**Sheryl**: All right, we are at N-CATT's seventh webinar, which is Autonomous Vehicle Pilots and Beyond. Our next webinar is going to be on the Promising Practices Guide that will be October 15th. And of course, we have a series of white papers coming along. Carol Schweiger, who is one of our speakers today, will be the author of that.

And we also are on social media and we have a monthly newsletter, if anybody would like to sign up for that. Okay, so what is N-CATT? For some of you who are not familiar with us, we are a national technical assistance center that started on October 2019. And we are operated by CTAA through a cooperative agreement with the Federal Transit Administration.

And what do we do? We carry out our mission of serving small, urban, rural, and tribal transit systems and transportation services with technical assistance and also with replicable resources and with news about technology, Applied Technology. So, what do I mean by Applied Technology?

I mean technologies that are emerging like autonomous vehicles and technologies that are being adopted and implemented such as battery electric vehicles. So, we're kind of in that small spectrum of technologies that aren't fully implemented and taken advantage of. And hello kitty cat, Carol's window.

**Carol**: Hello. Sorry.

**Sheryl**: No problem. We do that communication in many ways, and also through the technical assistance of our strike teams and our state summits, which we held this summer. And you can find us and all of our resources at n-catt.org. And I'll keep that slide up just a moment as I talk a little bit about automated vehicles and what we're going to talk about today.

So, today we're going to talk about fully automated vehicles where a driver is not required, although in most of these vehicles, there is a backup operator—a human operator—onboard most of these. And we are not talking about partially automated vehicles. And what do I mean by that?

I mean something like the Tesla Autopilot system, where you need a driver who is still attentive; the driver is being assisted by automation, but the driver must still be there operating the vehicle. And that's a really game-changing distinction as far as we're concerned. In terms of COVID, I have to say there's not much that has happened in some respects during the COVID time.

And that would be legislative activity has pretty much ceased at the state and federal level except just this morning, I saw that Hawaii has a bill in its legislature that will regulate automated vehicles in terms of allowing testing pilots. It would require that a human driver be on board and the bill would give its state DOT wide latitude and how to regulate that.

And the state laws go really across the board from allowing almost nothing to allowing everything, and we're not going to go into all those details today. But if you want some information about that, feel free to contact me. In terms of COVID, automated vehicles are pretty stopped, much stopped for a couple of months in general, and then started up again. And that much of in the way of automated vehicle activity pivoted just like transit to a lot of delivery activity versus passenger activity.

And again, that's just a broad overview. And now I'm going to introduce you to our first speaker, Carol Schweiger. Carol, as I said, will be doing our white paper on AVs and she really is like on other subjects really an expert on this.

She has over 40 years of experience. She's nationally and internationally recognized in transportation technology consulting. She has several specialty areas including public transit and paratransit technology, traveler information strategies and systems, open data and open software.

She's provided over 65 transportation agencies with technology technical assistance. I can't even say what number of panels she's been on at various conferences. And she develops technical specifications and structured processes to procure and implement technology systems. And she's done some of that work even for N-CATT.

She's developed and delivered modules regarding technology standards, and she co-developed and was the lead instructor for five transit technology training courses for the National Transit Institute. And without further ado, I'm reading everything in Carol's biography. I will let her take it away and I will approve you as the person for our PowerPoint presentation. Okay, Carol.

**Carol**: Well, thank you very much, Sheryl, for that introduction. And thanks to everybody that's here and I will apologize upfront for Snuggles, who decided to become part of this. I don't know whether he's going to put the slides or I am, but we'll see.

Anyway, the initial presentation that I'm giving is really to give you an overview of automated vehicles and try to focus on automated vehicles in a rural environment. And so, I'm just going to turn off my video for the moment just to make sure that I can get the slides flipped okay. And so, I am going to move to let's see, there we go.

So, this gives you an idea of what I'll be talking about in my presentation, give you just a little idea about really what is an automated vehicle. We talk about this all the time. But sometimes it's not clear exactly what technology is involved. I want to talk a little bit about sort of the state of deployment.

And then I'll be dealing with, I want to give you an idea of where there are pilot projects going on in the United States. And then I want to finish up with some details about several of the pilots that are going on.

So, I'm going to focus on two things here. One, is looking at this from a very rural perspective, which is typically not the focus that automated vehicles have because there are certainly challenges associated with that. And the second thing is talking about automated vehicles that are actually being operated in transit service. So, they are actually part of the transit services being provided. And there are not a lot of those either and there were even less of those in rural areas.

So, let's move on. So, the very beginning of this, and Jacob, I think you'll have a comment or two about this. This is usually my opening. Almost all presentations that I hear about automation say "The future of mobility is automated, connected, electric, and shared." But there are really two things that get left out of that picture.

And that's my third focus. And you'll be hearing from everybody else, dealing with making automated vehicles accessible and equitable. And a number of pilots around the US don't have accessible automated vehicles yet, although that is the hope that eventually-- And I know one of our other speakers is going to deal with that specifically.

So, let's get into it. This slide, I'm not going to read it to you. But the reason for this slide is, I want everybody in the audience to think about what it takes to make what the USDOT calls a complete trip. And the complete trip starts the minute that you start investigating how to go from point A to point B. So, that's the pre-trip stage.

Then you are getting to either your first point of getting on a vehicle is either at home or it's a bus stop or station or whatever. And so, the complete trip, you really have to look at every single transition point. And when we talk about using automated vehicles in a rural environment, these are the kinds of questions we need to ask.

Because most automated vehicles are not operating in rural environments, where there might not be paved roads, there may not be other infrastructure. And so, we need to ask ourselves all of these questions as we think about all of the transition points in a complete trip. So, kind of keep these in mind as we're rolling through.

So, basically, the technologies that are being used, and what we referred to as automated vehicles, at least one function of controlling the vehicle is happening without input from the driver. That's really our definition. And you can see here that there are a number of different technologies that are being used on this. This is just a diagram of what's on an automated bus, for example. And so, you can see it's a variety of different technologies.

And we also have a positioning which tells you exactly where the vehicle is located, and also gives you some other information about it moving through the space. And it may combine some other technologies, which we think of more in an automotive environment, which is a vehicle to vehicle communication and also vehicle to infrastructure.

So, if we look at this from the level of automation—and Sheryl, I'm glad you made that comment earlier on—this is the typical levels of automation that a lot of people have already heard about, and they relate mostly to when we talk about automotive automation. But here are the various levels. And you can see what the driver's role would be in each of these levels of automation. Nothing has really met level five, which is absolutely full automation. But we're getting closer and closer to that.

So, the next thing that I want you to keep in mind is how ready is our transit industry for this kind of automation? And so, we've got some issues that are coming to light from various studies and also from our transit industry itself, where there are drivers that are obviously very concerned about what will their role be if the actual operation of the vehicle becomes automated.

And so, where there are unions there issues related to that. But also, if there is still a role for the driver, what will that role be? And then we have to turn this to the passengers. How much are they going to trust the technology? That's another factor that we need to think of when we're talking about readiness.

What are the actual operational benefits? The biggest one that we talked about is the fact that we will reduce the number of crashes because we're using automation rather than relying on a human-driven kind of a vehicle. And it may also allow us to improve our schedule adherence a bit, but we need to be talking about these issues so that we are ready to move into automation when we think we are.

And we may actually need to change some organizational models to incorporate the automation because it's not something we necessarily have now. So, I did briefly mentioned safety in the transit industry with some of the studies that have been done at the DOT level.

There is some positive perception of safety because it's not a human-driven vehicle and it's not the driver doing things that they shouldn't be doing. It's being controlled. I already mentioned reduction in crashes, potentially, and a positive traffic safety in general.

But the thing that people get confused between safety and security, security is actually the security of the passengers and the drivers. And that's a little bit different. And the perception of that is a little bit different. Because if there is no one on board but just the travelers, then people have thought, "Well, that's a little less secure because I don't know who I'm sharing the vehicle with." I think that's changing and becoming a lot more positive.

