



C.J. Muse: Well, good afternoon. This is C.J. Muse was Evercore ISI. Thank you all for joining us. As part of our Evercore ISI semiconductor series, it is my pleasure to host Analog Devices with the focus on Automotive Electrification. Our special guests, we have Patrick Morgan, he's Vice President and General Manager of Automotive Business Unit. As well as Michael Lucarelli, Director Investor Relations. We have prepared slides that we'll go through roughly 10 to 15 minutes, and then we'll do a Q&A. If there's anything that you would like me to ask Patrick, please email me at cj.muse@evercoreisi.com. And with that, let me turn it over to Mike Lucarelli.

Mike Lucarelli: Thanks C.J., thanks everyone for joining us today for our second in the series here. As everyone's working from home, stuck at home, we decided to launch this ADI Uncovered Series to give you a different view of ADI. And talking to different business heads, what we see as growth drivers for the business over the short, medium and long term. We hosted one a couple of weeks back on 5G, and today I'm excited to host one on there to battery management systems or BMS, with Dr. Patrick Morgan. Before we get kicked off into the exciting stuff, I will read the forward looking statements, I'll do a very brief reading of it. There's the forward looking statements, you can see them on your screen. We have no obligation to update our statements we make today. You can read the rest of it right there. If you care to learn more about our forward looking statements. And with that, I'll pass it off the Dr. Patrick Morgan to start the presentation.

Dr. Patrick Morgan: Thank you, Mike. Thank you, C.J. And thank you all for joining us today. So as mentioned, I'm here to talk today about our automotive business and Analog Devices, and I'll specifically focus on battery management systems or BMS, the market, the position we have, and our look to the future. So I have a few slides today that I'll go ahead and talk through. Let me start with this one. First, I just wanted to give a breakdown of our automotive business, how to think about it.

First of all, when you think about Analog Devices and automotive, we are an innovation leader with the number one position in audio and battery management systems or BMS. We're also one of the first suppliers in the automotive MEMS technology nearly 20 years ago. And this is a major part of our safety business. In fiscal year '19, last year, ADI automotive generated \$930 million of revenue. That was approximately 16% of total revenue for Analog Devices.

So the way to think about this business is electrification which is about a third of the revenue and there's key areas: battery management systems, power conversion, isolation, and other parts of the electrified powertrain and battery management.

Infotainment is the next piece and is about 40%. And it's built upon our long heritage in audio signal processing. A few years ago, we brought to market our unique connectivity solution called A2B, which we combined with our industry leading digital signal processing technology, or DSP, to create a scalable audio platform that we have seen very strong uptake by customers, giving them, high fidelity audio, less wiring, and lower weight. And more recently we've added new technology into this platform with an active noise cancellation to cancel out the road noise and enhance the passenger experience further in the car, also improving fuel economy. The final piece is autonomous mobility which is about a quarter of automotive, our position here is built around providing technology for safety, navigation, and perception.

Now for growth drivers, we see increased penetration of complex audio processing, along with increased numbers of channels, even within mainstream vehicles. And we see that this creates a nice growth tailwind for us. In fact, our all digital noise cancellation system, as we recently announced earlier in the year, represents a first for production vehicles. There are several benefits of this technology, not only to the consumer and to the OEM, but also from a fuel economy standpoint as the technology enables the elimination of up to 80 pounds of weight. We're also aligned with electric transportation adoption and our technology covers the entire electrification ecosystem, which I'll speak to shortly.

Finally, we also see opportunity to bring our power capabilities into the new complete system. So, you can imagine adding power into our A2B platform. We're delivering high performance power and radar and camera solutions that go around the car. And of course, within the electrified powertrain, within the power conversion area, onboard charging and so on. So overall, we're well positioned, and we're diversified across multiple areas where our innovation leadership aligned with secular growth drivers that will deliver strong, profitable growth over the long term.

