



Marcela: Great. Awesome. So, welcome to this webinar on Green Energy Strategies and Trends for Small Transit Agencies hosted by the National Center for Applied Transit Technology. And our friends at the Center for Transportation and the Environment are going to give us a great presentation on Green Energy and how that interacts with transit agencies a little bit about N-CATT. We can move forward on the slides. Let's go with about CTE first. Go for it, Drew.

Drew: Yeah, no problem. Thanks again everybody for joining today. My name is Drew Turro. I'm an associate with Center for Transportation and the Environment. I wanted to give a little bit of an overview about some of the work that CTE does.

So, we're 501c3 nonprofit engineering and planning firm whose mission is to improve the health of our climate and communities by bringing people together to develop and commercialize clean, efficient, and sustainable transportation technologies.

I'll talk a little bit in a minute about our portfolio projects that we have, but it spans across a variety of different project types in our 90 active projects total over \$316 million in project funding. Our primary focus is zero-emission transportation technologies, and we have offices across the United States.

There you can see in Atlanta, Berkeley, Los Angeles, and Saint Paul, Minnesota. Like I said, our projects are thorough, geographically diverse. You can see some areas that we do have some heavier clusters of projects, but we're always, always looking to work with agencies, wherever they are in the U. S. Our project types fall into four different categories.

So, the first is Prototype Development and Demonstration. This is kind of the pre-commercial stage of technology. An example of the project that we worked on was we helped Proterra, who's one of the main zero-emission bus manufacturers that works with transit agencies, helped them to develop their first pilot bus back when they were getting started enough off the ground.

Our Prototype Development and Demonstration also applies to zero-emission fueling infrastructure. So, both battery electric plus infrastructure and hydrogen fuel cell. We also work with agencies' Smart Deployment projects.

That is for agencies who are just getting their zero-emission vehicle deployment off the ground. We have a system that we've developed over time in working with agencies to help deploy these technologies to help ensure both from a technology analysis point of view, but also from a project management point of view.

On both bringing the vehicles and company fueling structure online that the project is set up for success, and that the deployment is going to lead to a successful additional deployment down the road of zero-emission vehicle technology.



We also are looking to plan for more long term transitions for folks in California who may have the state mandate to move toward zero-emission technologies by a certain time frame or for agencies either through their internal goals or through local or state goals, are looking to what it would take to transition their vehicle fleet to fully zero-emissions.

So, we help to look at the different operational and financial impact of that and help to put together a plan for agencies who are looking at that longer term fleet transition. We also do a number of pieces on education and outreach for webinars like today. We also work with the Zero Emission Bus Resource Alliance and put on an annual zero machine bus conference that we host.

And we also work with organizations like AFTA to help to put out educational pieces and to work with putting out events to help bring in transit agencies who are maybe different points along the technology curve but are interested in integrating zero-emission bus technologies into their fleet. I'll turn over to Marcela for a quick word on N-CATT.

Marcela: Thank you. So, N-CATT is the National Center for Applied Transit Technology. We walk small agencies through the technology landscape, which we all know is rapidly changing at all times. So, we produced resources on adopting emerging technologies, including zero emission vehicles and green infrastructure/green energy which is the webinar you're here for now, as well as data management and new software decision making.

So, we provide resources in the form of guidebooks, white papers, webinars, workshops, as well as in depth technical assistance to transit agencies adopting new technologies through our innovative strike teams and state summits. We also have some podcast, which I did not mention before.

And also, we have two upcoming workshops in June on how to understand how different technologies can be applied including a series on data management, and then another on digital tools to facilitate system redesigns. And I'm Marcela Moreno.

I'm the transit technologist with N-CATT. And before I pass off for Andrew's introduction, I wanted to have a couple of housekeeping items. You can access a full transcript live of the webinar in the more section of your Zoom account, as well as if you have any questions that come up, feel free to add them into the Q and A or chat and let us know if you have any questions or need any assistance throughout.

Andrew: All right. Thanks, Marcela. Hello, everyone. I'm Andrew. I'm the director of N-CATT. Thank you all for joining us.