So, we're in the midst of taking a look at that. And also, we really need to keep studying what are the impacts of automated technologies on safety. Are we really achieving what we think we are? And then, as Sheryl mentioned, there've been sort of bits and starts where it comes to legislation on automated vehicles, specifically as it relates to transit vehicles. And so there are a number of issues that are currently being discussed in the industry.

One is a risk analysis, which is basically that discussion is happening, whether it's about transit or privately owned vehicles or fleets of automated vehicles. That's a very important part of this aspect of automation. Also, the discussion about liability. Liability typically is discussed where humans are involved, and there really is no legal framework yet that has been accepted.

And at the USDOT level, they have stepped back a little bit from a lot of the regulations that we thought we might be seeing, we certainly still might be seeing those coming along. And then I want to reinforce the idea that we really need to look at this now as we're designing the vehicles and designing these services so that everyone has access to these services.

So, we need to keep the accessibility of the services physically, the equity piece of it. Is this available to anyone? And we need to make sure that it is inclusive of everybody as we move along. So, here are just a few more of the specific topics that are relevant to automation in transit, and I would argue even more important in a rural environment.

So, you know, development of automation and buses, it's been kind of slow. There's been a lot of work on the commercial vehicle side, but not a lot when we look at our typical transit vehicles because most of what you see with the pilots and transit agencies are these smaller shuttle vehicles, which may be perfectly sort of applicable in a rural environment. But we may want to look at automation of other vehicles and we're not quite there yet.

Also, some of the specific automation components are not quite available for transit. They're coming from other industries, again, like the freight in the trucking industry. Right now, we have some good technology in transit that's using some sensor-based systems to alert the driver, for example, about any objects that are very close to the bus while it's driving. But a lot of these are not quite universal yet. So, we're hoping to incorporate that into the automated vehicles.

And then I already mentioned about most of the pilots are with the smaller shuttles, and a lot of the shuttles do not meet ADA requirements. Not all shuttles are accessible vehicles. Now, this is just meant to give you an idea of the volume of projects that are going on. This is just in the US. I actually have a table in a report I wrote that has probably triple the number of agencies in areas that are actually piloting automated vehicles in transit because there is a lot going on in Europe and in the Asia Pacific region.

But I left that out. What I wanted you to see is indeed, many of these planned in-progress projects or completed projects are taking place in rural areas. So, we are going to be learning a lot from what's already happened and the things that are coming online.

So, I want to just spend a little bit as I begin to sort of wrap up in talking about several projects and I will give you all of these but one, the middle one, are really dealing with automated transit vehicles in an urban environment. But that doesn't mean that we can't learn from their experiences. And so, what I want to show you is several of the projects and how they do relate to what we're thinking about in a rural environment.

So, we've got the big Jacksonville project that's got a substantial amount of federal funding. This project, it's called FABULOS, which is happening in Europe. And there are five cities where automated vehicles are being piloted in actual transit service, not as just pilots, you know, jump on it anytime. They were actually some scheduled services that they're in. UITP, which is an international-- If you think about the American Public Transit Association or CTAA, UITP is the international equivalent of those organizations. And they've put together a tool kit that actually does talk about what are the things we need to think about in a rural environment.

Then we've got an example from Hamburg in Germany, and then Connecticut DOT that just won a grant from FTA. So, this is a partial description of what Jacksonville is in the midst of and we were fortunate to have somebody from JTA come to the automated vehicles symposium that several of us participated in a little over a year ago.

The folks from Jacksonville have a very, very ambitious program to deploy automated vehicles to some degree to modernize. They had one of the first automated vehicle systems in the US because they were part of what was called the Downtown People Mover Program. And people who are as old as I am, remember that because that program was very well thought of in the beginning, and it didn't end so well.

But Jacksonville has got an existing, they call it their skyway, and that needs to be modernized, but that's will become part of their whole series of automated routes. So, you can see down below that they have a specific corridor that has a lot of employers. It's called an Innovation Corridor and something called Autonomous Avenue.

They're going to be converting the remainder of the old Downtown People Mover system, and then eventually they're going to be extending automation into various neighborhoods. Now, the other thing that I wanted to mention about Jacksonville that I think is going to be of interest is they developed these requirements for their automated vehicle program. And specifically, it deals with the vehicle itself and they call it the Golden 20 because there are 20 requirements that they came up with.

And in our transit automation environment, we are not quite seeing this yet. So, they kind of took an early step to say, "When we go ahead and we do our procurement, and eventually, we're operating automated vehicles." These are the requirements that these vehicles need to satisfy. So, I think a number of them are very, very applicable to a rural environment, for example.

All right, so next example is this project from the European Union. And the beauty of this project, if you just Google the word "Fabulous" without the U next to the O—so, it's spelled a little bit differently—you'll get a wealth of information.

The project was funded by the European Union because they looked at the whole process of procuring automated vehicles for transit service, all the way up to piloting them. And right now, these five pilots are actually being operated. The first one is in Norway, and that's a city in Norway. It's not a very big city. And the reason why I wanted you to see this was because each of these cities have kind of unique characteristics that somewhat could be applied in a rural environment.

So, the first city, the first bullet there, is in Norway. And they have really mountainous terrain there, so the automated vehicle has to be operating in these steep inclines. And so that is taking place now. The second one is in Greece. And this is a part of Greece with extremely high temperatures, particularly during the summer.

So, that certainly applies to a lot of rural areas in our country. In the Netherlands, this is a city called Helmand. And here, there is a very large population of people who cycle everywhere. So, the automated vehicles need to recognize that and I think that applies to objects in a rural environment. Maybe it's not someone cycling but maybe it's an object in a rural environment that we wouldn't see somewhere else.

Helsinki, I think most of you know that's in Finland. And the route that they're using has a very high volume train station. It's the second busiest train station in the country. So, that probably has a lot less applicability in the rural environment. And then in Tallinn, which is in Estonia, they're looking at a connection to an airport. I do see there being applicability in a rural environment because we do have a lot of rural airports. And they're often the only way to access those airports is by a car.

So, this was actually a video that I can't play while I'm flipping the slides. But I would just tell you, again, go to their website, and that that video is right there. You can play it. It talks a little bit about the five pilots. And then this is the toolkit from this project, that's called SPACE. And we're not really talking about space, but it's an acronym. And I've completely forgotten what the acronym stands for.

But in any case, part of this toolkit directly addresses the rural environment. And so there are three chapters. Everything is on the web, you can go and look up. So, they've got a chapter on typical scenarios for automated vehicles in transit service: How do you integrate them into transit service so they're not out here separately as a pilot.

And what is the impact on using automated vehicles on the transit service? So, let's see if I can-- Here we go. I just wanted to show you. So, this is in Hamburg, Germany, and they have come up with a vehicle. The dimensions here are in meters. But I think it still gives you an idea of this is a custom design vehicle.

The characteristics of the vehicle are in the bullets toward the bottom of the slide. But this project heat started in 2018. And they've already done pilot tests in 2019 in a very, very small city. And they're also expected to be piloting this at a high rate of speed outside of Hamburg.

So, where we have a lot of rural areas with long stretches of highway, I think this pilot, this project is going to teach us a lot about the capabilities of those vehicles in that long-distance environment that we have to travel in a rural place. So, in 2021, next year, they'll be piloting this in the long-distance trips.

And then last pilot and I know everybody's going to say, "Yeah, this is a 40-foot bus. What does that have to do with me?" It's important because this will be the first project that actually introduces an automated bus into transit service. And it's going to be operated on a, it's a dedicated busway that runs from downtown Hartford, Connecticut, out to New Britain. It's a 9.4 mile dedicated route.

And so really, when you think about it, it's a great way to start learning about how these buses are going to work whether they're 40-foot or the 30-foot or they're smaller because we're on a dedicated roadway. And so, we'll know a lot more about how they operate before we put any of these in actual service, in a vehicle that happens to be that the whole point here is to demonstrate something that's a Level 4 automation.

