

Ep.3.06 - Mujeeb Ijaz

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SPEAKERS

Announcer, Ed Clemente, Mujeeb Ijaz

A Announcer 00:01

Welcome to The Michigan Opportunity, an economic development podcast featuring candid conversations with business leaders across Michigan. You'll hear firsthand accounts from Michigan business leaders and innovators about how the state is driving job growth and business investment, supporting a thriving entrepreneurial ecosystem, building vibrant communities and helping to attract and retain one of the most diverse and significant workforces in the nation.

E Ed Clemente 00:29

Hello, I'm your host today Ed Clemente and we're fortunate to have Mujeeb Ijaz, founder and chief executive officer for ONE. Welcome to the show, Mujeeb. [Thank you, Ed, it's great to be with you.] And do you want to break down the acronym of ONE, what does ONE mean? And people don't even know what your company is. So why don't you tell people what it is?

M Mujeeb Ijaz 00:49

Yeah, we named the company Our Next Energy, the Our is the "global our," you know, the almost 8 billion living on Earth. As we see this transition from fossil fuel to electrification. We see this as a chance for the global community to start adopting and embracing electrification. So we decided to name it Our Next Energy, which stands for ONE.

E Ed Clemente 01:14

Yeah, and I think, obviously, Michigan is becoming a bit of a hotspot now. Hopefully in the electrification path. In fact, I just heard the U.S. Department of Commerce describe it as what, battery row or what are they call it the belt? The battery belt now? [Okay, great. Yes.] Along I-75. All the way up and down. [Yeah, the battery belt. There you go.] And so it's sort of

interesting and it's exciting, the joke is if Henry Ford came back today, he would still recognize what an engine does, right? And this is the first time maybe in 100 years, you're having this revolution as well as evolution, right?

M

Mujeeb Ijaz 01:53

Yes, that's right. You know, I study that history a bit back in the day, when electric cars were part of the early turn of the century in the 1900s. They didn't deliver on cost, and range. And we're still working on those two topics. So hopefully, in this century, we get that right. And we can help create the transition to electric vehicles and electrification.

E

Ed Clemente 02:17

I give tours for international delegations a lot of times at the Henry Ford Museum. And there's a truck from 1900 there. [Yes.] I don't know if you've ever seen it. [I have.] Yeah. And I cover up the you know, the little description, and I go, What do you think propels this, what moved this back then? And almost nobody guesses electric. You know, they go horses, steam, coal, wood, you know, all kinds of things. And it is amazing, how a little bit, that Edison was also his mentor. [Yes.] And you worked at Ford Motor Company, so why don't you kind of get like how you got on this path, too.

M

Mujeeb Ijaz 02:53

Yeah, you know, the first time I entered Michigan, I was lucky enough to be driving a solar car that I had a hand in making. So you might say that my first electric car back in the late 80s, was a GM Sunrayce USA competitor, as Virginia Tech. We were one of 33 colleges that raced from Orlando, Florida to Warren Tech Center, Michigan. And really that journey of both creating an electrified powertrain and then racing that vehicle to Michigan, gave me the motivation to join the automotive industry and electric vehicle. And so in 1992, I joined Ford Motor Company.

E

Ed Clemente 03:34

And you did quite a bit there actually. Did that sort of help you, kind of, it's hard to be like a generalist maybe coming in the automotive industry, but did that help you sort of get your love of how electrification was playing out?

M

Mujeeb Ijaz 03:49

Absolutely. I think that, first of all Ford is continues to be a great company in leading the next generation of technology. And back in the early 90s, some of the most advanced battery research work in the industry was going on at Ford, and I had a chance to join the battery effort in the early 90s, and be a part of a lot of the electric vehicles that lead up to really I would say the point where range not being enough, was the core problem. You know, in the early days, it was trying to create an electric car and integrate systems and learn how systems engineering could be brought as a tool into designing better total system powertrains. But then battery

technology had to mature to get over the barrier of getting it to consumer acceptance. And that became now the next big phase, is the powertrains were no longer a big mystery. You can make reliable electric drives. You just needed a better battery technology on range, and then eventually on cost of materials as well.

E

Ed Clemente 04:54

And this might be a little bit off topic, but recently we had an expert on. She used to work for CAR, Center for Automotive Research. But now she works for the Chicago Fed. But it was interesting. And I never knew this. But because of all the electrification, how many more microchips and semiconductors now have to go in vehicles. Is that part of the integration? Like you have to kind of work on those things too, as you're designing batteries?