Drew: All right. Thank you, Andrew and Marcela. So, over the past few months we've been working in partnership with N-CATT. I'm developing Green Energy guide for transit agencies. So, there is an accompanying guidebook that will be published.

So, stay tuned for more information from N-CATT on when that publication date will be coming out. So, what we'll be covering today, it's kind of a high level overview of what we cover in more detail in the guidebook.

We're happy to answer any questions as myself today that you have over the course of the presentation. But there will also be the guidebook that you'll have access to when that is published on the website.

So, to get started, I just want to start with the definition of what we mean when we say green power, green energy. So, what we mean when we're talking about that is electricity supplied from a subset of renewable resources that provide the highest environmental benefits.

So, you'll see here, this is from the Environmental Protection Agency's guide to purchasing Green Power, which is another great resource that talks about what it takes to bring green energy onto your site.

But for things that follow the renewable energy category like a large hydropower municipal solid waste, while they are categorized as renewable energy, they don't necessarily provide the greatest benefits to the environment over the long term.

So, that subset of green power that we talk about in the guidebook is what you see here, wind, solar, biomass, geothermal, biogas, and more low impact hydropower. And green energy, green power is important for transit agencies because transportation and electricity account for more than half of the total greenhouse gas emissions in the United States.

And where this comes into place on the transportation side, obviously, as you replace vehicles that run on fossil fuels with vehicles that run on either electricity or hydrogen or other zero emission technologies, you're able to eliminate the greenhouse gas emissions that are associated with the actual operation of the vehicle.

But when you look at the full picture of everything that it takes to make the vehicle operate, what we call the well-to-wheel emissions, which includes everything related to the fuel production, processing, distribution, and use.

You can see here based on the national average for electricity in the United States. And this comes from the Department of Energy. You can see here on the bar graph that even in the All Electric scenario, you have, like I said, the zero tailpipe emissions.



Just if you have the national average of what the different sources of electricity production, there still is going to be some accompanying carbon dioxide emissions that come along with that. So, as both the national share, and your local share, and your utility increases the amount of green power that they're using to produce the electricity that is going into to fuel in these vehicles, you'll see those well-to-wheel emissions go down and you'll see not only the portion of transportation emissions in the United States start to go down, but also, on the electricity side of things.

So ,those two things that help to make these vehicles, both the vehicles themselves and how they are actually being powered, is going to start to make a real impact on that chunk of a Michigan that does make up the majority of what we've seen in the United States.

So, when we talk about the benefits of green power, we kind of group those into three primary categories, the environmental, operational and financial benefits that you can be the environmental side of things.

So, for agencies who are able to locate on-site green power, they are able to claim those environmental benefits either for the actual fueling of zero-emission vehicles or even just to go towards the operational footprint of the electricity being used to run things like the bus maintenance building, just general facilities, that the transit agency is operating.

From a financial perspective, if you're looking at trying to just find a way to pay for green power, there are options through Utility Green Power program that we'll talk about here in a little bit. And then from the operational point of view, if maybe you're interested in looking into green power as an option but maybe I'm sure whether there's either the upfront capital necessary to purchase that power or maybe the space on-site there are some constraints there.

There are some options that we'll talk about under the Energy as a Service Procurement option. So, starting with utility green power programs, that's probably one of the easiest ways to start by exploring what your local electric utility or provider has to offer. You can see a map here of what is currently being offered across the United States as far as consumption of resources from the World Resources Institute.

So, looking at the green tariffs, which is something that would most likely apply to transit agencies in the commercial industrial space, who for folks who want to buy green energy under a special utility tariff rate.

So, the utility will take the subsection of their electric generation mix that is renewable or green power, and you'll be able to attribute the energy used by your facilities, or to charge buses, or anything like that to green power under that green tariff program.

There are also green power products, which are shorter term programs. So, you may have an additional monthly costs that get added on to your utility bill that helps to support the utility in bringing on additional electricity or a mix of renewable or other green energy sources.