Now, I want to start talking about electrification and as we move into that, it's important to realize that electrification is really a full, complete ecosystem that includes everything from battery formation and tests, through operation of the vehicle and even into energy storage systems. And our devices have been a special position within the ecosystem because our technology touches many parts of the ecosystem. Each with a different set of customers and each with a different value proposition. However, if you look across the ecosystem, the common theme for ADI is all about innovation achieving the highest performance, which gives real benefit for our customers. So for example, if you look on the left side battery formation and test, this is about better factory utilization and ensuring that the cells are manufactured and created for maximum capacity, maximum reliability for the duration of their life cycle. Within the vehicle, the value propositions are more about extending vehicle range, providing clean, stable power and enabling fast charging. So these are the types of benefits that we see as consumers and that our customers see. So these are all exciting developments that push not only the frontier of the technology, but also make a positive impact on society and on the planet as we progress towards a sustainable electrified future.

So now I want to talk a little bit about some of the dynamics surrounding the market. So the automotive market is continuing its evolution and we see electrification as one of the major trends shaping the industry. Countries, OEMs and consumers are all converging towards broad electric vehicle adoption. Despite the COVID-19 impact on global auto sales very significantly this year, the electric vehicle sales have held up much better than the combustion engine, and there's several reasons for this that I want to talk through. So first, nearly all major countries have had some type of electric vehicle incentive in place. As a few facts, more than 14 countries and 30 municipalities or regions, have announced targets for phasing out sales of new internal combustion engine vehicle completely in the next 10 to 12 years.

Very recently, you might've seen that Germany doubled their incentives up to 9,000 euros for buyers purchasing full electric vehicle up to 40,000 euros in price. That's very significant. Second, especially in Europe and in parts of the US, emission standards are being put in place that favor electric vehicles. These targets help protect our environment from greenhouse gases and other emissions, which threaten our planet. Some municipalities have gone all electric for their taxi and bus fleets, including in Asia. Bottom line, the awareness of our environment and the need to protect our planet has perhaps never been greater than it is now, especially as we start to wake up from the COVID-19 crisis.

Thirdly, consumers have a growing preference for electric vehicles, especially as costs come down. The cost of lithium ion batteries have been in steep decline, dropping more than approximately 40 to 50% over the past year. And as we look to the future, we see the overall electric vehicle cost becoming comparable to an equivalent electric vehicle within the next two to three years. So finally, all in all, we see that over this decade, EVs are going to grow to account for something on the order of 20 to 25% of global passenger car sales, up from just 2% in 2020.

So now I want to shift to our battery managing system position, talk a little bit about the technology and then move into the rest of the presentation. So the first question is, well, what is the battery management system? So simply put, a BMS is a system of hardware and software which delivers power into and takes power out of the battery pack. The BMS is a critical piece of technology for every electric vehicle, especially because its job is to manage the battery. As you saw from the last slide, the battery is a major asset in the vehicle and represents about a third of the total vehicle costs. So there's several interesting characteristics about ADI's BMS. First of all, it's a complete system, it consists of isolation, communications, cell monitoring, pack monitoring, and software. We're now on our fifth generation BMS, and we were the first to shift production high voltage BMS over 10 years ago, in 2009. We have number one market share in high voltage BMS, shipping in more than half of the top 10 selling electric vehicles.

Our solution is fully scalable from 48 volts to over 800 volts. And we have a full family of products in our portfolio. Our BMS system achieves the best performance in the industry, and this was very well recognized by our customers. In fact, we guarantee our best in class accuracy over the entire life of the vehicle. And this translates into a benefit up to 20% more miles per charge, which can mean a total vehicle range of over 400 miles. Lastly, our solution is fully safe and sustainable. Not only ASIL-D, but also meeting the safety and security standards which are evolving. The solution supports multiple battery chemistries, such as lithium ion phosphate, which has zero cobalt. That's a big deal, since it avoids ethical issues surrounding cobalt mining and helps lower costs and strengthen safety. All of this means that ADI has a strong position in BMS and it's a major investment area for us as we go forward and we're continuing to innovate even further.

So, as we look in the future, we see a disruptive technology coming and this technology is wireless. And you should ask yourself, "Well, why is that?" And the answer has to do with costs, scalability and battery second life. So first let's cover costs. So the way to think about wireless is that wireless is built on top of all of the features of the wired BMS system that I just described. And it eliminates the need for the wired harness. This translates into 80% savings of wire pack. Plus it also saves engineering design and development costs associated with the harness, as well as the associated mechanical challenges and complexity.

