

Beyond the Electron Podcast

Electrified Transportation



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Energy

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Chris Warren: There's little argument these days that electrified transportation will play a significant part in the world's efforts to decarbonize. Looking at a couple of examples, Navigant research projects that electric cars could make up nearly 20% of all new car sales by 2030. And Bloomberg New Energy Finance projects that figure could be nearly 60% by 2040.

Chris Warren: But in this big shift from gas powered cars, buses, and trucks to electric vehicles, it's important to not get too mired in the data and statistics. What ultimately will propel the transition to electric vehicles are consumers. Put simply, drivers need to understand and embrace electric vehicles in order for them to become mainstream. Keeping the consumer in mind will be critical as the auto industry, utilities, policymakers and regulators work to build vehicles and create the infrastructure needed to make electrified transportation a reality.

Chris Warren: Understanding electrified transportation and how to put the consumer at the center of this transition will be our topic on this episode of Beyond the Electron, the energy cloud podcast series.

Chris Warren: I'm your host Chris Warren, and I'm pleased to be joined today by two guests who have unique perspectives on this topic. With us today are Derek Jones, a director in Navigant's energy practice. Derek leads Navigant's transportation consulting group, where he works on everything from market assessments to business case analysis to leading broad stakeholder consortiums and planning regulatory and policy roadmaps.

Chris Warren: Before joining Navigant, Derek led early efforts at the Utility Pacific Gas and Electric company to understand and plan for the then newly emerging electric vehicle market, both internally and alongside the Southern California utilities.

Chris Warren: Also with us today is Doug McMahon, head of immobility and grid flexibility at the New York Power Authority. Doug and his team at NYPA are in the midst of accelerating the adoption of electric vehicles in New York, which is a critical part of achieving the state's ambitious de-carbonization goals.

Chris Warren: Among other initiatives, NYPA is rolling out 800 DC fast chargers between now and 2025 to make it possible for electric vehicle drivers to go from one end of the state to the other.

- Chris Warren:** So let's start our conversation by getting some of your observations about consumers and EVs. Derek, we'll start with you and then I want Doug to jump in. Let's start with perception. I want you to talk about what the biggest myths are around electric vehicles.
- Derek Jones:** Excellent. Thank you Chris, and good to be with you and Doug today. So myths obviously are something that have really permeated this market since the early beginning. Back in the first wave of the EV introductions that we saw with the EV1 back with General Motors, the myths have really propagated since that time. And in this next coming, as it were, of electric vehicles right around the 2008, 2009 time period, myths, be it in the customer space, in the supply chain space, in the policy and broader regulatory space really have taken different shapes and forms.
- Derek Jones:** And our team certainly been engaged in that when we talk with our clients in the utility space, with our government clients and certainly within the broader EV ecosystem as well. So just want to share a few with you and certainly love to hear Doug's thoughts on these as well. But the one that's been out there in particularly over the past few years is ecosystem actors, like utilities, have looked to enter into this fray with respect to EV charging infrastructure is the build it and they will come myth.
- Derek Jones:** So that concept is that just like gas stations, if there's one on every corner, then they will get used and over time. Challenge with that is that as with fossil fuels and other more portable forms of energy for combustion through transportation to move a good or a person from A to B, unlike those, electricity and electrons already flow to where vehicles spend most of their idle time, be it homes, be it commercial locations, depots, et cetera.
- Derek Jones:** So the "build it and they will come" myth really rests on the idea that folks can't charge up or fuel up, as it were, at home. Because they can, or at their depot or at their workplace, then the idea of where to put infrastructure really needs to take a careful look and take into account key alignment areas around occasional adoption trends that we're seeing, with respect to different types of vehicles in use cases. So certainly you've got your light duty passengers, driveway-bound vehicles and they're probably going to do a fair amount of charging at home.
- Derek Jones:** If they have a workplace, they may do maybe 15%, but really 80, 85% of the charging that we've seen for those light duty passenger vehicles is going to happen at home. So if you're an entity like a utility or a charging network provider that's looking to expand this market and make a play to capture a value in it, you really got to think carefully and plan carefully with a number of different stakeholders where you're going to put that infrastructure to get the best return on that investment.
- Derek Jones:** Realizing we're still early in the adoption curve here for electric vehicles, for the rollout of infrastructure. So where I get concerned about the "build it and they will come" myth is the risk of damaging brands for those that are building it, and further distancing customers, whether they're your parent getting your kids from soccer practice to chorus or you're a delivery and logistics provider getting a good from a distribution center to a doorstep.
- Derek Jones:** You really don't want to damage that brand with those customers because they are ... In both of those cases, those are very time-driven individual decision makers. And if they're going to move from an ICE or an internal combustion engine life into a BEV or a battery electric vehicle life, that transition really has to make easy the mental transition as well.
- Derek Jones:** So really want to protect that brand and steer away from that "build it and they will come" myth. So happy to pause there, Doug, if you had any thoughts.
- Doug McMahon:** Yeah, sure. Good afternoon, Chris. Delighted to be here with Derek and yourself. I mean I think there is some truth in the "build it and they will come" myth, but I think it's really important to understand why that myth exists and I think it goes back to the consumer again in my mind. And it goes back to this notion of range anxiety and that EVs don't have the necessary battery range for the customers to live out their daily lives.