Then looking at the Energy as a Service, this is a category of business models that can go beyond what the local utility might have to offer. So, these fall into a couple of different categories that we talked about in the guidebook.

So, for folks who are interested in looking at locating solar at their location, there are solar leasing programs where you can have a third party that will actually take care of the installation and maintenance of the solar system at no upfront cost.

And then you'll agree to a certain contract length, and they will be able to supply electricity at a set price, for the duration of that contract. And those are generally longer term contracts that you're looking at with that fixed price there. There are community solar programs that are in operation in different states across the US that would be Subscription Model.

So, there would be a larger solar installation generally cited in one spot or in numerous spots throughout the community. So you would be able to buy into or purchase a portion of that solar installation and claim that as your own and be able to realize both the environmental benefits and the cost savings that could be associated with that that come with being able to develop a project that's a bit larger, and as it starts to scale up, is able to potentially help to bring down those long term costs for electricity.

There are also power purchase agreements, which I'll get into a little more detail here. So, that is a financial arrangement in which you're working with a third party developer so that developers typically going to own, operate, and maintain the generation system.

And then like I mentioned before, for a defined period of time, you'll be able to purchase the system's output from the project developer over whatever contract link is agreed to between the two parties. The PPAs also involve the transfer of renewable energy credits.

This is the tracking system that helps to actually attribute the environmental benefits associated with generating that green electricity, and can be used either the financial incentives from selling those renewable energy credits to organizations who are trying to meet clean energy goals or by retiring them to have the environmental claims that go along with that attribute that green energy to your operation.

So, we go into more detail about the renewable energy credit in the guidebook that that can be a whole area of its own. And generally, your third party organization who you're working with to develop

that power purchase agreement is going to help walk you through what your options are and what it means and the terms for those renewable energy credits.

And then looking at on-site power generation storage that is something that is located at your facility. Again, there are different options for what it means to both install and then take ownership of the operation and maintenance of those energy systems. So, whether that is outside green energy generation or outside energy storage, there are some different options that you have there.

So, you can take the full ownership model and then take care of all the maintenance and things along those lines or work with a third party to take on some of those operational maintenance past that potentially either don't have the internal-or they do have the internal capacity to take on and be able to outsource those and not have to worry about taking care of those things if issues do arise. And then all of these different green energy components can be brought together in the form of a microgrid.

A microgrid allow an agency to do the combination of energy generation storage, microgrid controller, and then the ability to actually disconnect from the utility grid itself can allow an agency to continue to operate, whether it is their facilities, whether it is powering their fueling infrastructure for the zero emission vehicles to continue to operate in a scenario where the utility grid overall that would typically supply power to an agency's location were to go down.

So, obviously when the grid goes down, you still have to be able to meet service levels and can't have long periods of time where you're not able to charge your vehicles. So, a microgrid presents an opportunity for agencies who are looking to add more resilient to their operations, especially as they are starting to go from maybe that early stage deployment of buses.

Where maybe just a few buses in your fleet and you're able to work through having those buses be of service if you're not able to charge them for a longer period of time into adding more buses in your fleet and coming into the situation where if you were to not have the zero emission vehicles for long periods of time that would substantially impact your service.

And now, I'm going to transition into, we have a couple of guests here today. We're actually working on a microgrid project right now. I'm going to be able to speak to their experience thus far. We'll have a brief question and answer with them.

And then at the end of that, we'll be able to take questions from folks about anything that I talked about today and anything that we talked about. I'll go ahead and turn it over to Calvin and Michael to go and get a brief introduction, and then we'll get started on our question and answer. So, Calvin, would you like to go first?



Calvin Jones: All right. I'm Calvin Jones. I'm the acting division chief for Montgomery County Government Fleet Management Services. We support approximately 3500 vehicles, everything from transit buses, highway services equipment to police vehicles and all of our other supporting entities in Montgomery County government.

For today's discussion, we'll be focusing on the microgrid at Brookville. So, one of the hats in Fleet Management Services is obviously we support vehicle fueling. And this kind of works like a vehicle fueling project for us. While it was different and unique, some of the challenges were very similar to past projects like CNG. Thanks for inviting me to speak today. I'll turn it over to Michael Yambrach.

