common:

Over the past 10 years, smartphones and tablets have taken over the world. According to data firm Statista, 139 million smartphones were sold worldwide in 2008.

In 2019, those sales came in at 1.52 billion. Millions of people in India, China, and other emerging markets are becoming the first in their family to own not only a car – but an iPhone, too.



After the iPad was introduced in 2010, worldwide tablet shipments jumped from 19 million to 230 million in just four years. Electric cars like Tesla's Model S are set to transform the car industry and create trillion-dollar ripple effects in the future.

But there's much more than phones and cars:

- There's medical devices, from hearing aids and Pacemakers at home… to blood pressure machines, IV pumps, and ultrasound machines in hospitals. Patients can't afford for any of those to stop working in a power outage.

- Sensors are a giant industry in themselves and heavy users of batteries.

- A move to clean energy is underway. And when the wind dies down, or the sun goes behind a cloud, battery storage becomes essential.

- Then there is the Internet of Things (IoT), in which almost everything we own will be connected to the internet – from thermostats to automobiles to streetlights. This is a massive trend in its own right, and all of those devices need to be powered.

That's why any investor needs to be on the lookout for the next big breakthrough in battery technology. It's an innovation that will have multi-trillion-dollar economic implications:

Think of a world with electric cars that have massive ranges. Think of an iPhone that needs charging just once per month. Think of mass adoption of clean solar and wind energy. Think of airplanes that run on batteries. Think of the eventual demise of the oil and gas industry.

I've spent an enormous amount of time studying the battery industry. I can tell you this mega innovation isn't a matter of "if," it's a matter of "when." I believe the next big battery breakthrough

will go down as one of the greatest inventions of the 21st century.

Of course, there are huge investment implications here. Those on the right side of this innovation stand to build incredible wealth… just like people did from the creation of the internet and the smartphone.

Think of this as your "field guide" for profiting from the next big battery breakthrough.

Batteries 101

Odds are you are reading this on – or near – a device with a lithium-ion battery. Believe it or not, it's been standard in most devices for nearly 30 years.

At the time, its inventors could never have imagined the types of devices we use a lithium-ion battery for today.

And the cutting-edge technology it was created for? Sony camcorders, like the ones you see to the right.

But ultimately – no matter what they're used in – all batteries work the same way. (And that includes the groundbreaking technology we'll look at in a minute.)

On one side of the battery, there's an anode (which has a negative charge). On the other, there's a cathode (which has a positive charge). To power your device, batteries create an electrical current by shuttling electrons from anode to cathode. There's a "buffer" in the middle that keeps this current from going directly from one side to the other – forcing it through your device, instead.

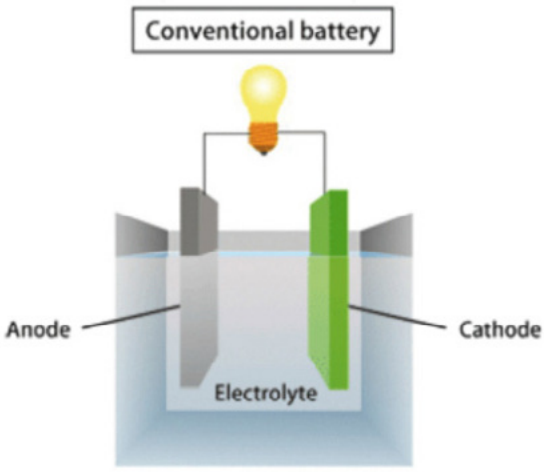
In a conventional battery, the buffer involves a liquid electrolyte.

In your car battery, the electrolyte is sulfuric acid, while the anodes and cathodes are lead. In the alkaline batteries we buy for our remote controls and flashlights, there's an electrolyte of potassium hydroxide, an anode of zinc, and a cathode of manganese oxide.

Most alkaline batteries, however, are made to be disposable. And the rechargeable ones don't last long.

This presented a problem for Sony in the late 1980s.