So, you will have access to these slides, so I'm not going to talk about these resources. But I want you to know that the Federal Transit Administration has an automated vehicle program and there's a lot of good information there for you to get through those resources. So, at this point, I'm going to turn it over to Jean to do our next presentation.

**Sheryl**: Okay, and I will introduce Jean before we go on. I just want to say today that we have really a great panel of speakers who really know their stuff, as you saw with Carol, and you'll continue to see with Jean. Jean Ruestman is the administrator of the Office of Passenger Transportation for the Michigan Department of Transportation. And Michigan is one of the leaders in automated vehicles. She's worked for MDOT for almost 30 years, all within Passenger Transportation.

And in her current position, she's responsible for the state's public transportation programs and guides the state's involvement in quickly evolving new technology mobility ecosystem. She's passionate about advancing the use of technology and innovation to improve mobility at all. And if you keep up with sort of different challenges across the country, what's going on in the States, she led the $8 Million Michigan Mobility Challenge, and she's on the steering team for the unique public-private partnership CAV, Connected Automated Vehicle Corridor Project in Southeast Michigan.

She's also the co-chair of the Transportation Research Board’s Committee on Innovative Public Transportation Services and Technologies where she is serving her second term. So, Jean really is a repository of information as well as the leader. And I will let you take it from here, Jean.

**Jean**: Right. Thank you, Sheryl. I appreciate it. I appreciate you having me here. It looks like-- Here, my slides are back to where they were. So, I really just want to talk to you today about how MDOT Michigan are approaching new technology and innovation, and what we're doing to support it because we're in a little different situation as a state DOT rather than an actual provider of transit services.

So, I'm going to walk you through a few of the things that we've been working on and why we're doing it. So, I'm going to kind of start with the why and the how. We decided that one of the important roles that we could play and encouraging and supporting innovation and technology was sharing risk.

We have many transit agencies who simply could not afford to do innovative projects and try new technologies that might fail. They don't have the resources to fail, they have to put their money where the sure thing is. So, if we can help fund projects that helps move things forward.

The other thing is that we do is provide technical support, we help clear the way. We're going the right direction here. There we go. And so, we provide all the technical support we can to make sure they're on the right path and get what they need to make the project successful. We also facilitate partnerships. I'm going to talk about that a little more as I go through this step.

Gathering and sharing lessons learned, we can't just keep this in information to ourselves or let the transit agencies keep it to themselves. Only does good if we can gather information, lessons learned of what to do what not to do, and share that broadly. And then clearing policy and regulatory roadblocks if we can. We try to identify things that are standing in the way of advancement of new mobility projects and clear those roadblocks if we can. It's not always easy to do, but we try.

So, I'm going to, in the next few slides, go over some of the recent projects we've been involved with and give you a little bit of information and hopefully not talk too long. The first project, as Sheryl mentioned, is the $8 Million Michigan Mobility Challenge. And that project was really all about using technology to solve mobility gaps for seniors, people with disabilities, veterans, all across our state and rural areas, suburban, urban. We wanted to make sure we really touched on all parts, we can learn lessons about all areas.

And one of the most important things we did during that in hindsight—we didn't know it at the time—was having a launch event. That was a day-long workshop. And we brought together transportation providers representing all different sizes and types of public transit systems, technology companies of all types, and advocates for and members of the target populations.

And we facilitated conversations so they could get to understand each other-What were the challenges for the people who were trying to use these services and who were trying to get simply from point A to point B?

What technologies are out there that maybe weren't designed with mobility in mind? But then hearing the problems, they could discover that they actually could be applied to that. And you know, the advocates and the providers, and we brought in universities as well because we need that research background in this study.

And it was just amazing the aha moments that happened during that workshop and people that suddenly realized they could help each other. And so, partnerships started to form. In fact, we require that to apply for these funds you had to be in a partnership with some other type of entity, a private and a public. We actually received over 40 proposals for those funds and way more than $8 million worth of proposals we ultimately selected 13 projects to award.

I'm just going to talk about a few other projects that we did that are more related to this topic because we did fund an autonomous and automated vehicle study. It was a purpose-built. So, accessible vehicle, automated vehicle, that was built from the ground up by Pratt & Miller, and they involved many different partners and brought people in with different types of abilities to tell what they needed in this vehicle, how would it become accessible for them. So, it was an exciting process to see it to go through. They launched at Western Michigan University just for a couple of weeks demonstration project, and their students got involved in designing what the stops would look like, what the information that was put out would look like. So, it was just an exciting partnership to see.

Some of the other automated technology is a robot and an automated trailer, that instead of taking people to goods and services, we're taking services and goods to the people. They'd be homebound. And little did we know at that time that we would all be trying to shelter in place, basically. And this type of technology can prove very helpful to delivering goods and services to people but also between buildings and a hospital campus say.

We also realized that if you can't get to the bus stop, if you can't figure out where to access a bus or how to do it, none of the services do any good. So, we're testing a couple of different types of technologies to help people get to their bus stop, to get on the right bus, to get off the bus at the right place. And so the driver also knows what the intent of that rider is.

And then once you're on the bus, if it's an automated vehicle, and you can get on yourself maybe but if you can't secure your mobility device in place, that defeats the purpose a little bit, and especially during COVID. So, the automated wheelchair securement system that was a very successful demonstration. And many of the systems in Michigan have started ordering those and putting them on because of COVID and wanting to keep their drivers at a further distance and the passengers at more of a distance, if at all possible.

So, if you want more information—I just touched on the surface of that—we have a website, michigan.gov/mobilitychallenge, and you can get report outs on the projects that have finished and the new ones that are coming up. We've also partnered with FTA to do a deeper dive into many of those projects to get more lessons learned that can be shared around the country. So, next slides are advancing without me doing it.

So, another mobility challenge, since we tend to like that term in Michigan, is the NAIAS 2020 Michigan Mobility Challenge. That is a North American International Auto Show or Detroit Car Show. And that challenge really revolved around-- Let me see if I can get it here. There we go. Just demonstrating innovative solutions and cutting edge technologies, and really establishing NAIAS, the city of Detroit and Michigan, as a preeminent environment for new transportation solutions. So, that was a multipronged project.

We actually put out to bid a couple of different types of service. And the first was an airport shuttle that would go-- Let's see if I can go back to that. My slides are advancing without me doing anything for some reason.

**Sheryl**: Sorry Jean, I think I did that when I tried to mute myself. I apologize.

**Jean**: Okay. All right, so I can't get back there, but I can talk you through it. So, the first demonstration is simply a shuttle going from the airport to downtown Detroit. It's a fairly long distance, half an hour or so and it's an expensive service, so we are limiting that to two days of service.

And it'll just be for VIPs and the media. And what I should mention I should have mentioned a second ago is, as you all are probably aware, the auto show was canceled for 2020 which is when we had intended to do these.

We're hoping to be able to do them in June of '21 when the auto show is rescheduled for. If not, we'll figure out some other way to make these happen. We're still committed to making these demonstrations happen. So, the shuttle had to be at a minimum level three and have a dynamic passenger experience inside the vehicle, to explain to them what was happening and what they were seeing around them and in the vehicle.

So, we have two vendors that were selected to do this shuttle. And then the other factor of the challenge was the downtown circulator. And again, this was level three and above. Safety, drivers, is required still in these and it's open to the public, as well as the NAIAS attendees.

So, this could have a really broad reach and helping people form their opinion of, you know, are they afraid of autonomous vehicles or not. So, that was always in the back of our minds. And we wanted at least a good mix of accessible vehicles in this.

So, we ended up choosing five different providers for this, four of them are doing fixed-route service, and the fifth one is providing kind of a robotaxi service. And then to kind of bring it all together, we went out to bid for a white-label MaaS application that was specifically for the NAIAS challenge.

But that went beyond that, that it isn't just going to be able to be used to book trips on those autonomous shuttles, but also see all of the mobility options that are available in downtown Detroit so people can use it as a comprehensive tool during the auto show and maybe beyond. We're going to see where we go with that, but move at one of the bid for that. HNTB has been our partner throughout this challenge.