Michael Yambrach: Good afternoon. I am Michael Yambrach. I'm actually the Capital Project Manager for Montgomery County, doing a lot of their advanced energy projects. We've done a lot of solar projects. We've done a lot of microgrid projects.

This project at Brookville was kind of a unique project, because again, it involves transit, electric busses and trying to develop an infrastructure that not only supports the buses from a charging standpoint, but also developing a resilient project and a renewable, environmentally friendly projects.

So, we were a little challenge in trying to put all three of those together, but I think we've got a successful project that we can talk about and present to you guys today. I think you'll be excited to hear about it.

Drew: Yes, definitely. So, my first question is when putting together, you decided that you're going to go forward the microgrid project. What were the primary goals that you sought to achieve when developing this project?

And maybe we can talk about, I know, I mentioned for folks who are looking to just maybe have on-site green energy and I know you talked about you've worked on solar product support, what was the difference that led you to microgrid project as opposed to just on-site generation?

Calvin Jones: So, much like California, Montgomery County has an emissions reduction mandate. So, where 80% emissions reduction mandate by 2027 and 100% by 2034, we had purchased four electric buses as part of a loan now and we had another 10 buses on the way as far from the bus and bus facilities grant.

So, for us, initially, our goal was really we were looking for a way to charge our vehicles are built in design infrastructure that supported our charging needs. Initially, I can tell you my biggest fear was similar to CNG.

When we got into CNG, one of the challenges was making sure that we had resiliency built into the project. I think early on, very early on, a lot of times when these projects are undertaken because these fueling strategies are a little different than your traditional fossil fuels.



Initially, everyone looks at it as almost like a one for one, like, say, you're literally just flipping a switch and moving on to a new system or new technology. What I liked about the microgrid portion of it is it allowed us to build resiliency right in the beginning.

I mean when you start thinking about the microgrid project and the process, it gives you the opportunity to build in the resiliency upfront. It also it allows you to fully leverage solar so you can fully leverage your green energy with battery storage and with power generation on-site. It becomes a scalable project. You're building your resiliency upfront.

From the transportation standpoint, my experience again with CNG led me to be kind of leery of doing business directly with the utilities. Basically, making the utilities responsible for me being able to provide transportation services.

What I liked about the microgrid project is that it allowed me to move away from that piece altogether to be able to operate in island mode, and avoid some of the demand charges associated with charging with only utility.

So that we can really build a solution around transportation and not build transportation around the utility schedule. And it provides a way to help control utility costs. Mike, did you have anything you want to add on that?

Michael Yambrach: You covered basically everything, Calvin.

Calvin Jones: I've tried to, Mike.

Drew: All right. And Michael, maybe you could touch on how some of the differences in this project versus just going with only on-site generation. How the project is deferred with incorporating the energy storage and other portions of the microgrid itself.

Michael Yambrach: Sure. Initially, we had the D.O.T. department come to us and say, listen, we've got four buses coming in. We've got to build out an infrastructure to be able to charge the buses. So, the initial plan that we got presented was like one charger to one bus and we're going to roll out 70 buses. And I sat there and I said, that's a lot of power.

How are you going to charge them? And they go, well, we're going to just hook into the utility company. And it's like, well, that's fine. They can do that, but first, do they have the capacity there? Are they going to be able to provide you the resiliency that you need to keep these buses running in the event of a major grid outage?

So, we started looking at saying, okay, can we take the knowledge that we've gained from other projects that we've done other microgrids and apply it to this facility and bring a renewable component to it that, again, can actually take us then, from green power to green delivery of the system.

The system right now, the way we've got to design is we've got about two megawatts of solar panels. We got about four megawatts of battery, and we've got about 1.5 megawatts of natural gas fired generation. Now, of course, in most transit industries, most transit sites, you charge at night, may be charged a little during the day.

It's tough to be able to charge solar at night because that's when the buses are charging but the sun don't shine then so you use the batteries to be able to augment some of that. And it's a delicate, balance on trying to charge and trying to manage your infrastructure development.