Lead-acid batteries were rechargeable – but extremely bulky. (That's why this technology, which dates from 1859, is still primarily used in backup power systems for cell phone towers and hospitals, in addition to cars.) So most cameras used nickel-cadmium batteries. But those weren't exactly small. You still ended up with an ugly and difficult to hold "bulge" on one side of the device.



Sony turned to the much smaller rechargeable battery technology, involving lithium, that had been discovered by a scientist called Stan Whittingham and perfected by John Goodenough.

The lithium-ion battery was a trade-off between size and battery power. It lasted long enough for a video camera (100 hours a year, or less), while being small and lightweight.

Sony started using them in 1991, and all other cameras followed suit by the mid-1990s. They were developed for laptop computers, too. Then Apple put them in its iPhone in 2007… and the rest is history.

But the more we rely on lithium-ion batteries… the more glaring their downsides become.

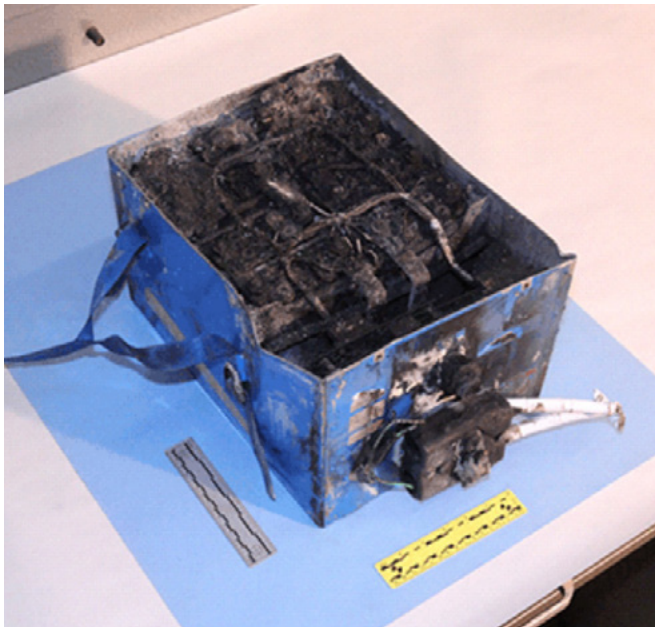
Limitations of the Old Technology

For one, that liquid electrolyte is a big problem. Not only does it leak out when the batteries get old and sent to landfills – it also acts as fuel to fires when the battery overheats.

We all remember the big issue a few years ago with the Samsung Galaxy Note 7 smartphone. The lithium-ion batteries inside were catching fire, and the phone became a hazard. The problem got so worrisome that if you flew on a plane around that time, you heard announcements from flight attendants about the Note smartphone when boarding.

In early 2018, HP recalled the lithium-ion batteries in 50,000 of its laptop computers due to a fire risk.

And it could get even worse. The future of transportation will rely heavily on batteries. Imagine a lithium-ion battery exploding as you are cruising down the highway at 70 miles per hour. Or worse yet, flying at 35,000 feet. Below is a picture of a lithium-ion battery from a Japan Airlines Boeing 787 that caught fire before takeoff in 2013.



Boeing doesn't want a repeat of that. Neither do the airlines. You better believe they will demand a new battery technology that is actually safe for flight.

That fire-safety concern also goes for hospitals… cars… solar arrays on our roofs… and the smartphones we all carry.

And we're trying to run all of those things... using battery technology from the 1980s. It's like getting into your car today, and having Fred Flintstone running along underneath, trying to keep up with traffic.

At the time of invention, Goodenough's lithium-ion battery design was much less volatile than Whittingham's had been… but more powerful.

There was one key "ingredient" that set his battery apart – and it's still one of the most important materials today:

Cobalt.

About three-fourths of the world's supply of cobalt is in one country – the Democratic Republic of Congo (DRC). Mining waste is responsible for a lot of water pollution there… and considering that a lot of uranium comes from the same region, radioactivity is a big concern.