So, they've been we've been working very closely with them. Another project that we're involved in is the Automated Bus Consortium, ABC. And this is looking at demonstrating 40-foot autonomous electric vehicles. Carol was just talking about how Connecticut will be doing it on a dedicated lane. These demonstrations will primarily be in all kinds of settings and not necessarily dedicated lanes.

We started out with 13 state agencies and transit agencies. And unfortunately, a few of them have had to drop out because of revenue situations due to COVID. But we were able to make it through the first phase, and choose demonstration sites so that we had a wide array of types of service that we were going to be showing how these buses could or maybe couldn't serve the needs.

And we are moving now into phase two, with fewer members or allowing new members if anyone is interested in joining, please contact me. And hopefully, some of the old members will come on. But this phase will actually move into to procuring those vehicles and putting them into service, coming up with all of the details about the routes, and how all of the infrastructures is going to work together.

So, it's a really exciting project. The buses should be we're hoping on the road by 2023. We'll see how things go and how COVID keeps impacting it. But we're very hopeful. Exciting project. And again, there's a website that you can go to get more information on that. And that is acting as a bit of a leader in that just to go back a quick second in that we have agreed to do to head up the procurement process for that as a coordinated product. So, we will be going out to bid for all of the vehicles associated with this.

And then the members will have individual agreements with the selected vendors to do that. So, lots of exciting elements to this project. Another project that we are looking at doing, and we are in the early stages of this and we're actually utilizing CARES Act funds that came to our state to utilize for the rural areas, is looking at the development of a statewide MaaS app. And the reason we're looking at this is because things were crazy at the beginning of COVID.

Not that they're not crazy now. But people needed to know what transit was still available out there, how they could get around, and how if they had loved ones in another part of the state, how were they going to get where they needed and get the services that they needed.

And we decided that a statewide MaaS app would really help with that, that you could get on from anywhere and be able to know what services are available anywhere in our state and figure out how to book that trip and possibly, in some cases, book it right on the app.

So, we're developing that base level application so that other products can be added to it possibly regionally, or in specific rural-urban areas or rural regions. We think it's an exciting way to go. We'll likely be issuing an RFI for that in the fall. And then the newest exciting project to come out is a Michigan Connected Corridor that Sheryl mentioned at the beginning, and before I can actually speak about this, I have to show you my next slide that warrants and I'm sure you can all read exactly what this says.

But this is proprietary information that I'll be sharing in the next few slides, not meant to be shared broadly or provided as if it were your own. So, a project or idea was brought to MDOT, and we're on the highway side, to begin with, that we have a connected corridor, and that we go into a public-private partnership to do that, so that we would provide technical assistance and access to our roadway, but not actual funding for it, and that the private industries would provide the funding for it.

So, we went out to bid for that. Sidewalk Infrastructure Partners actually launched Cavnue to bid on this project and they were the successful bidders. And we are really excited about this, it is a 40-mile corridor between Ann Arbor and Detroit where we have many automakers, we have many universities.

We have the American Center for Mobility and Mcity. We have so many resources to offer and it's an exciting project to see take off. A lot of partners have already signed on with Cavnue—obviously Sidewalk Infrastructure Partners, Ford, University of Michigan, ACM, as I mentioned, several consulting firms. There are more to come with that. Just to talk a little bit about what the vision is for this corridor. It's really a project to accelerate AVs drawing on the resource of Detroit and Michigan.

So, we want to advance everything having to do with connected automated vehicles. So, as I said that SIP and Cavnue will be providing upfront capital, this will be aligned with regional transit. This isn't something a project nice that they came to the highway side first, immediately they pulled us into it. And that's my timer saying I'm out of time, so I'm going to do the rest of this really quickly.

So, lots of partners, lots of opportunities for new technology along that corridor, and we will do everything we can to enable that to happen and provide the technical assistance. We're heading up many working groups to solve all the problems ahead of time and to make sure things work smoothly with this. I'm going to go really quick through these slides.

Integrated CAV Laneway, it creates mass mobility with greater throughput and efficiency; that is the whole thought behind it. And there are basically four broad buckets in this: physical infrastructure, digital, coordination of infrastructure, and operational infrastructure. An integrated infrastructure technology framework for the CAV corridors.

So, the corridor itself is one piece of the broader picture; you have to include public transit and all the automation that can benefit that: smart curbs and stops, ride-sharing, support, so EV charging stations, Wi-Fi, and compatible CAV so everybody can talk to each other and all of the infrastructures along the way. And dedicated laneways obviously going to be a progression. So, today, there's really nothing there.

We'll start with the connected transit lane, and then eventually have an integrated connected AV lane so that the entire corridor there has connected technology on it, and we can launch, hopefully many, many demo projects. I'm incredibly excited about it. Really quickly, a few other projects we're working on, we received a LoNo grant. We partnered with Kelstar on that, so we'll be deploying electric buses, again, in many different settings throughout our state. We're working on a project with WSP.

That is, again, looking at a road project and an urban project to use technology to enhance mobility. One is crash avoidance. If we can make it safer, more people ride it. And along those safety lines are also a transit pedestrian detection system in Southeast Michigan. And then we received an IMI grant for the northern part of our Michigan to use technology to help advance AMT needs for mobility. And quickly the lessons that we've learned, I believe is the next slide.

And the one I'm just going to focus on right now is allow enough time to develop projects and fully develop partnerships and fully develop everyone's understanding of what they're getting into, what they need to make this project go forward, and then monitor the heck out of it and be adaptable as you go through it. That is all I have. And I think I was a couple of minutes over, so I apologize but happy to take questions later on.

**Sheryl**: Okay, thank you, Jean, for all that information. It's really interesting to see the variety among the states. Michigan is pretty unique in terms of having such an integrated idea of AV with other technologies. But if you look at the study that came out of Wisconsin, one that they came out of Minnesota, another one that came out of Iowa City, what they really do is express the values and priorities of a particular state and how they want to approach AV. So, thank you so much, Jean.

**Jean**: You're welcome.

**Sheryl**: Our next speaker is Jacob Labutka. And I hope I'm pronouncing that correctly, Jacob. Jacob is a project planner for Pinellas Suncoast Transit Authority in Florida. And he assists with a variety of short and long term transit planning projects such as bus stop consolidations and updating the transit development plan.

He leads the development and submission of PSTA's discretionary grant applications. And he's been very involved in electric bus deployment, integrated app development, and the AV demonstration development plan. And I will let you, Jacob, take it away.

**Jacob**: Great. Thank you so much, Sheryl. I think I just-- Oh, okay, here we go. I think I just have control of the screen. Can you see my screen okay?

**Sheryl**: I can see you and your screen. And I'm going to mute myself.

**Jacob**: All right, perfect. Well, good afternoon, everyone. And thank you, Sheryl. My name is Jacob Labutka. And I'm with the Pinellas Suncoast Transit Authority in the Tampa Bay area of Florida. And today, I want to talk to you about our autonomous shuttle demonstration program that for right now is mainly just focused on the deployment of low speed on level four autonomous shuttle.

And we're really hoping to leverage what we learned from our demonstration program to inform future deployment of autonomous vehicles in the area. So, just a little bit about us. So, we at PSTA is responsible for providing buses to Pinellas County, Florida, which is right across the Tampa Bay from, of course, Tampa.

So, we are just shy of about a million residents in our county, a slightly older population with a mean age of about 48. And we have 24 different municipalities, 22 of which are served by PSTA. And we have a variety of services that have home here, a lot of health, manufacturing, and financial services are headquartered here. But of course, given that we are right on the beach on the Gulf of Mexico, we have a very significant tourism industry.

So, apart from transporting tourists, we do transport a lot of the workforce that works along the beach, at hotels, restaurants, and other places that support that industry. We have about 44 bus routes, most of them traverse Pinellas County, two of them do go over to Tampa. And during non-COVID times, of course, I know ridership is kind of affected everybody during this-- Rides have been affected during this time. But typically, we get a little over 12 million trips annually across all of our modes. So, I think for us, it's really important that we keep innovating in the transportation space.