Next, it allows the battery pack design to become highly modular and highly scalable by defining each group of battery cells as a module, different pack designs can be made to fit different form factors for different vehicle models. This allows the battery pack design to scale across the fleet, which gives flexibility and saves development costs.

Lastly is the topic of second life, because the battery module is wireless data can be collected and stored from the time the cell is formed through storage, assembly and use within the vehicle. At the end of the first life, the data can be used to set a residual value for the battery modules. This helps reduce the cost of a battery and enables a second use or a second life, which could be used in storage, recycling or some other applications. We see this feature as very interesting, broad across the ecosystem and disruptive

because it can create new business models and even potentially entirely new industries related to the battery industry, which also helps regenerate the planet and ensure a sustainable future.

So now let me go ahead and wrap up with a few takeaways. First, we see the automotive industry in a very interesting time where innovators are becoming market leaders. Now more than ever, we see that innovation is valued for the vehicle. And ecosystem is becoming ever more complex, which means that new business models are emerging. And this creates new opportunities. We also see a type of triple play that's very unusual where you have commitments from governments, OEMs, and consumer pull, all coming together at the same time. So we see the time as potentially transformative and as the leader in the BMS market and multiple areas of innovation across automotive, ADI is in an excellent position to continue to grow and to lead the next wave of innovation for this very exciting and dynamic marketplace, as we all proceed forward together towards a brighter and more sustainable future. Thank you.

C.J. Muse: Patrick, that was great. Thank you so much. You hit a lot of my planned questions so I guess I'll try to be creative here. I guess just first off to try to level set where you are within the BMS industry overall, my impression is that ADI historically has been strong in China, a growing presence in North America and early stage of success in Japan. So, is that assessment correct? Where do you stand in terms of initiatives for share gains elsewhere? And what is the life cycle for ADI to penetrate these other markets?

Dr. Patrick Morgan: Yep. Great question. So let me break it apart, maybe into a couple different pieces. Let me first start with the regions. So China was first to recognize the importance of electric vehicles and the country invested early. That's why that country is leading in electric vehicle shipment and we've maintained and grew our focus there. Today, China has over half the world's electric vehicles and we're strong in China. We're also strong and growing in North America with the established OEMs and with the innovators.

Now, historically, we've been a little bit less penetrated in Europe and Japan, but we're winning designs there as well. From a technology perspective, let's go back into time and look at Linear Technology prior to the acquisition by Analog Devices. So Linear Technology is acknowledged as the technology pioneer in high voltage BMS. They had the first product about 10 years ago, they were on gen five, going to gen six, as I mentioned. And what's also interesting is that the incentives are favoring full electric vehicles and this was recognized early on. Hence the focus on performance and the focus on developing unique, innovative technologies that provide important differentiation for the life cycle of the vehicle. And today, if you look at our position, we are the market share leader in full EVs, shipping into well over half of the top 10 selling electric vehicles.

So the last part of the answer might be that you might ask yourself the question, well, why do customers choose us? Okay. What I would say is that there's multiple reasons. First, we guarantee accuracy over the life of the battery. That means the most miles per charge. And it also means that when the customers want innovation and then they want proven performance, they look to Analog Devices. We also support the world's highest safety and security standards. These standards evolve over time. And so focusing on performance, safety, security, designing for the future, that's what Analog Devices does. So bottom line, the world is moving to EVs, our technology is enabling that move with great efficiency and safety. There's a strong environmental awareness, and this helps drive the demand growth even further. All those strengths trends we see as really strong for ADI.

C.J. Muse: You mentioned in the slide deck that you're now on your fifth generation product. And just curious, does that kind of keep you focused solely on high end applications or does it give you the capability across the whole spectrum of offerings?

Dr. Patrick Morgan: Yeah, so we do have capability across the spectrum. We have a full family of products within our portfolio. So yes, we do target the premium, but we also, by having a scalable and complete family solution, we can compete across the range. So there's a couple of reasons why, a couple of important points regarding our solution. So first is that we have the highest accurate solution in the market, and we continue to innovate that pushes precision higher and higher. And I think I've already talked to some of this, but let me explain why accuracy matters.