Plus, the country is one of the most corrupt and unstable in the world, and the supply could be dramatically cut at any time. Without a reliable, sustainable supply, it could disrupt the production

of batteries and ultimately bring electric vehicle production to a standstill.

Even if cobalt production remains at recent levels of about 93,000 tons per year – that's just not enough. According to projections from Darton Commodities, demand will have jumped 30% by 2020, to *120,000* tons per year.

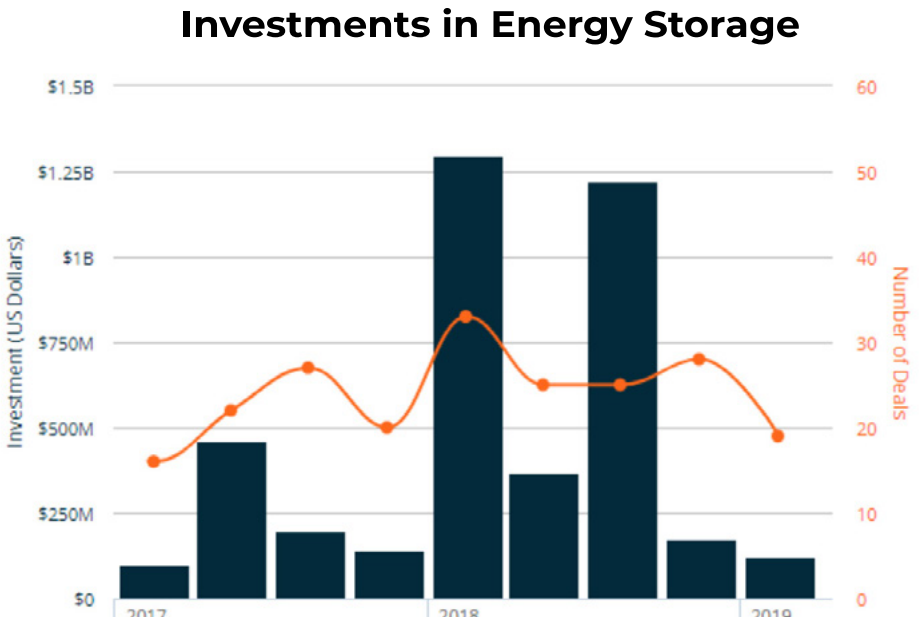
As demand for cobalt has skyrocketed, so has the price. A pound of cobalt was $10.60 at the beginning of 2016 and hit a high of $44 in 2017. By summer 2018, the price had eased back down some, but several experts believe it will reach a new peak by 2020.

Meanwhile, the batteries need lithium, too. And mining consultants Roskill put demand at 1 million tons per year by 2027. Compare that to production levels between just 80,000 and 91,500 tons per year by 2025.

A supply crunch for key components of our current batteries is inevitable – and a potential major disruption to basically every technology we rely on... until a new battery is viable.

Big Money In Search of A Solution

For all the reasons I just gave, startup battery companies are seeing a surge of big investments.



Data: Cleantech Group (May 2019)

Halfway through 2018, investments in battery startups had already doubled the amount for all of 2017. If the $3.2 billion invested in 2018 and 2019 is any indication, the future of batteries is about to change dramatically.

And much of this capital is coming from major players.

Let's start in Japan, which has been a leader in battery technology for years.

A collaborative effort was launched recently between the Japanese government, private companies, and research organizations. The goal is to find a new and better battery technology that is viable in automobiles and can be mass produced. Two of the largest companies involved are well-known names – Toyota and Panasonic – and leaders in battery technology.

Due to Japan's obsession with battery technology for the last few decades, the country is the current favorite to be the first to mass produce next-generation batteries. Nearly half of all the new patents are held by Japanese companies. But Japan is not alone.

Companies around the world are all fighting to come up with the next great battery breakthrough. From the largest global automakers to Tesla to the richest men on the planet, the search for the trillion-dollar battery technology is on.