As you know, a lot of these technologies happened, I think it's kind of important for us to kind of be on the forefront; that we are able to just kind of know what's going on with these technologies. And we've done a lot in the ACES space. I noticed there was a great graphic earlier that sadly, mine's not as great, mine's more of a list out. But I think it really shows that the ACES transportation technology are really interconnected.

So, for us, we've done things with connected vehicle technology as well as our real-time system, or our transit signal priority that we're integrating into our Bus Rapid Transit Line that's currently under construction. We've also done stuff things with deploying all-electric vehicles. And we currently have two electric vehicles out on the street today, with four more on the order that we will be focusing on deploying in environmental justice areas.

And in addition, we've done a lot of shared mobility programs with taxis and TNC, such as Uber and Lyft. One such program is called our Direct Connect program that gives riders $5 off to or from select bus stop locations. Earlier this year, we actually received funding from the state to increase that subsidy to I believe, $9 to our firm bus stops to help low-income individuals actually get the full cost of the trip to or from bus stop locations.

So, we've explored so far about three-fourths of that sort of ACES list here. So, I think for us to really have that kind of complete picture and to see how everything here fits together, our next step is to explore how autonomous transportation technologies work in our service area here in Pinellas County.

So, here is kind of a map of the autonomous shuttle deployments that are either about to happen or are in the works. So, one that is currently in the testing phase right now is in downtown Tampa. So, that's not one that PSTA is sponsoring. That is sponsored by Hillsborough Area Regional Transit or HART, over in Tampa, however, they are using our same operator so it'd be really interesting to get the less and load demonstration. So, they're looking to do a year-long summit of low-speed shuttles in downtown Tampa along the transitway.

That'll share the road with other buses serving along about a three-fourth mile stretch in downtown Tampa. It's currently in the testing phase and should be launching in the next few weeks. In Pinellas County, we're taking a bit of a different approach. So, in Tampa, they're doing an about year-long deployment in their downtown. We're hoping to do about a year-long deployment.

But to test the technology in several of our municipalities, like I mentioned earlier, we have 24 different municipalities at Pinellas County. We're a very diverse county with a lot of different cities with different road structures, different populations, different needs. And so for us, it was important to plan a program that accounts for the diversity of our county.

So, we'll be looking to launch a demonstration in Downtown St. Petersburg this fall in November. I have a little bit more on that one later. So, that one is fully funded. We'll be launching in November. So, we're currently looking to explore and expanding that demonstration program to last a year. And we're looking to expand it to two other locations in northern Pinellas County, one in Downtown Dunedin, which will connect sort of their downtown area to their baseball stadium.

There are the spring training location for the Toronto Blue Jays. And there's a lot of mobility that happens within the city during that period of time. So, I think it's a pretty exciting use case. And then after that, we're looking to take it to Clearwater Beach. You know, right on the beach, that would go along a roadway where there's a lot of hotels, restaurants. We'll provide supplementary service to existing transit services out there today.

For those demonstrations, we are currently putting together grant proposals to the Florida Department of Transportation. So, they are currently unfunded, but we're hoping, assuming the grant proposals come through that we would do those demonstrations immediately following the one in Downtown St. Petersburg.

**Sheryl**: So, Jacob, I see that you're not controlling the screen for some reason. So, I can advance your slides. We're on the AV Demonstration Purpose and Deployment slide.

**Jacob**: Okay, that's perfectly fine. Let's see. All right. Let's see. Okay, great. Oh, there we go. All right, well, sorry for the mix-up there. But yes, I just applied I was on anyway, so that works out. Anyway. So, we have a couple of things that we kept in mind: What is the purpose of this demonstration? Why are we doing this? And of course, we want to introduce the technology to our service area.

So, that technology has been deployed in many places around the country and of course in Florida, such as in Jacksonville, Gainesville, now in Tampa. So, I think there are use cases that show the technology working, but for us, we want to know how it works here in our service area. And I think for a lot of our riders and at large, they hear about AV technology on the news and in other sources of media but most have not had direct experience with it themselves.

So, this really provides us an opportunity to educate the community on driverless shuttles. And a component of our program will actually be to survey writers about their experience with the shuttle to see how the interaction with technology did or did not change their perception of it.

That's something that's really hoping get some good data coming out of this. Also, looking there's potential economic development, things to be gained from this. So, I know with our funding source for the St. Petersburg demonstration, and I'll get into this a little more later, but receiving a grant from a commuter assistance program.

So, part of what we'll be testing here is how the technologies can help with commuter assistance in our different service areas. And of course, these are very new and exciting technologies and something that our local elected officials have wanted us to keep in mind is, there may be some maybe people who are going to come to visit these areas specifically to interact with the shuttle who may not live in St. Pete or in some of these other areas. So, I think that's something that could come out of this.

And of course, all of the data we collect, whether it's on operation, the community's perception of the technology, all of this data that we're going to collect is really going to help us inform what future deployments of this technology--Oh, have I been muted the whole time?

**Sheryl**: No, no, just for the last two minutes.

**Jacob**: Oh, no, I'm so-

**Sheryl**: That's for actually the last, it's really like 10 seconds. Just very briefly you were muted.

**Jacob**: Sorry about that. I just realized-- I'm calling on my phone and I keep forgetting I have to unmute on the screen and on my phone. Anyways, I think in the interest of time, I'm going to go ahead and move to the next slide. I think you have a sense of what our service area looks like for the deployment. So sorry about that. Anyway, so for the technology, this picture here shows what the kind of shuttle that we will be operating, what it looks like.

And this will be operating a Navia shuttle. Actually, what we will be operating it we're working with an operator called Beep, who is based out of the Orlando area and it's been doing deployments around the country, including the one in Tampa, one in Peoria, Arizona, and one in Lake Nona just outside of Orlando.

And those use cases will also be in mixed traffic, which is what we're looking for all of our deployments to do as well. There was a discussion of the shuttle specs earlier, so I'm not going to get too much in the details of it. But these are low speed, all-electric shuttle and that can operate--

We're told about seven hours to a charge but it'll be really important for us to test the shuttle since it is Florida, it can be hot, temperatures vary. We might look out in St. Pete in the fall, but if this goes to Clearwater Beach next summer, we would anticipate it probably it would not operate for quite seven hours. And there are a variety of sensors employed on board under the force that allow the shuttles to operate autonomously.

Next slide, please. So, this is sort of the demonstration I will just focus on since this is the one that is funded and definitely in the works. So, the map here shows our demonstration route in Downtown St. Petersburg. So, this is the longest street called Bayshore Drive. Those are waterfront on Tampa Bay. I'm connecting a hotel on the north side of the route to a musical theater and art museum, the Dali Museum, on the south end of the route.

And so, this route partially goes along where we have an existing downtown circulator. But this will be sort of providing enhanced frequency for a period of three months. We're hoping shuttles to operate about every 10 minutes or so during peak periods, so we'll have two shuttle operating along this route. There will be an attendant on board who although the shuttle operates autonomously can take over manual control at any time.

And then really, customer ambassadors, they're to answer any questions about the technology, take over manual control at any point, and probably most importantly, will be able to assist any ADA customers or those with mobility devices. There are two seats on board the shuttles that can fold up and wheelchairs can be secured to the space where those seats are once they are folded up. And the service will be serving existing bus stops.

All the bus stops currently have a good landing pad and that will especially be helpful for those ADA customers to be able to board and alight the shuttle. And something interesting as well is that this route will also be serving kind of in the middle. If you see those two pairs of stops to the east on is our newly reopened pier district. It's about a 16-acre waterfront district that goes about a half-mile long run a pier, and it's been a great attraction. It's been a great thing to open during COVID because there's a lot of open space.

A lot of people have been a great community asset. So, it'll be really interesting to see how visitors interact with the service and the pier. So, the service does connect to local transit services, including several bus routes, as well as the seasonal ferry that will be operating from the pier. And this will be a fare-free service. And as I mentioned earlier, this program through a combination of a few sources.