Doug McMahon: The average New Yorker I think drives around about 40 miles a day. 95% of all trips are less than 30 miles. The average range of a typical EV when you compare it to that is well over 200 miles nowadays. That's enough to cover four to five days worth of driving. So obviously if you're a road warrior or ride share driver or just wanting to take a long trip, range can still be a problem driving around New York, which is the area where NYPA serves, particularly if you don't own a Tesla.

Doug McMahon: And that's what we're looking to address through our DC Fast Charging program. But the long and short of it is, range anxiety shouldn't be the reason why people don't gravitate towards EVs. And that leads me to, I think, two other key customer myths that are driving, certainly directing a lot of the work we're doing with the Evolve New York program. I look forward to talking about that a little bit more in due course.

Doug McMahon: But the first of those myths is that the EV is only for the wealthy. And when you compare monthly fueling, insurance, maintenance, depreciation, costs, all of these are considered plus the federal state and utility discounts that are taken into consideration as well. The total cost of ownership for an EVs lifetime can be thousands of dollars less than the gasoline equivalent. And obviously one reason for that is the typical EV drive chain contains less than 20 moving parts versus 2000 or so moving parts in a gasoline vehicle drive chain.

Doug McMahon: So that's one myth that's still, in my mind, predicates around the consumer. It's one of the area they're concerned about. And in the other, which to me is actually probably the biggest myth that I see when we talk to people in the utility industry, in the EV industry and with general consumer, is that EVs are just a passing fad or that they won't be a prevalent part of our world until a long time in the future.

Doug McMahon: And this to me is the most dangerous myth that exists in the industry. Bloomberg keeps accelerating their price parity projections. I think it's 2022 in Europe and 2024 in U.S., but we're also starting to see evidence of changes in policy and in industry that are telling us this hockey stick adoption curve will be here sooner rather than we think.

Doug McMahon: So in New York, the state has put into law the most ambitious GHG targets in the U.S. So 40% of which comes from transportation. And within that, nearly two-thirds actually come from light duty vehicles. So we basically need to either remove or replace three million combustion engine vehicles from the roads of New York between now and 2030. That's over 25% of all vehicles in the state.

Doug McMahon: And to put it into context, we currently have roundabout 20,000 full battery vehicles on the roads in New York today. And the second piece is when major vehicle manufacturers like Daimler and Volkswagen say they're phasing out further investment in conventional gasoline engines moving away from, I guess a product that served them well over the last 80 years, that to me sends a strong signal to the industry.

Doug McMahon: So these three myths, range anxiety, EVs for the wealthy, and that EVs are a passing fad, to me, these are the ones that are really driving a lot of that consumer behavior at the moment and probably why we're not seeing as much adoption of the electric vehicle as we'd like to see.

Chris Warren: That's a great segue, Doug, let's get you to dive a little bit more into how some of those misconceptions and myths actually animate the kind of work you're doing at NYPA. So I have a two part question. One, how do you understand what people think about electric transportation?

Chris Warren: And then the second part is what are some of the things you're doing? It sounds like education's really important. How does that guide the work you're actually doing on the ground?

Doug McMahon: All right, great question. Our efforts are really focused on getting more EVs on the road. And to your point, we really must start with the end consumer in mind. In particular, as I've talked about, the perception of range anxiety is stated as the single most important reason why people choose not to buy EVs.

Doug McMahon: Currently, just over 1% of new car sales are EVs. And in New York, that number needs to be well over 20% by 2025 in order to hit our zero emission vehicle target. So the need for the consumer to feel comfortable that there are charging options for all driving eventualities is therefore the number one consideration for our public DC Fast Charging rollout program.

Doug McMahon: So the other myths that we've talked and we've talked about, to me it really is just demonstrating to the industry that much more consumer awareness and engagement is required, and that's really driving a lot of the research that we are doing with the consumer as part of the evolve program.

Doug McMahon: And obviously spending quality time with the consumer is a great place to start. And we've really been kind of attacking that in a handful of ways. So firstly, over the last year we've taken a booth that the New York Auto Show, which has over a million attendees in the week that it runs, and the state fair in New York as well, which has about 1.3 million New Yorkers attend.

Doug McMahon: So we're using that as a means to really try and educate and provide outreach to the wider populace. We've also commenced a program of visiting communities across the state and engaging with consumers on their own turf. We found that very valuable. And it's little things like every time I take an Uber or Lyft, I talk to the drivers about the reasons for vehicle choice and what it would take to get them in an EV.