In the summer of 2018, Volkswagen invested $100 million into QuantumScape, a California-based company working on a new battery. Founded in 2010 as a spin-off from Stanford University, the company is already considered a "unicorn" with a valuation over $1 billion. The CEO of QuantumScape has been successful in the past as the founder of Lightera and Infinera. The company is shooting for 2025 as the year it will begin mass production.

QuantumScape is not alone in the startup world. Massachusetts-based Ionic Materials has garnered some attention from big names like Renault-Nissan-Mitsubishi, Hyundai, Total, and Hitachi.

The timing is obviously up in the air for all companies. That being said, when successful billionaires are investing their riches in new technology, we should all take notice.

Battery Demand Just Can't Wait

And when you look at the numbers, it's no wonder the smart money is interested:

- Medical devices were already a $379 billion global market in 2014. Ten years later, by 2024, EvaluateMedTech projects that to be $594 billion.

- Semiconductors and sensors for the Internet of Things will have quadrupled from $27 billion in 2015 to $114 billion in 2025, according to industry group SEMI.

- Clean and renewable energy is taking an ever-larger chunk of Big Oil's pie. From next to nothing as recently as 2005, BP expects global consumption of renewables to reach 2.7 billion metric tons of oil equivalent by 2040.

All of that takes batteries. So it's no wonder that overall demand for battery technology is set to explode. (Not the batteries themselves… just the demand!)

Research firm Arthur D. Little sees the entire battery market growing to $90 billion by 2025 from $60 billion in 2015.

And – with the trajectory that medical devices, sensors, and clean energy are on – that market will just keep growing.

You want to invest in companies that will be winners in this breakthrough technology soon – while the smart money is still making investments but before the masses join the trend.

The rest of the world is sure to catch on soon. Bloomberg New Energy Finance predicts demand for batteries will explode from 100 gigawatt hours (GWh) last fall to 1,500 GWh by 2030. That means battery technology needs to keep up with the 15-fold demand increase in the next 11 years.

That demand will never be met if we stay with the current leading technology – the lithium-ion battery.

The supply of lithium is clearly not sufficient; neither is the supply of cobalt, a key component to the lithium-ion battery. This potential shortage is just one more reason researchers are focusing on an alternative.

And with everything we use on a daily basis that's powered by a battery, the race is on.

The Answer Is Solid State Batteries

There is no doubt a new battery technology is on the horizon. There is no doubt lithium-ion is on its way out the door. The question is which technology will reach the peak first and emerge as the revolutionary new leader.

I believe the winner will be the solid state battery. That is what Toyota, Volkswagen, Dyson, and dozens of other companies are pouring cash into today.

John Goodenough — the same scientist who brought us the current lithium-ion technology — thinks so, too. He still goes into the lab every day, at the age of 96, to replace his own game-changing battery with a new solid state design.

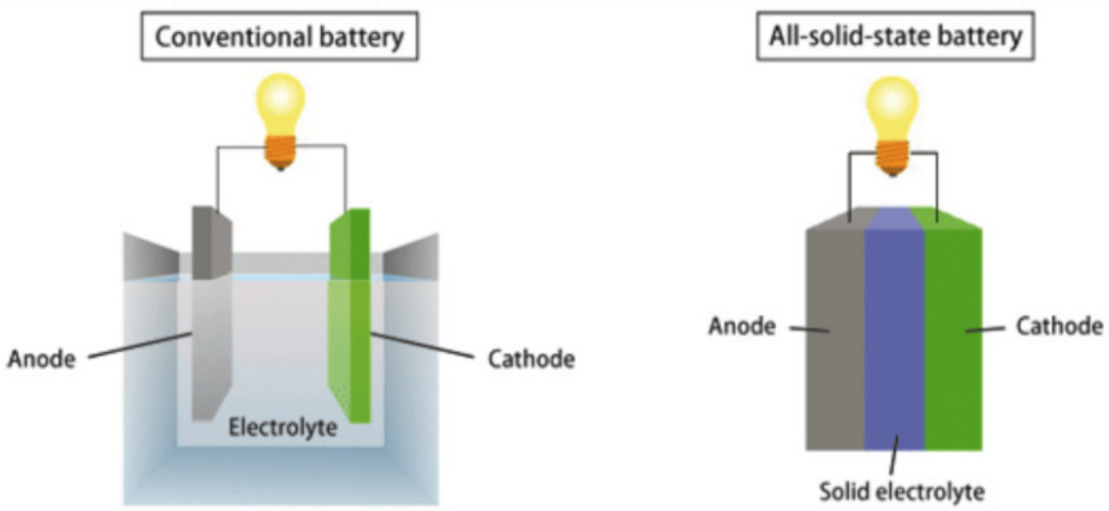
Without getting too wonky, let me help you understand what's special about solid state batteries so you can also understand the potential.