So, about half of the operations are funded through a program called a commuter assistance program through the Florida Department of Transportation. PSTA is providing matching funds for that program.

And in addition, we are receiving in-kind contributions from the city that can be used as a match for this grant to do the things such as improvements of stops, improvements to the route, as well as on securing areas for storage of the shuttles and satellite communications equipment, which I'll get into a little bit later. And this route as of a few months ago, has officially been approved by the National Highway Traffic Safety Administration, or NHTSA.

So, that approval process is really important for these types of routes. So, any sort of autonomous vehicle like this has to be approved by NHTSA in order to operate in a public right of way. So, next slide, please. So, I mentioned that here-- Oh, sorry, I totally forgot to move the slide. Let me just address this real quick. So, of course, given the-- Actually you can go back, I'll just quickly address this.

So, of course, given the rise of COVID-19, we are taking certain precautions with the service. So, our operator hat is working with a service that specifically will be cleaning the shuttles and sanitizing them. The shuttle can usually hold 10 people but capacity would be reduced to six or even less to encourage social distancing, and there are designated seating arrangements on board, requiring facemasks for all of our attendants and riders. And of course, as the situation changes, we'll make sure that we'll be in compliance with any CDC or city requirements. Next slide, please.

So, I think I previously did emphasize the NHTSA approval just because so much has to go into planning these demonstrations, but without that NHTSA approval, you have no project to operate on a public street. So for us, it was really important that everything that we no matter what we did to plan for this route we kept in mind that we kind of are aligned with their criteria.

So, for any of you that may be wanting to plan similar deployments. I'm just provided some steps here of just what it has taken for us to get to where we are now. So, I have listed here just a few steps that helped us to lead to the submission of our NHTSA application.

Some of them are similar to regular transit service planning activities and some are specific to AV, so of course, you have to identify an AV operator. We were initially going to lease the shuttles directly from Navia and operate them either ourselves or have worked with a local partner to operate them. But there was a federal law change a few years ago, and you actually have to own the vehicles if you're going to operate them.

So, of course, we had to switch gears that are now contracting with Beep, the autonomous shuttle operator. We of course have to identify an ideal road to the deployment. Listed here are the characteristics that we looked at in a road. It's probably some of the most important ones for NHTSA are low-speed street, typically about 25 miles per hour or less is about the speed limit that NHTSA will approve for these sorts of videos.

As well as having a short distance of a route of these demonstrations typically don't go more than maybe a mile and a half, two miles in each direction. So then, once that's identified, then the operator will typically do 3d mapping of the roadway.

And then after that, that's kind of more of a service planning type activities determining your operations plan, how many shuttles were required to operate the service. So, we'd want it to operate two shuttles so we could have that increased frequency and make the service more usable, especially since it is pretty walkable location. Definitely important is to identify a storage location for the shuttle.

And then you want the storage location to be within about a quarter-mile of where you're going to be operating from since these are low-speed shuttles. So, you don't want the shuttles to have to cross a major highway or something like that to get to the storage. And you want it to have access to electricity and available water for cleaning. We also had to identify a secure rooftop for GNSS or Global Navigation Satellite System equipment.

So, that's equipment that connects the shuttle computer systems with the satellite systems that help with geo-positioning and to operate autonomously. And once you have all that information compiled, the operator puts it together into a NHTSA waiver and sends it off. Let's see. I'm trying to--

**Sheryl**: You are muted again.

**Jacob**: Sorry about that. All right. I think I was going to the next slide, please. I'll try to run through this pretty quickly.

**Sheryl**: Yeah, because we're running behind.

**Jacob**: Okay, great. I'll be really quick. Seeing what's on here. So, once you get the NHTSA approval, these are sort of the steps that we will be taking before launch: finalizing our stop location, installing the chargers in the facilities since we do not have those there, working with EMF services on training, training ambassadors.

The operator will be testing the shuttles for about two weeks before deployment. And then of course, finally launching the service come November. Next slide, please. So, there we go, last slide. So, as we sort of go through this demonstration and our future demonstrations on the data collection. It will be really important for us to plan for future use cases of this technology of parallel efforts that we've also been involved with.

Similar to Jean from Michigan, DOT, we are members of the automated bus consortium that of course, we're looking at potential deployments of 40-foot autonomous buses. And I've listed out a few potential use cases here that we'll be looking at in the future, which will very much be informed by the data and the data we get from the operations of this demonstration. And with that, I will call it.

**Sheryl**: Okay, thank you so much. That's great information. That seems like a year or two of planning before you can really go live with one of those.

**Jacob**: It has been quite an effort. You can do it in a compressed timeframe, but more time is definitely ideal.

**Sheryl**: Okay. All right. Thank you so much. And last and very much not least is Matthew Lesh, who is going to be presenting. He's passionate about accessible mobility, clean energy, and automation. And he has been very much involved with these topics. He spent more than 15 years at the local and federal levels of government in both the public and private sectors.

Many of you may remember Matt from his work at the USDOT where he launched and managed multiple programs including the TIGGER program, and kick-started the US Electric Bus Market and the mobility on-demand program.

He consulted for Noblis on the Accessible Transportation Technology Research Initiative, ATTRI, and the automation program plan and the Smart City Challenge. He also worked at Local Motors, which many of you may know produces the Olli, which is a self-driving shuttle. And he's currently serving as the founding Chair of the ASCE committee on automated transit systems.

Matt is an independent strategist and he works with startup firms, tech firms, nonprofits, cities and agencies to set up pilots, develop roadmaps, match-make, research and hatch new ideas. And Matt has been working with one of our strike teams as well. And Matt I will let you take it away. I can either advance the slides or you can request share screen, whichever you like.

**Matthew**: Let's just go with it with you advancing, and I'll run through this quickly because I think we're supposed to be ended by 3:30.

**Sheryl**: We are.

**Matthew**: Okay, well, let's go. She did a really good background of me, so I won't go into much more. Actually, I have another slide down below. What I wanted to talk to you about and leave one impression is that if we're thinking about a future transportation system that's using, utilizing automation, let's think about a future that incorporates everyone.

So, mobility for all, and that includes people with disability, older adults, young people, etc. And without that, we're still going to have the same transportation problems. So, next. And this is the real point here.

That's the one thing to think about is the form factor of the vehicle. And that's one of my passions is looking beyond the form factor, so without the steering wheel, without a driver. We can really start to think creatively about what the vehicle might look like, because if you see here, this quick picture here: a car going to an electric car going to an autonomous car, what's the big deal? What are we going to get out of that? We're going to get maybe some safety. We're going to get some efficiencies out of it.

But all in all, how are we going to continue to move forward next? And so that's my point. Instead of just utilizing the tool of automation to enhance the automobile, let's enhance, let's apply the technology to advance all of us. And that's just my daughter there, keeps me focused about why I'm doing this. It's for safety, alleviating the close to 40,000 deaths we have on the highway, lowering speeds and providing new opportunities for future generations.

Go, next. Next slide, Sheryl. So, this is real quick. I've been thinking about this for quite a while. Even though I was working even on some non-motorized type of bike sharing and transit-oriented development, I really saw the opportunities for a systems approach, looking at how vehicles are going to be part and parcel of our society.

So, that shows kind of a timeline of the different types of vehicles that I have been working with and looking for more input and future opportunities for other systems. Next. And so, the things I want to just touch on is really the needs. Some of the programs that are really pushing this forward from the Federal Transit Administration.

I'll talk about a few tools that you might consider if you're looking at doing pilots and deployments, and then just some lessons learned. Next. In short, the point I like to make is that one in five of us have some type of disability and that means even able-bodied folks, if you go down the ski slopes wrong and you break a leg, if you get older and you're losing your vision. You know, you don't have to be born with a disability to experience one.

And so, we really need to think creatively about how we create these future mobility opportunities for all of us. Older adults are living longer, and isolation is a big killer. And we need to provide systems that are safe and enjoyable for them and for everyone. Next, next slide. And what the problem is, is that there's been billions of dollars in this technology, looking at how to merely automate them, the vehicle as it is.