Doug McMahon: So just really getting out and talking to the consumers as much as possible is extremely valuable. The other thing that we've done actually at NYPA is we've rapidly come to the conclusion that you really need dedicated marketing and consumer engagement resources within the team. And in response to that, we've recently hired a head of customer engagement and marketing into our group, a lady called Rebecca Hughes, and her role is to really ensure that every investment decision we take will drive greater adoption of EVs.

Chris Warren: You can certainly see how that would change people's mindsets about what an electric vehicle actually is. Doug, I want you to jump in here again, there are two things I want you to address. One, kind of looping back to what

we were talking about around consumer awareness and availability. Do you do work with the dealers?

Chris Warren: I know I've read in numerous places where a big challenge that people find with EVs is that people don't see them and it's just not even considered an option. And then following up on that, Derek mentioned the corridor, the charging corridor that you guys have been working on. I think that's an important point to have you flesh out a little bit. So why have you been working on that at all?

Doug McMahon: Sure. Yeah. So let's talk about the dealerships first very quickly. As Derek mentioned, it is a challenge. I think there's a couple of different issues going on with the dealerships. In New York for example, there are, I believe, five Tesla dealerships across the state, all of which are in the Southern part of New York state. So if you live North of Westchester, you're going to have to travel more than 1500 miles to go to your nearest Tesla dealership.

Doug McMahon: So getting the prevalence of EVs and the models of EVs out at these various dealerships and in locations where people can go and see and drive the vehicles, I think, is really important. The other challenge, which I understand about the dealership model is that a lot of their incentives are driven by warranty and maintenance of vehicles as we mentioned before.

Doug McMahon: EVs are less costly to maintain due to there's fewer parts, less breakdowns, and the like. So I think there are still some outstanding questions in the dealership industry that needs to be addressed on how you can adequately incentivize the salespeople to ensure that they are talking about EVs in the same way that they would do a gasoline vehicle.

Doug McMahon: In terms of what we're doing with building out the fast charge network corridor across the state. As you mentioned Chris, we're looking to build out a robust network of 800 150KW-plus fast charges stations across the state and we've got \$250 million to invest and we're looking to operationalize the first 200 of these charges across 50 sites by the end of 2020, targeting on a lot of the major corridors that traffic moves along.

Doug McMahon: Our charging network will be available to anyone and we'll work with any EV. And our real aim there is to get more EVs on the road by addressing the issue of range anxiety I've talked about. We believe that this will help address the chicken and egg scenario that currently exists with fast charging investments, the build it and they will come mentality that Derek mentioned and that is, that you really need a more robust charging network to accelerate EV purchases.

Doug McMahon: But without a higher penetration of EVs on the road, there isn't sufficient site utilization to attract the necessary private investment. And I kind of experienced this firsthand actually last summer when I was traveling through Namibia, so Namibia is like four times the size of New York state and the third least densely populated country in the world. And Namibia has around about 50 gas stations in total, which is crazy given its size.

Doug McMahon: That wasn't the real issue. The real issue was that at any given time, half of those gas stations had no gas and as a driver, I had no idea which had gasoline and which did not. So this really changes the way you think about driving and the concept of range anxiety even in a gas vehicle. And wherever I saw an open gas station, I basically fill up, irrespective to whether I stopped two minutes ago or three hours ago.

Doug McMahon: So it wasn't a comfortable couple of days to be honest. And that's really what it's like driving a non-Tesla EV on the roads of New York right now. So that's really what we're trying to address through building out this robust network. Is to make sure that for those who are aren't able to charge at home or who are taking long journeys or who drive long distances for work, that they have this backbone of available charging stations to fall back on when required.

Chris Warren: Right. So I'd like to get you to talk a little bit about ... You mentioned in your answer the private sector. How do you approach the role of the private sector in the build out that's really required for this kind of infrastructure? And to make it so that drivers are actually able to go where they need to go?

Doug McMahon: I guess we see ourselves as kind of a necessary market accelerator and de-risk for fast charging. In New York right now outside of Tesla, growth in charging stations has actually declined over the last two years. I think there are only about 125 non-Tesla fast charging ports across the state and we need to get to several thousand conservatively by 2030 to cater for the three million EVs that will need to be on our roads.

Doug McMahon: So as I mentioned, we see ourselves as this kind of necessary market accelerator and de-risk for the private sector. So the money that we have at our disposal, to be clear, we're not granting this money. Far from it, in fact. Our aim is to transparently demonstrate how the private sector can make money out of these investments longer term.

Doug McMahon: And while NYPA has made the decision to invest, to own and operate these sites, we are actively looking for co-investment from the private sector, whether it be OEMs, charging infrastructure companies or other looking to get into electrification. And longer term, I believe there's a very strong chance that we'll get out of the public DC fast charging business, when of course the private sector is ready to step in. And of course providing the consumer continues to be put first in the build out.

Chris Warren: Now, Derek, you can provide us, I think, a bigger picture view of what charging infrastructure is looking like outside of New York. What are you seeing? Are you seeing roadmaps, sort of like a Doug just described? What flavors does infrastructure and the kind of infrastructure investment that is required take in some of the areas that you focus on?