M

Mujeeb Ijaz 05:22

Yeah, for sure, if the original automobile did not depend on engine controls being electronic, but rather carburetors and conventional mechanical systems, the adoption of an engine controller was a big step for the auto industry. But going from transmission and engine to completely electronic inverter, motor controls, electric drives and batteries represented a massive shift in compute power, chip content, and also wiring and electrical distribution. I remember the early days of even discussing what color should a high voltage wire be, because at the time, there was only red and black for 12-volt wiring, there was no orange. And we had to think about what is the right standard for the auto industry. Those days of like transition to electrification meant adopting a whole different philosophy of electric, let's say software, hardware, chips, circuit boards, that content massively transformed, the way you thought about a vehicle powertrain from let's say, the 80s, until the end of the 90s.

E

Ed Clemente 06:31

I would guess there's, you might have somehow referred to this, but optimum use of battery consumption, right, the energy from a battery. Because, like I know a car usually gets heated because of the heat from the engine originally. So that's something you had to really take into, like colder climates.

M

Mujeeb Ijaz 06:48

That's right, you know, consumers are not conditioned to believe that winter is going to change range. Because waste heat from a combustion processes free. Really leaving the heat on and as high as you want is not a factor in the vehicle range. In an electric vehicle, it can actually be a 20% factor. Speed is another 30% factor. If I drive at 80 miles per hour. Well, back in the days of early electric cars, 55 was the speed limit. But as time has gone on 70 has become the speed limit. And people routinely drive a little faster than that. Electric cars have a burden unlike gasoline vehicles, because they have a limited source of energy. The efficiency of everything is very important. And that's where people have to start rethinking about the range topic being related to climate, and air conditioning and heat not being free.

E

Ed Clemente 07:43

Yes, when I was, I remember back in driver's training. They would say, because they're still worried about fuel consumption, but the optimum speed to drive a car was actually like 63. [Yeah.] But that kind of doesn't exactly equivocate with electrification, because it's different dynamics. And I don't know, probably aerodynamics as well.

M

Mujeeb Ijaz 08:07

Yeah, the the force against a car rises in an exponential way, as a cube of the velocity of the car. So if you go a little faster, like 10 miles per hour faster, you can actually double the amount of power required, and therefore the consumption is faster, and you can lose energy faster. So getting to a point where you can overcome that condition is one of the reasons we started the company, Our Next Energy. When I was working in California, I had been on a trip to Lake Tahoe from my home and the Bay Area. And the last, roughly the last 20% of that trip, was climbing a mountain. And the electric car that I was driving at the time, had predicted I would have gotten there. But I didn't get there. It was because it wasn't ready for speed and grade. And I had to pull over I remember my family being very deeply impressed with this electric car, because we had to pull over and leave the car to get at a grocery store and manage a lift from there to get onto our destination. And I had to come back and deal with that. And that real world problem that mountain climbing, speed and temperature affecting your range. I started analyzing that. And I realized we're about twice, we need twice the range or twice the total energy on board to overcome the real world conditions. And today's batteries would get part of the market. But we would not get to the whole market without doubling the amount of energy onboard. So we went after that goal. That's why we started the company.

E

Ed Clemente 09:42

It's funny you mentioned that because I remember reading a story, a Henry Ford book actually. And they talked about one of the attractive things about the Model T was what good mileage you got, compared to the customized cars that were built prior. You know, that were much bigger are in a heavier? [Yes.] The Model T is like stripped down like a dune buggy.

M

Mujeeb Ijaz 10:04

You bet. Yeah, lightweight. He talked about weight being the ultimate measure of success in your engineering endeavor is weight. It's minimizing the use of materials which ultimately translate to cost. I also read a lot of stories about philosophy of the Model T and keeping it simple and lightweight. And people would ask him, you know, routinely, why is your vehicle faster, and they always think of faster is related to powertrain, but faster can also be related to vehicle engineering. And that's the concept of systems engineering, you don't need to try to focus on just one part, one organ, if you will, of a total system, you focus on all of it working together. And that's what we've done in our battery technology to get to doubling the range, we decided that daily driving can be accounted in about 150 miles, but no one would buy that electric car, if you design an electric car, even though 99% of the time, that's where you spend your time, we would want an electric car to have a top line range of many hundreds of more miles than that. So we came up with a range extender, a second chemistry that was dedicated

just to extending range that had 1/10, the lifetime and 1/10 the power level, but it had a doubling of the amount of energy onboard that cell. And we were able to create that dual battery architecture through a systems engineering approach, not trying to make a single chemistry, we're bringing more than one chemistry together.