Obviously, there's some policy and practice that needs to follow suit from NHTSA all the way down, but I think we need to do more as a society than operate the vehicle as is. And you'll see the one thing I like to point out is nothing to take away from the individuals that work so hard at Lyft and Aptiv to create new solutions, but how do you get a wheelchair in that vehicle? Next.

And so, this has been my kind of passion is trying to figure out who's working on the new vehicles and how they're being deployed. And so here's a variety of different "purpose-built vehicles" that are taking the steering wheel out, that are looking for new operational strategies, and that will be the forerunners of what I think the future of mobility looks like. Next. And so here's kind of a guiding light of how federal dollars are going to be distributed.

And I think Joshua, over on the textboxes, has a put a link to some supporting documents of the strategic automation research program of FTA. But it really points out about where federal dollars is going to be focused, hopefully, even if there's an administration change. But looking at the different applications of automation from crash avoidance to precision docking, all these things lead to where we're going.

And I'm going to provide some examples in the next couple of slides. One was another program out of USDOT is the BUILD program. And one of the projects that were chosen last year was in Orange County, where $20 million are going to be funneled towards a community called Lake Nona down there that people will be operating some of their Navia vehicles there. And just because I've spent time at DOT, and live in the DC area, I always like to have a quote from secretary there.

This grant will support the country's reimagining mobility. It's an investment in cutting edge multimodal transportation. And so, when you hear a secretary of transportation say multimodal, and reimagining the word mobility, that's a big win. And so I think that's very helpful for where we might see the US Department of Transportation going. Next.

And so, I did want to give a little bit of a courtesy call out to Beep. They've done a wonderful job being operators agnostically of the vehicles. They've made inroads and working with the disability communities.

A lot of these vehicles weren't fully accessible when they first came on the market. And they've been one of the folks or one of the agencies or entities that have been really pushing this because they know the end-user as well as the government, requires it.

This grant was going to offer about 22 miles of a dedicated automated vehicle path. And they're going to have new infrastructure aspects which is a really key component, I think, to automated systems is that the infrastructure not only the digital but the physical is tied in part and parcel with the system. So, be on the lookout for that.

And that'd be a great place to visit when you go to Disneyland or others. Next. And this is what we're working with Pier recently. I asked them to kind of dedicate a slide of how we could communicate to other entities of what's necessary to really get prepared, kind of what's going on at the Noblis.

And probably one of the reasons that Noblis went with Beep is that they work at all levels of the community, state and federal community, the community at large, the private and public sectors, really focusing on the ADA community and then the first responders.

And so, what they like to say is engage early and engage often. Next. You heard Jean talked about a top of the hour, the Michigan mobility challenge. I was lucky enough to be on a team represented here will all the logos on the bottom.

But I wanted to give you a little snapshot of what we did during that challenge is taking that pod, that automated pod that you see in the background, and working with the disability community there, as well as the universities engaged and looking at how the vehicle can be improved, what their real requirements would be.

And so utilizing those funds to work specifically on mobility for all. Next. As Jean mentioned, there was a two week pilot at the university, Western Michigan University, and it was a really awesome experience. Again, working with the students and looking at the reactions of the students, you'll see that the vehicle operated in close proximity.

You know, maybe students are a different segment of the society but I really gave promised that at least some of my passion of where I think we can go where some of these low-speed vehicles can really add to our transportation network and help finish the first and last mile. Next. Some of the more like ADA's, Advanced Driver Assistance are coming online for long haul type, you know, full-size bus. This is really going to add in not only safety but efficiency and accessibility. We have—what do you call it—precision docking.

So, decreasing the gap and creating other opportunities to support and provide safety around the asset. Robotic researchers, the AV provider here, and they're also a slide I forgot to put in there is Connecticut, CDOT, is working with a new flyer in robotic research working on a fully automated bus. Next. And why this is important is because you have regions like Houston, where they're really looking at a multimodal automated system, using shuttles for first and last mile, linking to more automated type buses and taking advantage of bus-only infrastructure that they have. And really, they see this type of plan the only way they're going to be able to survive the crush of people that are moving to Houston. Next. So, what's the future going to look like? If this video works-

**Sheryl**: Matt, I just want to interrupt for one minute because we seem to be coming to 3:30. So, I'm going to go over and if our speakers can stay with us, that would be great. Just we have a few minutes for some chatting later.

**Matthew**: Okay. So, just real quick rollback. So, what I wanted to show here is that a few of the kind of enabling technologies I work with is a virtualization software, as well as a simulation software. And we worked with an organization at the, it's called Aerotropolis, it's a community improvement district around the Atlanta airport. And they're trying to create a new kind of automated, elevated system. And so, we worked with them to create this vision. This is a vehicle that does not exist now.

We wanted it to be agnostic, but we worked with them and with really some cost-effective tools to create a virtual reality for them so that they could gain insight and support from some of their stakeholders on how to go next, build the necessary requirements and look for funding.

Next one of those tools that I thought what might be interesting to present to you is the Doris, it's a very low cost, kind of feasibility type of modeling software and collaboration tool. And it looks at multimodal impacts on new types of systems, especially automated systems. And so, it might be worth investigating that as you start to build up a plan for an automated system in your community.

Next, one more slide on them. And why that's important is that it brings together expertise from the planning, the engineering, and the policymakers together on one platform. So, kind of think of it as the Wiki or something for infrastructure planning or for pilot planning. Next. And again, one of the things I did want to leave you with is the idea of the universal design principles.

This summer I got to work on a program with the Center for Inclusive Design at University of Buffalo. And I won't read them all there for you. But the bulleted universal design principles basically comes down to if we're going to design something, think about everybody's living in everyone's shoes.

And that really does include our transportation system. Next. And so, just this might I think almost last slide. If you're thinking about a program like Pinellas is doing, you have to find a local champion. I'd be curious to hear from Jacob of who'd that like.

Maybe that was him. You think about a universal design principles. One thing that is really important is pedestrian environments support multimodality. And so you'll notice that in Pinellas, the Navia shuttle is really incorporated in a very friendly, pedestrian-friendly area. It just creates more mobility choice.

Energy and electricity and understanding duty cycles is going to be important as most of these automated vehicles and systems are electric. And encourage the LOT, Internet of Things type of connectivity, leverage the purpose-built vehicles, and build inclusive strong teams from the start. Next. And this is a vision of Pratt Miller, an engineer who I work with. But looking at how a terrestrial-based automated vehicle might start to be incorporated in small and larger regions around the country. That's it. Thank you. A couple of minutes over, sorry.

**Sheryl**: Okay, no problem. So, we have a few minutes for questions. And somebody said that they hadn't seen many goals around reductions in emissions resulting from shifts out of single-occupant vehicles and wanted to hear your thoughts.

And I'll just offer a preliminary thought in terms of AVs, they're probably not so much a part of the transportation network yet that they are in any way affecting modal choices at this point. Does anybody else want to comment on that question?

**Carol**: I just don't think we're far enough along yet. Not to be the wet blanket but--

**Jean**: I agree. I think down the road, we'll definitely be doing that. But right now, we know that it'll have a positive impact but we're not ready to measure that impact yet.

**Jacob**: Right. And I think I'll provide a follow-up comment on that. So, I think when we initially went on this venture, I think one of our metrics for this was going to be ridership, which of course you get more ridership on these sorts of vehicles and that's potentially often in more emission.

But obviously, with the rise of COVID, not that we are necessarily not tracking ridership, but I think that's not necessarily a key performance indicator anymore since we are reducing capacity to promote social distancing. So, while we are tracking ridership, I think for us right now, what's more so how do people interact with the technology, how does it interact with the roadway?

And I think the lessons learned from this can really help inform future deployments when…..and we don't really have to worry as much about social distancing as much anymore and then where we can maybe have the data to really measure those emissions reductions.