The reason why it matters is that when the energy in the battery is measured, the more accurately you measure the energy, the more usable capacity you can get out of the cell. That's because the algorithms are written in such a way that the battery cells are protected on both the top end of the charge cycle and the bottom end of the discharge cycle. So if a certain solution has buffers of say 5% on the high end and low end, where we can safely achieve much tighter tolerances, this means more battery capacity available. All of this means up to more than 20% more miles per charge. So that's the accuracy value proposition. And we see it as extremely important.

The second is around safety. As electric vehicles become mainstream as I mentioned, there's a growing need for safety, safety compliance, and these standards are evolving and being refined. So, we've architected the solution to meet the highest and newest safety standards. And it goes well beyond ASIL-D. If you look at when we acquired the technology from Linear Tech, we started with great technology and we've evolved it to be scalable, robust, and safe all while guaranteeing the highest performance in the lifetime of the vehicle.

So it's not just about innovation and it's not just about starting with a great starting point, but it's really about scaling it and engineering it so that it lasts across the life cycle and that customers can count on it continuing to deliver the benefits, especially around accuracy. This is a very, very difficult spec to be able to guarantee. And we have a number of other differentiators, things like a robust communication protocol, scalable across the family as I mentioned from 48 to more than 800 volts, support for a wide range of channel counts. And of course the world class accuracy where the industry views us as a leader.

C.J. Muse: So Patrick, you talked about the 20% better range. And curious, that gets you to the 400 plus mile mark. What can bring further improvements on the range side? Are there any specific milestones that we should be monitoring in the coming years to improve on that?

Dr. Patrick Morgan: So there's several different ways to look at that I think. The first way that I would look at it is that range is one of the major important care points in the market, but it's not the only thing. The way that I would look at it is look at it from a consumer perspective. First of all, there is range anxiety. And as far as range anxiety goes, accuracy is the major value proposition that we have. And that's the one where we win in the marketplace with our superior accuracy, providing excellent range as I talked about before. But there's a couple of other care abouts. I've mentioned safety and security. There we have a leading position where we continue to innovate and support the latest and greatest standards. And I think that's also important.

The last one is cost. If you look at the top reasons why, from a consumer perspective, why the market is being driven from a consumer pull, costs are an important factor, but not the number one factor.

Typically it's about green energy, but they are an important factor. And when you look at costs, you should ask yourself the question, well how does our technology reduce costs? And there's several ways. The first is when you look at the total system and the total system cost of ownership, being able to guarantee a certain level of performance that actually translates into less margin in the system and therefore fewer components, fewer over-design of the system, if you will. System margin is always a good way for our customers to be able to save costs.

Secondly, integration. When you look at the ability of our solution to integrate and you compare the bill of materials of our solution versus the others, we're in a great position. And then thirdly, as we look to the future, what we see is wireless coming. That really creates a whole new set of value propositions for the ecosystem. So what that can mean is everything from battery pack makers taking advantage of the fact that the modules are connected wirelessly and that data can be stored. It means OEMs seeing the benefits of wireless scaling out their fleets. And it means potentially a brand new industry evolving where you have the entry of the battery cell into the second life, thanks to the data that the wireless system provides. So really that would be sort of the major areas that I would point to, not only the 400 mile mark, which is obviously really important, but I would also point to some of those other aspects as well.

C.J. Muse: It was a great segue on your part to the wireless side of things. I guess a couple of questions on that front, I believe production is slated for second half of 2021. So I guess, can you speak to timing? And then as you think about first adopters, will that be the current market leaders first or would that be new entrance that would take the opportunity to use this new technology? And then I guess as a follow up question there, do you expect it to be adopted high-end only first or because of the cost element, perhaps more mass market EV adoption? So a few questions in there, but hopefully you can hit on them.

Dr. Patrick Morgan: Yeah. So first around timing. So first of all, the technology has been in development for a while. In fact, I think if you look back into 2016 or 2017, Analog Devices with Linear Tech had shown a demonstration vehicle at CES. It's fairly easy comparatively speaking to show a demo with technology. What's really difficult is to actually make it ready for production. And this is what we've spent the last five years, four to five years doing, is starting from a good technology position and turning it into a great product position. So as we start to look ahead for production, yes, we expect that in the next one to two years, we will see the technology being ready for production.