Initially, we're having a roll out of about 10 buses a year, and you just can't build an infrastructure that sits there and says, okay, here's your first four 10 buses. We're going to build to this. And then a year and a half from now, we're going to add another 10 buses.

So, you have to build the infrastructure out from a cost effective standpoint all in one. And then that means you've got some stranded assets that are going to be hanging out there for a while. But from a cost standpoint, it's much more productive. So you have to learn how to balance your charging requirements and utilizing your assets to the greatest efficiency that you can.

Drew: So, when trying to balance the planning for the present and planning for the future based on the expected fleet changes, what were some of the main things that went into trying to balance those things in building and rightsizing the system for both your current and your future needs?

Calvin Jones: So, we did a lot. So it's interesting. So, we had to really sync down and sent those two processes together. Initially, when we started down this path, Department of Transportation's goal was to be able to charge 70 electric buses. But they really hadn't mapped out their purchasing strategy yet. What that really looked like from year to year?

Once we started getting a little bit more information, what we did was we took a modularized approach. The way our project is timed, we're doing a lot of the, of course all the similar upfront in phase one, we're doing all the solar in phase one just because it's the most disruptive to the site and then we're using battery.

We're using battery and CHP power generation in order to address scalability. As they bring in additional, we said we set milestones, so basically, as they add additional vehicles, then we'll be able to work to add infrastructure to be able to support it.

Andrew Carpenter: I know I talked about a little bit earlier, there are a lot of ways that you can go about procuring green power. There are different options and different business models to kind of base on the agency's need.

Who of the primary stakeholders been throughout the process both developing the project and then actually kind of securing the financing and moving things, who are both on the internal side of things for Montgomery County and external partners that you've had in bringing this along?

Michael Yambrach: Well, the stakeholders are basically again Department of Transportation and our fleet services group and then our energy procurement group, which is what I'm part of, then with the oversight of what our Office of Finance and Budget looks over as far as how we are expending both capital and then our operating expenses.

We've got standard energy procurement for all of our facilities but looking again at this site because there is a large capital investment needed to build out the infrastructure and at as with most government agencies, we don't have a whole lot of extra capital. We moved this to energy as a service project, which we've done in the past.

Actually, we were probably one of the first federal agencies to be able to use energy as a service when we first did our first project five or six years ago. It's a format that we're comfortable with and we understand because it's basically a risk management.

It is risk managing the cost of energy with the capital investment that's needed over the term of the contract. We were able to again standardized what our energy costs are going to be through the term of the contract and have somebody come in and operate and maintain the facility for us where we don't have the expertise to be able to run a sophisticated system like this and reduce that risk factor for ourselves and give us more of a comfort level of it being operating and maintaining the way it should be.

I think you know if you're looking at energy as a service, I think it's a unique approach with no capital outlay and basically a long term operating expense commitment to keep your system up and operating the way you want it to.

Andrew Carpenter: In working with the utility obviously, a big piece of this project is to be able to not necessarily have to rely on this utility to bring in that additional power needs as the bus fleet scales up on zero emission side but working with the utility to implement this microgrid project. What are some of kind of pieces that you had to come together on to agree on and work through in making sure that the microgrid projects kind of fit in with what the current utility infrastructure wasn't kind of anything that needed to be hashed out there.

Michael Yambrach: Well, since we're generating everything on site to handle our specific loads on site, there really wasn't an upgrade to the utilities infrastructure. Their costs tying into this was pretty minimal and that's one of the reasons why we did it because we had one fee coming into the site.

If we were going to rely on the utility company, we're going to have to add another fee there or to which would have added significantly to the capital costs on the project if we were to finance it ourselves. Going through energy as an infrastructure, we were able to work with utility using their existing fees on the project.

One of the unique aspects of this project is that in the state of Maryland, we were able to take part in a pilot project for the battery service. The utility companies are trying to learn how batteries can impact and improve their distribution system.