Derek Jones: Great question Chris. We are seeing a number of flavors of global infrastructure investment for building out charging capabilities worldwide. And these flavors we're seeing really similarly in the States as well as in Europe. So I'll take us through these three categories and give a few quick examples to help bring them to life.

Derek Jones: So first is going to be public directed, next is going to be more public private partnerships, and then lastly is going to be more of that pure play private investment. So let's start at the top of the public directed. And really with these, in nearly every case we're seeing that the idea behind them is to stimulate private investment. So things like the Department of Energy's EV project, which is funded by the American Recovery and Reinvestment Act, really in 18 cities and over 12,000 stations that are looking to stimulate investment back in roughly 2010 timeframe on.

Derek Jones: So that's a key example in the States as well as the West Coast Electric Highway covering British Columbia all the way down through California, trying to get installations every 20 to 50 miles. So really addressing that range anxiety issue that Doug spoke so well to just a moment ago.

Derek Jones: Two interesting examples I'll allude back to later in this category. We're actually court directed. So from that public idea of thinking about how legal fees, legal penalties actually helped turn into what we've seen is successful infrastructure investments. So one was flowing out of the Enron scandal, one of the parties there, a NRG, a portion of their legal settlement went towards funding electric vehicle charging infrastructure. That was a requirement of the decision in California courts. What then ultimately came of that was the company we now know as EV Go, so that public direction ultimately led to EV charging infrastructure and what's now a solely private company.

Derek Jones: Likewise with Electrify America from the VW settlement as we've all been aware of recently, that entity as well is a legacy of public directed funding from a court decision. So interesting flavors there with some gradations in between in that first category. In the second, that public and private partnerships that I mentioned, here, lots of great examples. I'll give a quick one from Europe, but really what they're trying to do is address range anxiety but also take into account other things beyond just return on investment.

Derek Jones: Thinking about equity and disadvantaged communities, but also grid support. So whether it's grid support today for load management or down the road for things like vehicle to grid integration, VTG, et cetera. It's thinking about how to bring those together with a number of different actors. The example I give is the central European ultra charging network.

Derek Jones: So that's covering seven countries, roughly 120 stations. And you've got a number of private partners with EU financing at the back, so about 20% of that funded by the EU. So really that's a direct stimuli for bringing about that type of infrastructure rollout. That covers the public private partnerships. I'm sure listeners can bring a number of other examples to the conversation.

Derek Jones: But lastly, on our pure play a private category, that last flavor, so here is where we've seen a great amount of planning, something we are just recently a part of is supporting our clients in Hawaii with the companies there, looking at carefully planning the type of infrastructure that they're interested in supporting, but also taking into account a lot of those key factors around range anxiety, equity and grid support at the Hawaiian Electric companies. So lots happening, certainly in the utility space, and Doug can speak more, of course, from that perspective. But we also see in that pure play private partnerships by the automakers.

Derek Jones: So in Europe, IONITY is a partnership with BMW, Mercedes, Ford and BW group to deploy about 400 stations in 2020, or by 2020, and they're well on their way, you can look on their website today. So really it's that idea of being able to unlock the market and the demands by addressing range anxiety and other issues through this type of collaboration.

Derek Jones: In the States we've seen a bit more of a pairing off, if you will, of partnerships in this pure play private sector. So certainly the solo play on Tesla, they have their superchargers out there, as many know. But GM, Bechtel also announced a partnership for a brand new charging infrastructure network rollout. So those would be new stations in their case. And we understand they're moving forward with that. But interestingly, thinking about Nissan and Ford, they have actually looked back to a couple of those public directed examples I gave a moment ago.

Derek Jones: And Nissan's partnered with EV Go. So thinking about their infrastructure that's already out there so that their drivers can take advantage of it. They've gone that direction and tap that value pool with an existing steel in the ground investment, if you will. And similarly Ford partnering with Electrify America on their Ford pass network.

Derek Jones: So not looking to build it all themselves and really looking to leverage what's already out there, and in this case from another flavor, that public directed pool looking to push that investment and the value in it even further. So there's three flavors of the infrastructure investment we've seen in the market today, Christ. I appreciate the question.

Doug McMahon: You look at comparing Europe to the U.S. and I think Electrify America in the U.S. are at least starting to try and build out that the regional corridor that has emerged in Europe over the last few years. Again, in the work we're doing in New York, we're really trying to compliment what they are doing from a regional perspective, from an East coast perspective and to fill in the gaps. And I think when we're starting to plan out the locations for fast charging sites and that citing piece, as Derek has mentioned, is extremely important.

Doug McMahon: We've got to think about what others are doing and how we can compliment each other to make sure that the infrastructure we're building out is as efficient as possible.

Chris Warren: Either of you can take this one. I'm curious, when we talk about private investment, I imagine it takes different forms, but when I just think about it as a driver, I think, "Well, who would want to invest in this?" And I think gas station owners would want to invest into

charging stations so that they're equipped to handle whoever might want to come by. Is that the form it's taking? What other forms are you seeing private investment take at this point?