In terms of the adopters and who the customers are, it's anyone who sees the value proposition across the chain. We've gotten and we've seen interest from a wide number of potential users of the technology as well as partners. So it could be anyone that touches that value chain from the battery formation and test all the way through operation to vehicle and into second life. OEMs especially see a lot of value as they see wireless, they can see the value proposition with wireless, able to enable them to scale their vehicles. Most every OEM around the world has pledged commitments to electrify their fleet, but not every OEM in the world has fully geared up to enable that to happen. So if there's an OEM which has made the pledge and is starting to step up and set up their factories, wireless is a technology that absolutely offers a strong value proposition that gets considered within that dynamic.

Mike Lucarelli: I can add one thing. So what we've said publicly is we do have a large tier one OEM signed up and as Patrick said, they'll launch in the next couple of years. We've not been public of who that is, but I will say it's a household auto name that everyone is familiar with. And with that, I'll pass it back to you CJ.

C.J. Muse: Great. That's helpful. I guess as you think about adoption of this emerging technology, can you walk us through what the content difference might look like versus your wired business?

Dr. Patrick Morgan: Yeah. So the way that I would think about content is a couple of ways. The first is that wireless itself, even though we call it wireless, is actually built on top of the existing battery management system. So what that means is all of those benefits that our solution provides that I talked about before, so things like accuracy that's guaranteed across the life of the vehicle and so on, all of those benefits still apply. And what wireless does is wireless adds additional technology on top of that foundational cell measurement and pack measurement and isolation technology. And enables the harness to be removed as I talked about. And because of the value proposition that you gain and that our customers and partners gain across the life cycle, that value is able to be shared at different points in the value chain. So what that means is that everybody wins. The technology enables each of us to capture more value. So there's more content for ADI and there's more value for our customers. We really see that technology as a win win.

C.J. Muse: That's helpful. In, I guess other conversations as I think about the technology required to win here, new materials have been a clear focus, whether SOI, Silicon carbide, et cetera. I'm curious how you think about the implications of adoption of these new materials and how that fits in with your future technology roadmap.

Dr. Patrick Morgan: So, Silicon carbide is interesting, especially from an industry trend perspective. It's primarily in the powertrain. So today, if you look at the powertrain of the electric vehicles, primarily IGBT, silicon based IGBT, we serve this market today with our isolated driver product. So, ADI is the incumbent in a number of accounts, and it won't surprise you by the way to know that we have excellent performance there too. For Silicon carbide, like I mentioned, we do see a trend toward Silicon carbide. There's some fundamental reasons for that, sort of physics based reasons. And over time we do expect to see more and more Silicon carbide coming in electric vehicles. However, relevant to the IGBT market, the Silicon carbide market is still relatively early. But we do have solutions in place and we are game to be positioned for the growth trends.

C.J. Muse: Another higher-level technology question. A key theme I think across traditional automotive is a desire to reduce complexity and move to complete system level solutions. Curious as you think about the EV side of things, how do you see the market moving forward as it relates to full system wide solution and how I guess do you fit into that with your roadmap ahead? And what might that mean for your dollar content per vehicle?

Dr. Patrick Morgan: The short answer is absolutely there is a trend towards more full system solutions. And Analog Devices definitely plays here. If you go back and one of the slides that I showed there about our battery management system, it's not just about being able to measure the cell or being able to communicate the data. It's about offering a complete solution sort of at the battery pack level, which means it's about cell monitoring, it's about pack monitoring, it's about communications and it's about isolation. Again, the battery is one of the most highly valued assets. It's about a third of the cost of an electric vehicle. So whatever you put on top of that is going to absolutely be an essential part of the system. And then the other piece is the software that goes along with that hardware. So those are the components of our offering. And that's one example of the system.