A

Announcer 11:35

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E

Ed Clemente 11:51

And you also kind of glazed over it a little bit. But you also worked at Chrysler, and then from Chrysler, did you go to Apple? That's why I assume you're working in California or am I mixing up your timelines.

M

Mujeeb Ijaz 12:03

Yeah, you're pretty close. But I'll give you the the nuance of the Chrysler connection. I actually founded the automotive A123 Systems team. [Oh, yeah.] Which is a battery company, founded in 2008, for automotive, meaning that Michigan team that brought automotive business, and the first company to award business to A123 was Chrysler. So you might say, as I worked at A123, I also work heavily for the team and in Chrysler for their electric vehicle effort. And as we grew that team as a first battery supplier in Michigan to build a factory here in Metro Detroit, that was the original lithium iron phosphate effort. But it didn't have the range, it was 150 miles capable, but not 300 to 400 miles capable. And that's kind of where the industry longed to get, it needed to climb over a threshold that the market would not question the utility of the vehicle. And therefore nickel and cobalt became the chemistries of choice. But as those chemistries started to proliferate, we started seeing cost problems, supply chain problems, where do we buy cobalt, as we start scaling the whole industry. And then there were some examples of thermal runaway, where the chemistry can break down and release oxygen. And then as it runs away, you can't control it, it could lead to a vehicle-level fire. Those topics led me to believe that doubling the range of electric cars a goal was also needing to be paired with sustainable materials. And we read and decided that iron and manganese represent the future sustainable materials. They're abundant. And they're low cost, and done right in chemistry that can be safer. So we're working now on iron and manganese future, absent cobalt completely and trying to minimize nickel. As we're developing those technologies. We're developing a North American supply chain all the way to the materials that will go along with it.

E

Ed Clemente 14:04

Yeah, it's so funny, how much now you hear about nickel and cobalt and countries that might not be as friendly to us, like geopolitically sometimes too. And even lithium to that matter, too, how it's sort of maybe going to be like electro states versus petro states.

M

Mujeeb Ijaz 14:23

Yeah, that's right. Well, if we get to an abundant material, any kind of an abundant material that you can mine anywhere, will prevent that. What we don't want is a geographically cornered market, where one country has 50 to 70% of the supply of something. That's where you get into the haves and have nots, and conflict is born out of the lack of geographic diversity. So we think in Our Next Energy, if we're going to help get to the full market, make sure range is good enough because batteries have to be more dense, and then make sure we have abundant materials.

E

Ed Clemente 14:57

And I kind of took you off tangent again, which is normal for me. But, what'd you do for Apple?

M

Mujeeb Ijaz 15:07

Well that, because I couldn't ever even talk about that with my family. [Yeah.] No, I still can't talk about what I did there. [Nevermind.] But I'm so happy that I was there. And it was a phenomenal opportunity for me to learn from a different perspective. I think my three careers, Ford Motor Company, A123, and Apple, represent three completely diversely different experiences. Almost, you could say my education to create a company like ONE. It came from those three experiences. Ford Motor Company being vehicle systems engineering, electrification, battery technology, and then how to put something into production. That's automotive-capable, A123 Systems, how do you become a supplier? How do you create a start-up into a qualified automotive supplier? How do you then serve the wider market and keep up with market trends and create factories? And then Apple taught me a lot about how do you develop an idea that creates disruption. And the most central ingredient in that third lesson that I got was the willingness to state a goal, an objective, that had no technology roadmap to get there. As you know, the earliest iPad was ever envisioned a window into the internet. The development of that technology had the needs of screens and touch screens, and then tablets, none of those technologies existed. When the idea started. For me, it's the statement we need to double the range of an electric car without using nickel and cobalt, the most successful chemistries of the day was my mission statement of impossibility, meaning that everyone else would say that's impossible. I was saying, Okay, well, what I've learned is, state the impossible, then if you go on a journey, and you figure it out, you'll be the first to try to figure it out. If you do figure it out, your company will be invaluable. And that's kind of the journey that we're on so far is how to peel the onion that creates that destiny of doubling the range without the raw material complexity of nickel and cobalt. And I think I wouldn't have had that inspiration to do a bold move like that without the training I got working in California.