The biggest breakthrough is that the batteries no longer use liquid electrolytes. Instead, solid state batteries use electrolytes like ceramic, glass, or polymers. This change from liquid to solid will improve nearly every aspect of the battery technology of today.

Due to their composition, solid state batteries are smaller, lighter, and can store a lot more energy than what is currently available. That's crucial, as we're far away from Sony's bulky camcorders, and devices are getting smaller all the time.

On top of the operational benefits, the battery is less likely to catch fire or explode. And since we won't have to worry about toxic chemicals leaking out – and it may not even need cobalt – it also has less impact on the environment.

Here's the design. The left diagram is how the lithium-ion battery works, with its cathode and anode on either side, floating in liquid electrolyte.



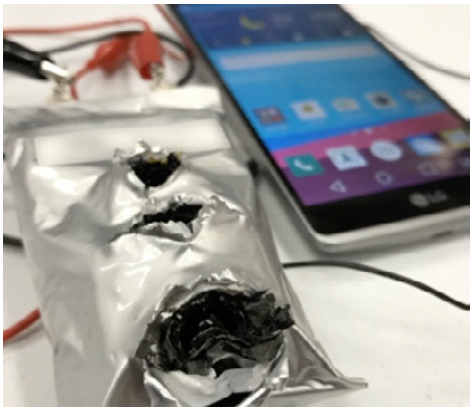
A solid state battery (on the right) has the same components, but there's way less of a journery between the cathode and anode. That means the battery lasts much longer – up to 10 years longer.

And, of course, the electrolytes are solid (the blue middle), not liquid.

Solid state batteries go a long way to eliminating the potential of leaks and fires that you get with current battery technology.

Let me tell you about a test that blew me away. It involved a solid state battery from one of the startups I mentioned earlier, Ionic Materials – and a .22 caliber Remington bullet.

Not only did the battery take three bullets and not catch fire, it kept working. And… it was still charging a phone 24 hours later!



That battery is shown in the picture to the right, bullet holes and all, still powering the phone plugged into it.

With components like ceramic and glass that are almost fireproof, the solid state battery could literally be a lifesaver in electric vehicles, planes, self-driving cars, power grids, medical devices, and more.

Every maker of these everyday products will be eager – even desperate – to get their hands on this along with all their competitors.

Solid state batteries are clearly safer… but are they BETTER?

Well, there are two very important words I'll bring up here: Energy Density.

The more power a battery can store in a small space, the lighter its weight and the less energy it needs. The improved energy density of a solid state battery is what is needed for the next generation of just about every technology imaginable.

Better energy density will allow electric vehicles to travel further without a charge, and it helps in the mass adoption of autonomous vehicles. Plus, as we saw in the diagrams above, the current lithium-ion models are much larger. So, with solid state batteries, medical devices will become smaller and less intrusive. And backup power for homes and hospitals will last much longer.