Derek Jones: I can take that one, Chris, if you don't mind, Doug. You're on the right track in terms of those gas stations, location, location, location, they're picked for a very specific reason around traffic flow, things like those metrics I mentioned earlier, average daily travel. But it actually is up-leveling to the oil and gas majors and we're seeing significant interest and investment from those players, particularly in Europe around, as Doug said, they've owned the last 80 plus years of fuel delivery for transportation.

Derek Jones: They're not moving slowly to be a major player in owning the next 80-plus years in the field distribution. So they are moving quite quickly and thinking in big picture ways about this transformation that's happening, as these two industries that have really walked in parallel until now, the auto industry and its fuel suppliers and the electricity industry and its suppliers have really operated serving the same customers, but in very different ways.

Derek Jones: So now that these two have converged, what we're starting to see is the opening up of business models through that fuel shift that we see coming over the coming decades. And how they're going to capture value in that transition is really critically important from a planning perspective that they're thinking big first.

Derek Jones: So where we see these types of business models unfolding these value pools, as we've been talking about, been talking about infrastructure. You mentioned your charging networks, Electrify America, other companies moving in this space, charge point, green lots in the States, but energy and others in Europe. Really thinking about what that charging services business model layers on top of the infrastructure and the value to capture there.

Derek Jones: We also start to think big picture and talking with our clients and understanding from the industry about load orchestration. So what comes with electricity as a fuel isn't just the electrons flowing in to the battery for use in a road application, but how electrons and how that fuel delivery system can help and support the broader source and transmission and distribution network to deal with its broader issue of having to maintain supply and demand instantaneously, which, which comes with the challenge around using electricity.

Derek Jones: Because fossil fuels being combustible can lie dormant without any activity for large periods of time and then be called upon at any moment. So having to leverage and be symbiotic with the grid is a critical value pool that we see that load orchestration really layers on top of those charging services. And lastly, it's really bringing those three layers together with the top layer around mobility services and being able to provide electrified transportation goods and people from A to B, wraps that together and starts to move the paradigm into a full transition from ice into BEV, in our view.

Derek Jones: So we'd see that out over the 10 years is about a \$200 billion market of value that can be captured through these four stackable pools, if you will, that is really critical to have in view in, in our mind, when thinking about how you're going to play.

Derek Jones: So whether it's down to the gas station owners, which certainly get impacted, because fuel's actually not where they make their money. They make their money on concessions and amenities on site. So having help from these bigger players, the oil and gas majors, utilities and other investors in this space is really going to be important to helping the other adjacent markets to continue with their business models that have been so fuel system delivery dependent.

Derek Jones: So hopefully that gives you a general picture of how we see this new delivery structure starting to unfold and who can stand to capture some value as it does.

Chris Warren: Well, great. Maybe Doug can give us some more color around what it looks like in New York.

Doug McMahon: I think the oil and gas majors, it's only in the U.S. have been a little bit more cautious in terms of their involvement electrification. On one hand, I think I read somewhere that I think Shell wanted to be the largest electric utility in the world by 2030, but then when you look at the investments that they're making at the moment in the EV market, it's cautious to say the least.

Doug McMahon: I mean I think Shell have acquired Green Lots. I think Derek mentioned a charging network company, and BP have also acquired a company called Free Wire who produce fast charging and storage solutions for EVs. So I think that they're taking a very cautious approach to just seeing how the market is going to fold in in the U.S. We also have another relationship with oil and gas companies through site hosts for fast charging in New York state.

Doug McMahon: And some of the sites are very good in terms of the potential location, but we are going to have to think a little differently, I think, about where we locate fast charging in the future and not just assume that the locations where gas stations exist are going to be the right locations. We've got to take into consideration some of the electrical constraints, but more importantly, fast charging is going to be a very different experience for consumers than filling up at the gas pump.

Doug McMahon: And we really need to identify locations where customers can step out of their vehicles for 10, 15 minutes and grab a snack, a bite to eat, freshen up and the like. And certainly, a lot of the gas stations are probably not as well equipped with those kinds of recreational services as would perhaps be desirable in the future. So I think there's a little bit of work to be done there. We're working with several gas companies in terms of potentially locating some of their gas stations in and around New York. So there's definitely interest there from a site host perspective. But in terms of private investment, I still think it's early days.

Chris Warren: Well, you brought up an issue that I hadn't even imagined and that's all about the experience that drivers will have as they wait for their vehicles to get refuel. Having an environment that's attractive. And again, it gets back to the whole concept of this being something of a mindset change and a cultural change is required, and it's not a huge one.

Chris Warren: I mean we're talking about 10 minutes, 15 minutes, but I wonder to dig into that for a minute, are there other things along that line that need to be considered or addressed when it comes to this sort of mindset shift that's required? Doug, it's a really interesting point. Are there others that come to mind?