E

Ed Clemente 17:26

Yeah, I'm very familiar with A123. I was a State Rep. before and I did some of the bills for the one that got created. And I think it was in Livonia. I can't remember where it was. [Yeah, Livonia and Romulus.] Yeah, I did several tours of both sides, actually. But I remember when that was all kicking around under Governor Granholm at the time. But you also brought up a different point, which I think is interesting. In a book I read just recently about how disruptors

really aren't necessarily disruptors, as much as sort of arrow points for evolution. Sometimes, right? [Yeah.] So the leapfrogging that has to take place is kind of, this is sort of the question I would have asked you anyway, but where do you see sort of trends that are either disrupting or evolving or whatever?

M

Mujeeb Ijaz 18:14

Yeah, well, you know, first of all, disruption comes from being stubborn. You have an idea, and then you don't give up on it. If you give up on it, then certainly you will definitely never achieve the disruption. So you have to be willing to kind of bump your head against a wall that says that's never gonna work, until you finally come up with some ideas to say it might work. And then you start pursuing them. So I think that that sort of latching in and not giving up is one attribute, you see that with a lot of the inventors of the past, they had to search for a successful route that they could keep going on. But then as you talk about, you know, it's sort of the evolution is you should build on ideas. I'm a firm believer in the pragmatic, building upon ideas. And so you could see that in our Gemini dual-battery concept is really what we've done is we brought a successful lithium iron phosphate battery, together with something that people discarded is never relevant to the automotive world, which is a high energy cell chemistry that has no lifetime and poor power. And I looked at that and said, Okay, wait a minute, all I need to do is create the integration through new electronics, new software, and validate a chemistry that would then survive automotive lifetime. I have to integrate all of those ideas, but they're really just kind of already sitting there on the table. Nothing was like a brand new, did not ever exist as an idea. And so disruption can come from the realization that you take incremental steps in certain ways, but you bring and integrate those ideas together like other people don't see. And that's what we're working on now with Gemini.

E

Ed Clemente 19:55

Yeah, it's actually sort of a weird metaphor, maybe for the balance between inductive and deductive reasoning, right? Because you're have to use both sometimes to solve the answers, right? So it's, what do you take away? And what do you add? Yeah, I always liked that, I used to have to do that for reading a mystery book.

M

Mujeeb Ijaz 20:16

Yeah. Yeah, there's another ingredient that I found very helpful, which is I jumped off my job into the big pond of startup, and I had to swim. And you know, when you're an entrepreneur, and you left your job, well, you know, you have like a family that look at you that says, was that a good idea? You have a certain pressure that is unlike any other where you must be successful, you don't have a choice. And I think in that context, you need a little pressure sometimes to be motivated to do something that you didn't do before. So I think it's that ingredient of being an entrepreneur, willingness to take the risk, and then kind of fight for survival. You get into survival mode, survival mode is a good mode to be in when you're trying to create something new.

E

Ed Clemente 21:04

Yeah, it's always easier to swim when you can see the shoreline. [Yes, that's right.] Um, so you just actually answered partially the question I was going to ask you, but is there any advice you'd give your sort of 17 year old self now that you've had all these different iterations of a career?

M

Mujeeb Ijaz 21:24

That's a good question. I would say that I lucked into this this electrification movement, I kind of randomly switched my major in college four times. And I never was that excited about the academic side, I was much more interested in messing around with hardware, my own cars, and motorcycles and things like that. But, when the solar car announcement came, I did recognize something the value that my parents gave me, because my mother was a solar physicist professor at Virginia Tech. My father was in nuclear physics, they both believed in alternative energy. And they talked a lot about the future of energy and the security that would come from having all kinds of different energy sources, not just depending on one, which was a geographic haves and have nots problem. So I feel like I got the benefit. And I lucked into the opportunity to integrate technology oriented mission around alternative energy was my hobby and my passion, working on cars, and sort of like messing around with mechanical things. And those two coming together and building that solar car. And GM, by the way, had an enormous impact. Still today has an enormous impact on the whole world of electrification in this country, because they had an insight when they ran the Australian World Solar Challenge. And they won that challenge in the 80s. They wanted to come and build an electric car, which was the predecessor team to the GM EV1. And that team wanted to recruit. And as they explained it to us as university students, they tried to find the talent. And there was no talent. They couldn't find academic route, where electrification was a thing. And they decided to create a competition that would inspire the youth to work on the subject. And they would find their way to the auto industry. And it didn't matter if it was GM or others. They just wanted to help. It was like a workforce development initiative, very successful even today, and has evolved. It's still around, the solar car is still around. Then now there's something called EcoCAR, which ONE is a promoter and sponsor of as well. And we see a lot of students coming out of the academic world with those backgrounds that hit the ground running and companies and are very successful in this electrification age.