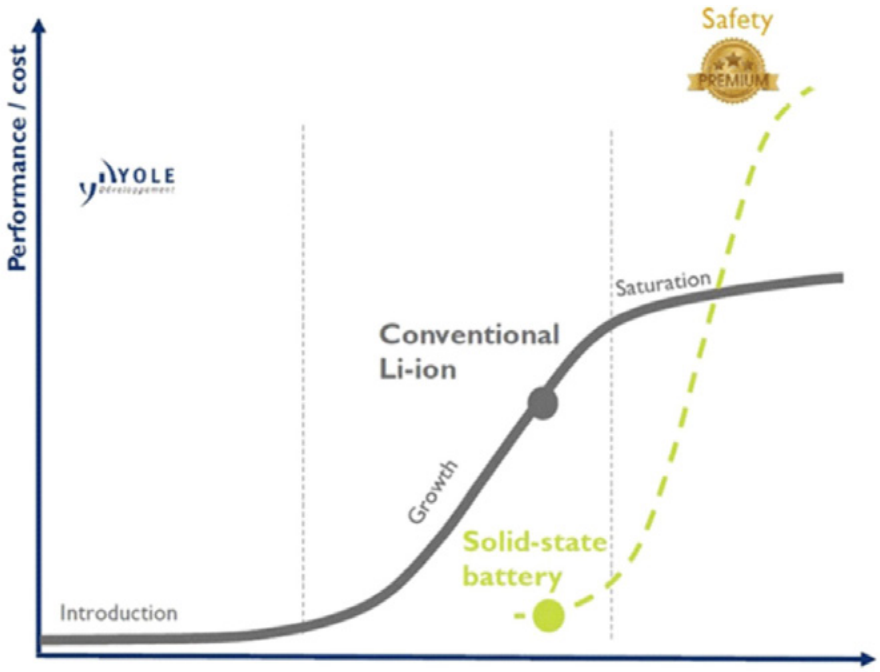
Planes and drones will also get pushed into the future:

Already, large sums of money are going into the future of air travel. In a 2018 survey, Honeywell found that dozens of the biggest companies in the industry plan to spend $1 million, $5 million, $10 million, or more on tech like this over the next five years.

Another big benefit of solid state batteries over time will be cost. Once they are mass produced, they will have a higher density capacity with a lower cost. It will basically do for batteries Henry Ford's factories and assembly lines did for Detroit cars.

The chart below shows the dramatically higher performance/cost of a solid state battery (the green dotted line)… and once again, it highlights the safety as well.

The bottom line is that solid state batteries are safer, offer better battery life, have better energy density, and eventually will be much less expensive.



Just about every industry that uses electronics – and these days, that's most of them – will want in on the action. Solid state batteries are their best bet to avoid the problems and obstacles of our current battery technology… thus drastically improving their business.

Any disrupting technology that can offer benefits like that is typically a good investment in my book. And that's why solid state batteries can't be ignored.

Incredible Growth Potential

After all the research and analysis, any potential investment opportunity must still have the numbers to back up big future growth. I would like to share predictions from a few research firms about the future of solid state batteries:

- According to a Global Market Insights report, the solid state battery market is expected to rise from around $100 million in 2018 to $2 billion by 2025.
- Inkwood Research expects the global solid state battery market to grow with a CAGR of 67% between 2018 and 2026.
- And let's not forget that researchers at Arthur D. Little expect the entire battery market to grow from $60 billion to $90 billion by 2025.

If solid state is the standard for future batteries, it will capture a large portion of that $90 billion market. Even a mere 10% is $9 billion. This would represent enormous growth in the next seven years. And even more importantly, it represents massive profit potential if you are invested in the right stocks.

The solid state battery trend is just beginning and it could last decades. Therefore, it is within our research to look 16 years into the future:

According to researcher Fuji Keizai, the solid state battery market will be worth more than $24.5 billion in 2035. To put that in perspective, the research firm pegs the solid state battery market at only $18.6 million in 2017. That is an increase of 131,620%!

And if we look ahead to 2040, Bloomberg predicts that solid state batteries will be in 60 million vehicles. That is from ZERO today.