**Sheryl**: Exactly. I think Jacob, your situation, your pilot really shows how data is going to be incorporated from the start, which is really important. So, you know the value of what happens during that pilot.

**Jacob**: Exactly.

**Sheryl**: And I know in Michigan, the Grand Rapids challenge shuttle will be starting up again soon and it had really done very well in terms of ridership.

**Jean**: Yes, absolutely.

**Carol**: And also, the shuttle in Rhode Island called Little Rhody, they did really, really well. I got a chance to look at the ridership figures. They had to cut out the last, I think two months of their demo because of COVID. But before that, it did really well.

**Sheryl**: Right. And the nice thing I think about Grand Rapids and the providence example of Little Rhody is that they were kind of real transit situations and not just a place to do a little show which has its value. But that's a kind of a different thing.

**Carol**: And that's the point that I was trying to make earlier that I think when we look at putting these in actual transit service, we have a whole host of other factors that we need to consider. It's one thing using as purely a shuttle service like a first and last mile.

It's a completely different thing if you're going to run it on let's say a specific fixed route or something like that, and it has to be integrated into the schedule. You have more that you have to consider. And in my examples, there are just very few of those right now.

**Jean**: Do you think, Carol, what we were hoping to show with the NAIAS challenge is by running those vehicles on a loop and creating an app where people could integrate and get take transit to one point and then hop on one of those shuttles, and get to all of the different venues that are planned for that auto show instead of people trying to drive from one venue to another or drive from their hotel to the site. Hopefully next year, we can actually show that in progress.

**Sheryl**: Right. Well, and that's that brings up the discussion of where in a rural area is a good place to have these, and does a rural area have to wait until we're a little bit more advanced in terms of a vehicle that can go into a more normal speed.

**Jean**: So, for the automated bus consortium, one of our demo sites, we have two in Michigan. And one of them is a rural area. It's a very rural area in the thumb of our state for those of you who know the mitten, and it was actually to connect workers who were kind of transplanted to Michigan. And housing was set up for them.

They needed workers desperately at a factory, but there was no housing close by. So, the housing is about half an hour away. And so it was to shuttle those workers from that housing area to where the factory is. And so it was a very rural area and we know that's why we want to demo it because we talked about avoiding bicycles.

Well, there you have to avoid farm equipment and deer and wild turkeys and tire speeds and a longer distance. So, for the electric portion of it, a longer distance, and you really have to plan out the infrastructure for electricity, let alone the automated technology.

So, we're trying to show that we're trying to figure out where is that and in the northern part of our state, where they're looking at an EMT services, they're considering is there an application that they can demonstrate with regular buses now, but that could be taken over with autonomous vehicles, getting people to medical services efficiently.

**Sheryl**: Exactly. And what you brought up before about wild turkeys in another place, it may be bears or deer or whatever, maybe other road users that these vehicles have to be careful about.

**Jean**: Yes, large farm equipment and getting down two lane roads around. For those of you who know what a large combine looks like, they're not easy to get around for a person.

**Sheryl**: Exactly.

**Jean**: That with an automated vehicle will be a great test.

**Matthew**: Is there any ford buggies up there?

**Jean**: Not in that area, but we do have……area.

**Sheryl**: Right, that's a very good point. And what can State DOT's do? And Jacob, I'd like to ask this of you. Is there a role that your State DOT is playing with it that you'd you think that State DOT's could play to help support transit systems?

**Jacob**: No, I mean, I think Florida has definitely been supportive overall of the deployment of this technology. So, we have a great relationship with our district. So, a big source of conversations with the district is show me the money. But I think it's more than just that, though. You know, they have their own funding sources that we have clearly leveraged for this.

They're also in talks with our USDOT, and conversations with them. So, we've submitted federal grants before for autonomous shuttle demonstrations. And something we've learned from talking with our State DOT is, hey you had a good application but the main issue here is that you hadn't really done much in terms of like showing the use case in anything.

But I think a lot of these federal opportunities, I think the one last year was like automated driving systems grant or something like that. They wanted to see maybe you just kind of put your toe-- At least have your toe in the water before they're going to put you fully in the pool. But now I think we actually have our toe in the water.

And with our established relationship with our State DOT and other local partners, I think we have the case to go after more dollars for either these other deployments coming online or for expanded deployment of the technology, whether it's fixed-route 40-foot buses, robotaxis or whatever that looks like.

**Sheryl**: Jean, I'll ask you the opposite question. What do you think that transit systems or transportation providers can do that would be helpful for them from your perspective at a State DOT?

**Jean**: I think from our perspective, it's really becoming knowledgeable about the project you're asking to get involved with. We've seen some agencies who "Wow, this looks really cool. And yeah, we're really excited about it."

And then when it gets down to the nitty-gritty, and they realize all of the work that's involved in doing it, and the personal, the resources from even if it's not their own money, it's their resources from their employees and such. I think they realized they went over their head. So, I think really thinking through if they have everything they need to be involved in a project that's that complex.

**Sheryl**: Okay, and so I'll ask a final question to Carol and Matt, since the two of you are consultants. Are consultants, can they step in to provide some of those resources or to help transit systems develop those resources to get further along in something like this?

**Carol**: I mean, I think absolutely. I also think that it's somewhat unrealistic, particularly for small rural agencies to think that they would be able to bring on somebody like on staff. I mean, eventually, they may have to do that if they embrace the technology and it moves forward in a certain way. But I think a consultant can be helpful in sort of going through the whole planning to deployment, really like with any other technology, it's just that it's actually a lot more complicated.

Because in deploying technology that's just onboard technology, sure, a consultant is very helpful there too. But eventually, the agency sort of owns that the drivers need to live with that on a minute to minute basis. It's different than bringing in this brand new sort of vehicle that's going to operate in transit service. And so, that's why one of my slides had that thought about, really organizationally, you really need to think through this, particularly on the rural side.

**Sheryl**: And, Matt, do you have any comments?

**Matthew**: Like what Carol said, I mean, what I try to do is kind of start from a basic level and just try to roadmap of what the necessary steps might be. And the real linkage to me is where the agency might be on electrification because I think a lot of these vehicles are looking towards electrification.

So, having that tie in and having that operational experience is helpful. And then with electrification typically comes to some new funding sources as well. So, that's the new avenues that I've been looking at.

**Sheryl**: That's the perfect ending here because this is the last of our first set of webinars, and we kind of built up to automated vehicles with components we thought were related to them in a logical progression, and electrification. However, a community decides to do that is a really good first step.

And as well as looking at some of the plans that are out there and studies that have been issued on a statewide or a community-wide basis to see what others are thinking about, not only in terms of the vehicles and like the hardware, the on the ground stuff, but also in terms of accessibility and how AVs will fit into your transportation network.

**Matthew**: And quiet and clean and all that. Yeah, I left a dangling question to Jacob before. Was there a champion in Pinellas County that got this rolling for you?

**Jean**: It's kind of a complicated question, to be honest. Actually, we started talking with AECOM a couple of years ago, who kind of came in and brought in one of their resident experts to sort of teach us about the technology. And kind of since then, I've kind of been the internal project manager but I know our CEO is really excited about moving this forward, our board is really excited.

I think we have a champion in the Florida Department of Transportation who I work with closely, who is really helping us to be a part of the regional conversations on AV, whether it's things going on the FDA or over the bay over in Tampa. So, I mean, I think having one champion helped but I think really having a collection of champions is what you really need to make this accessible.

**Sheryl**: Okay, thank you so much. This has been a great discussion. And I will just point out that there have been other instances in not too far back in history where there was a completely new kind of transportation. And people took that leap of faith and used it. Elevators are one. Subways are another.

Nobody had gone below ground to do anything. And there was a thought that no one would use it. And from day one, people got on the subways in Boston, in New York, and used those elevators. And I would guess I'll just throw my prediction out there that people will use automated vehicles as well when they come on the scene in great numbers. And thank you again, I'm really looking forward to see what happens out of Florida, out of Michigan and elsewhere across the country. And thank you for staying on late as well. We'll see you all soon.