E

Ed Clemente 23:48

So, you're a Hoya, right?

M

Mujeeb Ijaz 23:51

I'm a Hokie. [Hokie, that's it.] A Virginia Tech Hokie.

E

Ed Clemente 23:53

Hoya is the other ones, the Washington D.C. school, right?

M

Mujeeb Ijaz 23:54

Yeah. I'm a Virginia Tech Hokie. And we have a pool table here at one and I have a friend of mine that came from Virginia Tech, one of our interns, and he brought me a pool cue with the Hokies emblems. So, yeah.

E

Ed Clemente 24:13

I don't know what a Hokie is, though.

M

Mujeeb Ijaz 24:15

You know what, it's sort of like a turkey gobbler. All right. [Oh, it's a bird.] Yeah, yeah, that's true. Most people don't know what it is. And maybe that's the best kept secret of the south of Virginia.

E

Ed Clemente 24:29

I don't know if there's a big turkey walking around your sidelines for basketball games. So anyway, the last question, which is probably because you've been here before, I mean, you lived here before. What do you like about living in Michigan? I mean, you've lived in three nice states, Michigan, California, Virginia.

M

Mujeeb Ijaz 24:50

Yeah. When I came to Michigan, I remember missing the Blue Ridge Mountains. You know when you grew up around mountains you kind of miss mountains. If you look outside and you expect to see mountains in Michigan, it's pretty flat. So I was talking to one of my cube mates at Ford early on, about missing the mountains of Virginia. And he said, Well, if you're in Michigan, you should learn how to love our lakes. And so he pointed me to the Upper Peninsula, Mackinac Island, the Great Lakes. Sure enough, I bought a boat. And actually, it's funny, I bought a boat, and I went back to our apartment, and my wife's coming outside in the apartment parking lot. And she's looking at the boat. She's like, Okay, that's cool. But we don't have a house and what do you do? What are we going to do with this boat as we live in an apartment. I said, Don't worry, I'll find a house now. And she's like, alright, it was long as the boat leads to a house. So then I found, but actually, then I found a lake. And then I found a house. So I went to the complete reverse order, I found a boat, then I found a lake, then I found the house. And my wife decided that that was actually fine with her as long as it led to a house. But I love boating, fishing. Taking my kids to Mackinac Island, I think the natural beauty of the state is unparalleled. Just the joy of boating from Detroit River to Cedar Point, and spending a whole day on Put-in-Bay or, you know, any of the Great Lakes activities, and I live on a lake now, I just feel like the natural beauty in the Great Lakes are something to be treasured. And we're coming to a point in our human history, where fresh water is going to be a new problem. People are going to find it hard to find sources of water. And we're going to see that Michigan climbs

over time and value where people see this natural beauty as such an unparalleled beauty when climate change might affect other regions where they lose that capability. We have such a great supply of this natural beauty that I think we're living in a great place.

E

Ed Clemente 26:47

Yeah, that's a great point. I know the MEDC, we focus on that, but it's something that is getting closer and closer with that challenge. But once again, I just wanted to thank Mujeeb Ijaz, he's the founder and chief executive officer for ONE and Mujeeb, thanks a lot. You are a lot of fun. I hope you enjoy me not questioning you too much and welcome you back anytime if you want.

M

Mujeeb Ijaz 27:12

Fantastic, Ed, it's great talking to you. And thanks to the MEDC team for making us feel a warm welcome here in Michigan. We appreciate the opportunity to be a part of our development of new industry here. Thanks a lot.

E

Ed Clemente 27:25

Join us next week where I guess it's going to be Harry Moser. He's the president and founder of the Reshoring Initiative, and how it affects talent and America's future in manufacturing.

A

Announcer 27:39

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