Another example of a system that I could give you is our all digital road noise cancellation system. I touched on it a little bit in the presentation, but if I expand on it a little bit, earlier in the year, we

announced a collaboration with Hyundai, where Hyundai is putting our all digital road noise cancellation system into their production vehicles. This is actually the first vehicle in the world to use any type of all digital road noise cancellation. You can think of it as like a Bose headset for your electric vehicle that cancels the ambient road noise. So, when you're an electric vehicle, you've probably noticed that electric vehicle engines are much quieter. Therefore, when you're trying to listen to your audio or talk on the phone, you'll find that a road noise becomes a lot more noticeable. So that's one important benefit to the consumer.

The other important benefit, especially for the OEMs is that by using electronics to cancel the road noise, as opposed to the sound deadening materials that would normally have to be put into the vehicle, you're actually able to save weight from the road noise cancellation materials. You don't need that anymore. You just simply use the electronics. So that's another example of a really nice complete system. By the way, that system also involves using our IMUs and accelerators to measure vibration. So that particular system, it requires software, it requires a processor, it requires communication over the A2B bus for audio, and it requires a vibration sensor. So it's a pretty complete and pretty interesting system solution.

And then the third example I would give you is around our wireless BMS. As I mentioned before, that is already built on top of all those components for the wired BMS that I talked about. And on top of that, it adds a complete RF networking protocol, as well as hardware, as well as an interface library and some other components that enable the customers or our partners or others to be able to interface directly into the system. So again, those are also another nice example of a complete system solution.

C.J. Muse: To follow on your comments around active noise control. I have a question from an investor asking what is your content per car with ANC and when does ANC ramp?

Dr. Patrick Morgan: Yeah, so the ANC is definitely coming. Content per car, I'm not sure if we necessarily disclose that, but we can say it's a significant content for car, because like I said before, it's not just single components. Because it's building on the processor business, the connectivity business, and so on. When does it ramp? It's ramping now. So it's in production now with Hyundai, with that first production vehicle coming from Hyundai.

Mike Lucarelli: CJ, I'll say a couple of points to that. We won't talk specifically about what the content is. What we've said publicly is if you look at our A2B platform, which Patrick has talked about, we have design wins at 14 or 15 OEMs. We're shipping to a handful today, call it four or five. So the A2B platform will ramp. And what active noise cancellation does, it adds a different functionality to the A2B platform the customer can choose to use. If a customer chooses to use it, you need additional sockets so there's additional microphones in the car so our content goes up. And on top of that, you also need new technology, like MEMS sensors to monitor the vibration.

C.J. Muse: Thanks Mike. I guess really narrowing down on the BMS opportunity, you gave us the great slide that highlighted electrification at a third of the \$930 million run rate for last year. But really trying to narrow in on BMS. And I think in discussions with the company and in my confirming, roughly \$75, \$80 million per year revenues. But curious how you see the growth from that area, looking out over whatever timeframe you want to call out to the point where we're 30, 40% penetrated into total automobiles.

Dr. Patrick Morgan: Sure. Yeah. I can comment to some of the market dynamics and then I'll let Mike speak to how to model that. So yeah, first of all, as we said, we're shipping into over a half of the top selling electric vehicles. And what we see, especially in terms of market dynamics, is we see the innovators are becoming market leaders. And that's a type of trend that's very good for Analog Devices. Obviously we innovate, we push the boundaries with technology. We have full family scalability, but our customers value us especially for performance.

From a regional perspective we talked about China and it's importance for electrification, not only for batteries and vehicles, but also as a market. So we have regional strategies for China as well as for Europe and as well as for North America and Japan, like I've talked about before. So those are some of the dynamics. And then the next part of it, especially around electrification, is content. So obviously as your content grows, you also can gain your fair share of market. And we've given a couple of examples of how we are developing an offer and bringing complete solutions to market, especially in the electrification space, but not limited to that as we talked about.

So all of those areas, we see BMS as a strong growth driver for our business. We have a good leadership position there. We're committed to continue to fill that position and to continue to innovate for the future in some of the ways that we've talked about here today. Mike, would you like to talk about the modeling?

Mike Lucarelli: Yeah, sure. No problem. You're right CJ. What we've said publicly is if you look at BMS, it's just under 10% of automotive revenue last year. But it is one of the fastest growing markets, sub-markets for us. I mean, you saw the charts that we put up there. It's penetration, it's our share and it's our content, those three things. So I think as you look out in the coming quarters, I think that will grow faster than the automotive market and be 10% of auto. I think if you look over a long period of time, that BMS bucket continues to grow at a faster pace than overall automotive growth for ADI.