We are at a critical area in their infrastructure so that they needed support, that we're going to have to upgrade, do some upgrades anyways but in working with us on the project, we were able to work with our third party supplier to incorporate the batteries into the utility program and make it part of our resiliency.

This is again one of the first projects where again, as a transit industry, we can put the batteries in. It also supports the utility industry and it balances the load requirements that we have within our power requirements too.

Andrew Carpenter: In working with your utility, was that something that you found that they were already pretty knowledgeable about as far as the potential essential services that the battery could provide there, or was there some conversations that were ongoing in order to kind of communicate what some of those potential benefits the utility might be?

Michael Yambrach: I mean we try to work closely with the utility company. We know what their concerns are and they know what our plans are for development. I mean this was a fairly seamless conversation as far as working with them and again, the timing is right because they were incentivized by the Public Utilities Commission to be able to implement one of these systems so the timing was right.

Now if we didn't have the support from the Public Utilities Commission and we were trying to do this, I think it would have been more problematic for us to be able to develop a contractual agreement with utility to be able install a battery system like this for support but I think we got lucky because the stars kind of aligned and we were able to put all these components together in the end with basically a simple interconnection.

With any power purchase agreement from the utility or with the utility company, the interconnection agreement can be the most trickiest thing that you're going to do with them and the most contentious

with them but since again we were working in conjunction with the Public Service Commission and this battery program, it kind of smooth the way for us to be able to implement a little easier.

Andrew Carpenter: Great. Moving into the kind of the physical layout and some of the state implications of locating these things, how does the layout of your current facilities impact or did they impact what eventually ended up as the final design and the sizing your components of the microgrid system?

Calvin Jones: It didn't affect the sizing of the components. We did have some limitations that are associated with land usage so we had some impervious surface limitations. Right? Due to the containment pond that's located on site, we couldn't expand our impervious surface.

Since we couldn't expand our impervious surface when it came to setting up or when it comes to setting up the power generation, our contract is going to have to be creative. When the solutions that they embraced was actually using, taking advantage of some of the elevations in our own property in building a decking system in order to mount some of the power generation units, we were able to recover some of the green space around perimeter of the facilities but that was the biggest one, as far as facility layout was concerned.

We did have to select, some of the tasks that we couldn't use for solar panel but we have plenty of space for solar panels so that wasn't a challenge. Yeah that was the biggest issue with layout.

Michael Yambrach: Yeah. Keeping in mind, we are building basically canopy systems.

Calvin Jones: Right.

Michael Yambrach: We're going to be parking and charging underneath the canopy systems. Now these are big units, okay? These vehicles are huge and they move around. Okay? They are hard to move around.

Again, we have to take great care on how we're designing the canopy systems and giving enough space for the buses to be able to maneuver so that we're not totally knocking down one of the support systems on a regular basis.

I mean that's something you have to consider too. It is making sure you've got enough room to park them, making you sure you got enough room to come in and go out. We are in a constrained space. It isn't like we have a big, open lot that we can move things around easily. It's the bus parking. We also have a maintenance depot there, too, so they're constantly moving these buses in and out from maintenance into their charging spots than ever.

We are learning as we go along with this, and I'm sure we'll try to do some changing reconfiguration of how we're going to park the buses, how they're going to charge the buses but the space constraints are a challenge.

Andrew Carpenter: I'm sure you are very familiar with other projects. In addition to the space constraints, have there been any things kind of the administrative side of the project or any challenges to the product or space that have presented any delays or kind of anything that, if you were to go back and kind of go through things again, might do a little bit differently.

Michael Yambrach: From a construction standpoint, no. Again, we're still in the early stages of the construction standpoint. I think if anybody is going to do this project, the biggest issue is whether they're going to look at it as a construction project and they're going to do it themselves, or they're going to look at it like we did as an energy as a service and have a third party come in and develop the project for us and operate it.

If you're going to do that, there is a considerable amount of time looking at the contract procurement and contracting process for energy as a service and so make sure that they have to develop again that timeframe into their planning so that they don't have buses there and there are no chargers there.