We are making steps in the right direction. For example, in February, 24M – a startup out of Cambridge, Massachusetts – announced it has a semi-solid state battery that's ready for commercial use. Working off of existing technology, 24M says it can eliminate 80% of the lithium-ion battery's excess material, cut manufacturing costs in half, and nearly double the range of Tesla's Model 3 in the near future.

Ultimately, even if the number comes in at 25% of Bloomberg's prediction, that would suggest 15 million vehicles will be powered by solid state batteries. The upside potential is nearly impossible to put into numbers.

When I can identify long-term investment trends that offer potential growth of 10X, 20X, and in some cases 50X to 100X, I want in on the action. I suspect you do, too.

The future of batteries and energy storage is a true life-changer. The way you travel will be altered forever with electric and self-driving cars. The way you power your home will be based on a new technology of storing energy. Your devices could last literally weeks – can you imagine?! – without having to find an outlet for charging. Imagine cars driving on a single charge for nearly a month. The list goes on and on.

What seems impossible today could be the reality of the future.

The Current Leaders

In the early stages of a new and potentially groundbreaking technology, there are typically a few small companies leading the way. But you can believe that some of the world's biggest companies also join in the race so they aren't left behind.

Hockey great Wayne Gretzky once said, “I skate to where the puck is going to be, not to where it has been.” The companies that have the same type of thought-process will be successful in changing with the times.

When it comes to solid state batteries, the list of companies backing the technology is a who’s who of success in business. Let’s run down the list and see how they all fit into the marketplace as it is today.

Asahi Kasei (AHKSY)
Industry: Chemicals
Country: Japan

This diversified chemical-products manufacturer is part of Japan’s “battery cartel” backed by a $90 million government investment — specifically to research solid-state batteries for electric vehicles. The goal is to slice the technology’s current cost in thirds, cut recharge time to 10 minutes, and have solid-state batteries ready for production by 2022.

BMW (BMWYY)
Industry: Auto Manufacturers
Country: Germany

The German government is also investing big in batteries, as laid out in its “National Industrial Strategy 2030,” and BMW is looking to take advantage of it. It has applied for a slice of Germany’s $1 billion battery fund, and plans to use this grant to research solid-state battery technology. Whether or not BMW ever produces its own batteries (like some rivals), this is a clear signal of its eagerness to get industry-leading technology into its electric cars.

BYD Company (BYDDY)
Industry: Auto Manufacturers
Country: China

Build Your Dreams (BYD) and other Chinese firms are set to corner the market on electric cars, thanks to government subsidies, and soon that will include the batteries as well. BYD already makes solid-state batteries for industrial applications, like forklifts. It just broke ground on a new battery plant in Chongqing and is considering the U.K. and Germany as possibilities for another.

EnerSys (ENS)
Industry: Electronic Components - Industrial
Country: United States

EnerSys has to be part of a battery discussion. It is one of the global leaders in reserve power with sales of $2.8 billion in fiscal 2019, over 10,000 customers in more than 100 countries, and a 19% market share. It is more focused currently on continued advancement of lead technologies and expanding lithium into broader industrial markets. Even so, I would expect it to also be working on next-generation technology.

Enphase Energy (ENPH)
Industry: Semiconductor Equipment & Materials – Solar
Country: United States

Enphase Energy focuses on energy management for the solar industry, including inverters and home energy storage. Home storage, which requires batteries, is expected to grow 34% a year (compound annual growth rate, or CAGR) through 2022. The race is on for better batteries with bigger capacity – Tesla is also in this race for home storage – which will lead to next-generation efforts.

Hitachi (HTHIY)
Industry: Information Technology Services
Country: Japan

Hitachi's battery division took a stake in Ionic Materials — home of the "bulletproof" solid-state battery — in February 2018. Hitachi is working on an anode material to pair with Ionic's resin-based solid electrolyte.

Hyundai Motors (HYMTF)
Industry: Auto Manufacturers
Country: Korea

One of several big-name companies to have invested in Colorado-based battery company Solid Power, Hyundai expects to have cars powered by solid-state batteries on the road by 2025. Assuming that is true, the company should have prototypes ready to go by next year.