Doug McMahon: I think we're going to come up against a bit of a challenge where, my sense is, there's going to be pressure, particularly from consumers to have a very similar experience charging their EV at a public fast charging site than they would do if they were filling up for gasoline. And my sense is that the OEMs will work hard to try and be able to deliver that. But we have to weigh that up, I think, against the potential implications to electricity grid.

Doug McMahon: And really isn't just a utility industry but partnership with the OEMs, with the network providers, and with other key stakeholders kind of starts to set the right expectations regarding charging speed versus the potential costs to the consumer.

Doug McMahon: And there's a new Porsche that's come out called the Taycan and that utilizes an 800 volt architecture. And during its official launch in the U.S., Porsche charged the Taycan at a Electrify America site, I think in Pennsylvania somewhere. And they were able to do that at over 250KW, which is roughly about twice the typical speed of fast charging at the moment. The vehicle charged, I think, in just over 20 minutes, which is great for the consumer.

Doug McMahon: But that does come at a cost, unfortunately. And the monthly utility bill for that station because of the increased peak charging load during that specific event was well over a thousand dollars higher than it would have been otherwise. So now imagine hundreds of those types of vehicles charging in a city like New York at lunchtime or at 5:00 PM where we're currently seeing peak DC fast charging sites.

Doug McMahon: So imagine the additional cost to the grid that needs to be passed through to the consumer. So somehow we've got to get to a right balance between how we manage cost to the consumer for fast charging versus the experience that they're going to have whilst they're charging. And we really feel is part of the reason why we're being very specific around the sites that we're relocating our charges at, that we're expecting our customers to get out and buy some food, to take a lavatory break, to stretch the legs for a few minutes, because we think it's potentially unrealistic that they'll be able to have a similar experience charging an EV than they would do filling up their gasoline vehicle.

Chris Warren: Well that really underlines the importance of collaboration between different groups, different stakeholders who haven't traditionally had a reason to collaborate. I'm wondering what you're both seeing in terms of the effectiveness of collaboration between utilities, between the OEMs, the automakers, dealers, all the folks, regulators, who are involved in driving this electrified future. Are you seeing a meaningful and effective collaboration? And the second part of that would be what would you like to see improved?

Doug McMahon: So from the infrastructure side, we see several types of collaboration emerging in our DC fast charging business, each really focused on optimizing consumer engagement. So from the OEMs, I believe, can really help the industry, educate consumers not just on the vehicles but on how to integrate it into the consumer's daily regime. I mean that's one big gap we see at the moment. You go to a dealership, they'll talk to you about the car, but they can't really articulate what that charging experience and what that driving experience is going to look like for the consumer. So we need to find a way, to some extent, to bring the charging infrastructure industry, the OEMs. And the utility together to kind of present this end-to-end picture of what a driving experience could look like.

Doug McMahon: Many of the site hosts that we're working with are also known trusted brands with the consumers and this provides a traditional B2B business like NYPA with a limited reputation in the end consumer market. Really provides us with a lot of co-marketing and brand awareness opportunities, whilst also ensuring that the charging sites provide the consumers with the best possible experience.

Doug McMahon: And then I also feel that collaboration with other infrastructure network providers will also be important, particularly as we look to address interoperability situation awareness, clarity on pricing, a consistent experience including payment for the consumer and asset performance.

Doug McMahon: And I'd like to just touch on fast charging asset performance for a moment. I mean it's clear to me that the network providers and hardware providers are still coming to terms with a level of charging infrastructure availability and troubleshooting that consumers would expect.

Doug McMahon: So at the moment, roughly fast charges are available roughly 90% of the time and there's a 48-hour response time to issues. And that kind of asset availability is really not acceptable. And there are companies out there like Electrify America and the Canadian utilities, BC Hydro and Hydro-Quebec that are working with the industry to improve the quality of asset and service management.

Doug McMahon: And quite frankly, with tools and the technologies and the apps we have available today, there really should be no excuse for arriving at a fast charging site, not being able to charge. So that's one other area where I think there's going to need to be a lot of collaboration across the industry to drive up the availability and performance of the fast charging infrastructure that's being built out.

Chris Warren: Great. Derek, are you seeing anything you want to add?

Derek Jones: Yeah, sure. Doug did a great job of covering kind of areas to improve and I like, Doug, how you framed it that end-to-end picture of the driving experience, how do those pieces all come together? I think one of the hardest things, back to that intersection of these two industries that have been operating in parallel, speaking of the OEMs, the automakers and the utilities one thinks globally and the other's really no choice but to think locally. It's all about customers and the particular makeup of the customer footprint.

Derek Jones: What's the balance of residential versus commercial versus industrial agriculture customers? And making sure to meet their needs on a day to day basis to keep the lights on, the five nines of reliability and all those important things about serving customers from a utility perspective.

Derek Jones: The collaboration of mindsets I think is still an evolving question. We've, we've hosted a number of meetings between industry OEM executives and utility executives over the years to think through, where are those common ground points to understand how to move the conversation forward. Because as hard as I think it is for the two industries to get used to this new relationship, it's very much a speed dating exercise.