C.J. Muse: And if I can just add onto that, I think you previously highlighted roughly three times the content opportunity versus traditional ICE vehicle. Assuming that's correct, and I think the view on EV penetration is 25% over the next five to 10 years, is there a way to kind of size what this could mean for you? If you assume some range of market share?

Mike Lucarelli: It depends. I mean, we have good share, are in the winners today, but it also comes down to who wins the next five, 10 years. And no one knows who the winner is going to be. But we have broad market share and as a market lifts, we will go with that market. And as we penetrate new customers, like Patrick said... It's North America customers shipping more globally. It's new wins in Europe and Japan. It's additional wins. We have one in China for BMS. It's all going our way, our favor. It's just hard to say when that tipping point actually happens and what the growth rate is. And so I think for us, if you look at the market, it's taking off and it's going fast, you should expect ADI to grow faster than the market.

C.J. Muse: That's helpful. I guess on the adoption side of things, in conversations with folks from the industry, it sounds like COVID-19 is actually having a positive effect on pushing the green initiative, which may accelerate investment into areas such as vehicle electrification. Is this a dynamic that you are witnessing with your customers and partners? I guess just at a higher level, taking through ESG or sustainability, how are you thinking about the consequences of the focus there on EV and vice versa?

Dr. Patrick Morgan: Sure. First of all, the demand for anything green, I really think that's a secular trend. And I think one of the things definitely that COVID-19 has done is raised our environmental awareness, not only of our personal environment, but also the environment with each other and also the overall broader environment of the planet. So for all of those reasons, governments are backing it. They've got stimulus in place, a number of them, as mentioned before, but there's also a lot of data points around how the incentives are also moving into the direction of the full electric vehicles, where we're strong setting emissions targets. And also, consumers want it. So this environmental awareness and this demand for green, we definitely see is a dynamic that definitely... it definitely adds to this.

The last piece, of course, is about the OEMs pledging commitments to electrify their fleets. We've definitely seen some of the positive impact of the environment during the pandemic. Maybe you've seen pictures of New Delhi and some of the other regions, when you remove internal combustion engines from the roads, how that cleans up the skies. So definitely COVID has impacted the entire market, but the electric vehicles are holding up better than traditional cars. In terms of growth, we see electric vehicles definitely being incentivized in full, also from customers.

I could even maybe share some other data points, and some of them have been announced, where some of the OEMs have stopped development on their internal combustion engines. These days, especially during the COVID crisis, everybody has to pick their investments very wisely. The way that I phrase it is, the choice for electrification is really a choice for the future. That's where we see the market heading.

C.J. Muse: Very helpful. I'm curious if you could spend some time on current competitive landscape. Who are you primarily competing with for wins in this arena, and what are the main reasons that drive the win column for you guys versus someone else?

Dr. Patrick Morgan: Sure. There are a handful of competitors in the BMS space, and I think most everybody knows who they are. These are the traditional competitors. So why do we win? It's about performance. It's about innovation. It's about each of our customers staying ahead of the others. The fact that we can guarantee our performance for the life of the battery or the life of the vehicle, that's a big deal. It's a very easy thing to say. It's a very, very difficult thing to do. And it's thanks to the technology we've developed over the last 10 years, which is unique and proprietary for us. So it's a really strong differentiator.

Achieving the full safety standards. And now on our generation five. Our generation five is winning designs. We're pretty bullish about that, and it looks very, very good. It's introducing new types of features into the marketplace, even just into the wired space. And then of course, wireless is adding on top of that, making scalability easier for our customers as they scale their vehicles across the fleet. It's a really powerful value proposition, and it's a very interesting value proposition that extends across the value chain.

We've got a full family of parts. I mentioned that before. We can compete across multiple segments. When we lose, it's typically because the design, value and performance metrics are less, and they want a lower type of cost solution that is already commoditized. So for example, you can think about power tools for two wheel designs or things like that. These are relatively very simple BMS systems, and there's much more commoditized solutions available, but I would say in those cases where it's difficult for us to compete, we have had companies come back, try to return to us when they realized their performance didn't measure up to ours. We're really rigorous in terms of how we spec our performance we offer and

deeply partner with our customers to make sure that they see all the value that we bring to the party there.