Panasonic (PCRFY)
Industry: Consumer Electronics
Country: Japan

Panasonic is a long-time leader in battery technology. Now it's one of the largest companies involved in the collaborative effort with the Japanese government and research organizations to move the solid state battery to a place where it is viable in automobiles and can be mass produced.

Renault (RNLSY)
Industry: Auto Manufacturers
Country: France

Renault-Nissan-Mitsubishi is also giving some attention to Ionic Materials as it works to replace liquid battery electrolytes with plastic.

Samsung (SSNLF)
Industry: Consumer Electronics
Country: Korea

Samsung surely never wants to have another exploding battery in any of its devices and is another key investor in Solid Power. Solvay (SOLVY) Industry: Chemicals Country: Belgium Yet another major investor in Solid Power, Solvay "leverages its broad array of technologies and materials to expand its offer for next generation batteries, with a strong focus on solid state batteries," as the polymer/ specialty chemical producer puts it on its "Look Into the Future" webpage.

Tesla (TSLA)
Industry: Auto Manufacturers
Country: United States

Tesla famously built a $5 billion "gigafactory" to crank out its cars — and the old lithium-ion batteries. However, in February it did announce a buyout of Maxwell, which is rumored to be close to delivering a solid-state battery for mass commercial use.

Toyota Motors (TM)
Industry: Auto Manufacturers
Country: Japan

The Toyota Research Institute is making a four-year, $35 million investment in research using artificial intelligence to accelerate discovery of advanced materials used in battery technology. Its partner — a U.K. battery company that has had a solid-state battery for Internet of Things devices since 2016 — envisions the Toyota partnership will allow its battery to be "scaled up" for mass production.

Umicore (UMICY)
Industry: Materials & Recycling
Country: Belgium

Umicore makes precious metal-based catalysts for cars, industrial emissions control and the pharmaceutical industry, and recycles these materials as well. It's part of a Europe-wide alliance with Solvay, who's trying to develop solid-state battery technology. Umicore currently makes solid-state "thin film" batteries which can be used in medical devices, "smart" cards, RFID tags & wireless sensors.

Volkswagen (VWAGY)
Industry: Auto Manufacturers
Country: Germany

To reach its ambitious goals for all-electric, solid-state-powered cars, Volkswagen is partnered with a Silicon Valley startup that holds about 200 patents and applications for technology related to solid-state batteries. The two companies estimate that a production line of solid-state batteries will be available in 2025.

Investing in the Source

There are a lot of major, multinational companies on that list. But as an investor, I definitely like a pure play on the battery revolution.

This is the "picks and shovels" approach, which got its name from the 1850s California gold rush. After gold was discovered at Sutter's Mill, thousands and thousands of people from all over the world rushed to California. They risked everything trying to strike it rich. Most of these people found no gold and lost everything.

Instead of taking the risky “all or nothing” approach of looking for a big strike, a smart German immigrant named Levi Strauss sold basic goods to the miners. It was a much safer, surer way to acquire wealth than trying to hit the motherlode.

Eventually, Strauss started producing a new kind of durable pants for the miners. They became a huge hit and Strauss got rich. Again, Strauss didn’t risk it all on trying to find a big strike; he simply sold goods to everyone who was looking for the big strike.

This business model – selling picks and shovels to a booming industry – is extremely powerful. You get paid by all players, big and small. Any time I invest in a sector, I immediately look around for good “picks and shovels” plays.

If you ever wanted to invest in the coming electric car revolution, but weren’t sure how, THIS is your chance.

I know I do.

So I found a company that holds key patents.

Automakers like Toyota are relying on this tiny company for its electric cars. Yet the company is totally off the radar.

That makes now the right time to get in before everyone else. I’ve got a full presentation on the investment opportunity in this “Jesus Battery”.

Sincerely,

Matt McCall