Derek Jones: Because the environments that both operate in from a business and a regulatory perspective are different. And finding those common ground points can be tricky. One thing I think that having worked in both spaces in my career thus far, one point of collaboration is the appreciation for longterm planning and design. So planning in a distribution network for example, typically a five year process, just like planning for vehicle assembly design, typically five to seven year process.

Derek Jones: So a common thread that really, I think, could be pulled a little more firmly and explored on both sides is this design concept and appreciation in both industries for the need for that. The vehicles that we're seeing today were conceived of five to seven years ago, that are arriving at lots and the customers are getting excited about. So there's even more to come. But both industries understand the challenge with assembling and operating such complex systems that are so critical to really our civilizations in getting about our daily business and going about our personal lives.

Derek Jones: And we're starting to see through corporate needs and things like fleets and fleet electrification, an eye towards de-carbonization as a goal, and how they're going to play that out both with their own vehicle sets but also with their supply chain and their distribution networks for goods transport.

Derek Jones: So as fast moving as this is, and as strong as the need is for collaboration as it relates to passenger vehicles, we're seeing potentially even faster move on the fleet side with vehicles coming behind the fence, as it were, into private depots at a much faster pace. So thinking about now, just beyond how planning happens within a jurisdiction, at a sub-national level, how is thinking going to include that more global picture as it relates to this global trend around de-carbonization?

Derek Jones: That's certainly not just limited to Europe but also in Asia and in large part being dominated by the Chinese conversation. So really exciting time for folks that are in my business and part of these conversations, and really trying to keep stimulated progress and ideas flowing, which is a perfect example of this podcast and being here with y'all today.

Chris Warren: Well I think collaboration is important enough to stick on for a second more. Doug, let's take advantage of your experience. Are there specific examples that you've observed that really exemplify the kind of collaboration that you've seen done well, done poorly done indifferently, what are you actually seeing?

Doug McMahon: Yeah. So building on the great point that Derek raised about collaboration in terms of planning and integration of EVs into the distribution grid. One thing that we're doing under the Evolve Program is actually creating several model EV communities across the state. And the aim here is to, firstly, improve community perception about EVs for education and engagement efforts, hopefully leading to more widespread adoption of electric vehicles and electrification of broader transportation in the village.

Doug McMahon: We're also looking to build out a critical mass of electric vehicles within that community in a concentrated location in order to learn how to optimally integrate alternative forms of transportation into both electric grid and daily community life. And we really want to do that by establishing partnerships and investments with the private sector to support innovation and the affordable and seamless adoption of the of EVs. And we're going to be working with the town of Fairport, which is a town in the North part of the state and actually start implementing projects there in early 2020. So Chris, that's one example I think of a collaborative program, which I think we'll be able to talk a bit more about in due course in terms of its success.

Doug McMahon: The other one I want to just briefly touch on, and this one's actually in Canada, is through a company called Plug and Drive. And they're a Canadian nonprofit organization that promotes electric cars for their environmental and economic benefits. And it's a collaboration between the utilities, OEMs, and infrastructure providers to increase awareness and education of EVs through the creation and running of what they're calling, I think, an EV discovery center.

Doug McMahon: And the center is an objective location to test drive EVs, to learn more about EV charging and the wider operational implications of owning an EV, to get the consumer comfortable with the idea of owning an EV. And in 2018, they had over 7,000 test drives and 15,000 visitors to discovery center. Over 80% of which I think indicated, and this is a kind of a soft metric, but they indicated that having visited the center, they're more likely to buy an EV as their next vehicle.

Doug McMahon: So again, this is a prime example to me of where the three different components of the EV industry, the OEMs, the infrastructure providers and the utilities can kind of come together to really drive education and awareness of EVs to the general populace.

Chris Warren: That's great. Let's stick on collaboration for one more second. I'd like to get Derek to weigh in. You mentioned earlier that you're working in areas that may be outside of people's perception as hotbeds of electric vehicle interests. I could be wrong in talking about Tennessee as an example of that. What do you see in a place like that when it comes to collaboration? Is it different than what you would see in New York or California?

Derek Jones: Definitely different, Chris. That adoption can be smaller. At least the trends that we've forecasted and help stakeholders understand there about what's coming from an EV adoption perspective. But there is a strong impetus to plan and to be ready amongst utilities, OEMs, charging network providers, but even the universities as well. The university of Tennessee and other institutions, as well as industry actors that are on the forefront of creating some of these components and even smaller autonomous vehicles as well.

Derek Jones: So it's a great example of where there is impetus and initiative in the ecosystem. There may not be the vehicles yet, but that doesn't mean that folks aren't charting a North star and setting an ambitious vision, mission and goals to pursue. What they see as, kind of mentioned earlier, from a global perspective, the coming trend of transportation electrification. Mentioning that it harkens back, it's really a key example of where if adoption isn't as organically driven by early adopters, from a demand perspective, we are seeing strong collaboration from a supply perspective among that ecosystem, that consortium of folks I just mentioned.