C.J. Muse: Just to follow on that question, are you seeing differences in terms of competition on a geographic basis, and how are you fairing in hybrid solutions versus full EV?

Dr. Patrick Morgan: First of all, there's a regional dynamic. Different regions have different dynamics, but in general, the competition is kind of similar, I would say. As you said before, we do target on the premium end, and so we have a lot of differentiation there, but the fact that we have a fully scalable solution helps us. What that means is that our value proposition is most highly valued in those premium full electric vehicles, but also in the entry level full electric vehicles. So the point there is that, if it's a full electric vehicle, meaning that it has a plug and it's going to be relying on the electric battery for its operation, then our value proposition is very, very strong, and our scalability enables you to go from an entry full electric vehicle all the way up to a premium full electric vehicle.

Now, if you start talking about hybrids, the value proposition changes. For example, I've got an older Lexus 400 H hybrid that uses the battery pack that I think has got a range of like 10 or 15 miles, but it's primarily an internal combustion engine vehicle. It's just using the battery to give it a little bit better gas mileage, and maybe a little bit better performance under slow driving conditions. So in those cases the overall value for the electrification part of that vehicle is just less. So, you can sacrifice it. If your battery has 50 miles range or 10 miles of range, it doesn't really make that much difference.

But, like we said before, in terms of incentives, in terms of where the economies are going, where the governments are incentivizing, where our customers are going, it's all about full electric vehicles. We see full electric vehicles as the future. So we do compete in those other segments, but in terms of growth, in terms of secular trends, we see it's the full electric vehicles.

C.J. Muse: Very helpful. Pat, I think that you were recently made general manager of the entire automotive business unit, whereas I think before it was electrification and infotainment. And so curious, given that backdrop, how are you thinking about your full portfolio? Any areas where you see need for either greater investment or technology? But really just a holistic question around how you're viewing your portfolio and the growth outlook looking out over the next decade.

Dr. Patrick Morgan: Sure. First of all, I'm really pleased to be a member of the team here and managing our automotive portfolio. We've got a really strong technology history and a strong culture of innovation in the company, and this is something that you can really feel within the automotive group. We love to make solutions that are ahead of others, and we love to continually push the boundary of the technology. That really is a theme that I see across the company, and that's really well-exemplified by our automotive team.

The second piece of this, I'd say, is that this idea of scalability and competing in the market and gaining market share, I also see that as a really nice cultural backdrop to what we have at Analog Devices. We have a strong manufacturing footprint. We know how to scale design, and we have teams specifically within the automotive business units that are set up to do exactly that. Some of the technology that we brought in from Linear Tech, we started from a great technology base, and we've been able to scale that out, leveraging our manufacturing footprint. That's sort of the second aspect of it.

And then thirdly, in terms of investment, what we see going forward, electrification is a really strong area for us. We continue to invest very strongly there. Same thing for infotainment. It's a great franchise that we've got developing here. It's differentiated. It's complex. It's very, very interesting and it's aligned with these secular trends. But then for autonomy, we have an existing safety business and that's primarily MEM space, but we also have some fantastic technology in there as well, which we believe can be especially valuable as we look to the future around autonomy.

I would say overall the industry has had some push out in terms of mass market adoption of autonomy, but what we've seen is when you look across the different types of autonomous vehicles in the market, we actually see that growing. So even while autonomy may have gotten a push out from within passenger vehicles, we also see other areas where they can take advantage of our autonomous solutions.

C.J. Muse: That's great. I think we've exhausted our time. So Pat, Mike, I want to thank you both for sharing your time. We all greatly appreciate it. And to everyone in the audience, I just wish everyone great health. And thank you, ADI.

Dr. Patrick Morgan: Thank you, CJ.

Mike Lucarelli: Thank you, CJ, for hosting the call. And for the investors still on the line, you can find the presentation at the investor.analog webpage under the events section. Thanks, Patrick. Thanks, CJ. Talk to you guys soon.

[End of Session]