Derek Jones: And so in Tennessee, these folks got together and developed the entity known as Drive Electric Tennessee now. They put out a roadmap and they're taking steps towards advancing the market and figuring out the who does what. The blocking and tackling of if we've got this vision, mission, goals,

statement, we've charted out different initiatives and projects, activities, et cetera, then who does what? Because everyone can't move forward on everything at once, and folks have different capabilities, resources and sweat equity that they want to put forward to moving these different parts together in lockstep.

Derek Jones: So that's been a great example of that grassroots collaboration that I think fits into this broader picture. I think all feeds Doug's great point earlier of how do you give folks that end-to-end vision of what life looks like on the demand side? Really from the supply side, having that end-to-end collaboration amongst a consortium is a critical input to making it real and making it easy for customers on the demand side. So I totally agree with you. Collaboration is a really important point to stick on and I'm glad we covered that, a little bit of it there.

Chris Warren: Well, we can obviously talk on and on. There's so many moving parts and interesting topics to cover, but I want to wrap up with a final question for both of you and I want you each to take this. If you had a wishlist for making this shift to electric vehicles happen faster than it's happening, as fast as possible, what would be at the top of that list? What do you think is the most important thing that needs to happen to push this transition quicker? Doug, do you want to start us off? And then Derek?

Doug McMahon: Okay. I'd like to go back to the first principles that Chris laid out at the top of the podcast, de-carbonization. Electric vehicles are simply one of the many technological means to decarbonize our economy. And I use this example all the time, but one of my favorite authors, Douglas Adams, was quoted as saying, "We're stuck with technology when what we really want is stuff that just works."

Doug McMahon: And if you take a moment to think about it, this is not just a wonderfully playful statement but very relevant to today's EV industry. My one wish would therefore be for the industry to move beyond prophesying the cool factor, the excitement, the complexity and the social status associated with the electric vehicle. And instead focus on how to accelerate the normalization of the electric vehicle in the minds of the consumer.

Doug McMahon: And if we can get EVs to the point where they simply blend into our daily lives and make the driving experience both effortless and affordable, that should provide the right foundation from which to ensure accelerated adoption beyond the small percentage of eco warriors that the wealthy and the early tech adopters that are driving them on the east coast today.

Chris Warren: Excellent. Derek, what would be on the top of your list?

Derek Jones: Thanks Chris. And when I think about my wishlist, it really comes down to four A's, in this order and it's awareness, availability, affordability and accommodation. And what I mean by that on the awareness side, I think to Doug's earlier point, awareness is critical through initiatives like EVs are normal now. A commercial I often hear from Electrify America, but those corridors are critical. Those are branded, make it real examples of well-placed infrastructure that show truly that EVs are normal now.

Derek Jones: So those are absolutely critical. I think as each local jurisdiction thinks about how they're going to do their big branded corridor, do it wisely, do it with stakeholder input. And I often tell the folks that I'm working with, in five to 10 years, folks are going to look back at 2019 and 2020 and say we made a difference in how the market developed based on how well we thought about and planned at the turn of that decade.

Derek Jones: So that awareness is absolutely critical, and planning for it is important. That availability piece, lots can be said there, but I'm really encouraged by thinking like an early adopter when it comes to availability. I think Tesla has a really good model and there's other folks like Easy EV out there that aren't going with the dealer lot approach to getting vehicles to customers. They're realizing they're selling to early adopters. Early adopters today do their shopping online.

Derek Jones: That direct to customer through online ordering with a showroom to experience a vehicle but not necessarily buy it is really a fast path forward to availability. It gets around a lot issues that we were talking about before. So those two are really top of my list.

Derek Jones: Affordability. We're closing in on road parity. That's happening. The hockey stick effect, we've covered that well. And on the accommodation side, when I think accommodation, I think utilities, making it easy. As we've talked about, utilities are expert at designing their systems to be safe, affordable, reliable, and they have right people involved ready to help customers when those customers are ready to bring their vehicles into the grid. It's just a matter of maturation. Those first three As happening, the utilities are ready to make that connection and bring those loads onto the grid.

Chris Warren: That's all the time we have today. Thanks again for a great conversation, Doug and Derek. Now, one thing that really stands out to me from this conversation is just how central the experience of drivers is to the future success of electrified transportation, and it takes a lot of different forms. It can be about eliminating range anxiety. It can be emphasizing the smart economics at EVs or it can simply be about making drivers aware that electric vehicles are available today and they're not something out of some distant Jetsons-like future.

Chris Warren: We talk about how utilities are becoming more and more customer centric a lot these days and they have to be, but I think if we've learned anything at all here today is that utilities and their partners in this whole electrified transportation space really need to view all their decisions through the lens of the driver. It's really the only way forward.

Chris Warren: Well, that's it for this episode. Until next time, this is the Energy Cloud Podcast series. Goodbye.



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