We've been real lucky that we've been able to phase this in so we have chargers that match and service that matches the delivery of our buses and which is probably the most important thing you can do because you don't want buses standing up there without the ability to be able to charge them

Calvin Jones: Yeah, I agree with Michael Yambrach on that. It's been incredibly bump free. The biggest challenge was definitely upfront on the contracting piece. Once that was done, it seemed like everything else flowed really, really well and now it's just getting the bus, getting more buses there.

Andrew Carpenter: Definitely. One more question and then we'll get into the audience Q&A or if you folks have questions for Calvin or Michael and myself. If you have to offer a piece of advice for agencies who are thinking about slamming the microgrid project or starting to ask questions about kind of what value that could provide for their agency. Well, what would your advice be for your kind of where would you say to start if they're thinking about how microgrids work for their agency?

Calvin Jones: I think that on the front you have to look out into the future, right? You really have to do some future casting to decide what you expect your end products going to be and kind of work backwards. How much energy you're going to use and you expect to use in electrifying compared to your traditional fossil fuel fleet? I think that becomes one of the big drivers of how you build your charging infrastructure and then that analysis you got to get into obviously your own analysis and

stuff like that. I think that really helps make the case for whether or not you explore a microgrid or if you decide to connect to the utility.

I also think that you really have to take a look at it, When you look at your size and how do you expect to size your project. I think you have to put a cost on resiliency. How do you plan on provide charging support for your vehicles if you lose power. I think that they were the things like I said, really let me believe that was the best path for us. Mike, if you have some other stuff.

Michael Yambrach: I think you hit it on the head Calvin. There is a cost for resiliency. You do a microgrid because you want the resiliency, and you sit there and you ask yourself, "What's the cost if I can't provide service to the community with my electric buses?" Okay.

It isn't like being able to deliver diesel to them if they stopped someplace, got stuck someplace, and so you have to sit there and say, "Okay, if I am moving to an electric fleet, which seems to be the trend for more and more transit agencies. What's the cost for me if I can't get buses out to the local community?"

The microgrid gives you the comfort and the confidence that you're going to be able to continue to provide service that you're going to know what your costs are because you are actually tying down your cost for a 20-year period so you know what they are.

You're not going to be subject to field charges that are going to escalate or decrease and bounce all over the place, which could cause havoc with your budgets. You know what the fuel costs are going to be. You know that you're going to have power and you know that again you're going to be able to provide the service that your community is counting on you to provide.

Andrew Carpenter: Great advice. On that note Marcela, I'll turn it over to you and we can jump into the general Q&A.

Marcela Moreno: Sure thing. The first question is if there were any photos of your project, it would be nice to visualize what you all are doing. This is also a good place to say that Montgomery County will be featured in the guidebook as a case study so there will be more information there.

Michael Yambrach: The project is just starting to be under construction, wait about six months and we'll have some completed sites that you can look at. We do have on our website pictures of other microgrids that we've done at facilities so you can get kind of a concept of what a microgrid is going to look like.

It is not a transit facility. We do have pictures of chargers in the area and have pictures of the buses or whatever, but I think you're going to have to wait about six months or so to get any good pictures of what a true microgrid at a transit facility is going to look like.

Marcela Moreno: Awesome. Thank you for that. Well, I'll start off with a question. What are some common challenges that you see when agencies are implementing green energy projects? I welcome anyone to answer this question.

Drew Turro: I'll go and start. In thinking about how to implement, I think Michael wants to jump in first. I would say that I think like Michael touched on, I think trying to figure out how to try to weigh the upfront capital cost versus looking at something like energy and service to be able to put that into kind of a longer term operational expenses is kind of a decision that agencies will have to make.

I think a lot of that depends on like Michael said, you know, how much capital do you have available to put towards the project if you're doing it on site. Are you able to secure other federal and state funding or work with your utility to look at any incentives to be able to locate that green power on site?

Or does it make more sense for an agency to look at something like energy and service and to look at one of those kind of business models or procurement options that allows a little more flexibility and not having to put that capital upfront, but be able to also have somebody else to be able to oversee kind of the operations and maintenance of the system as well so that if anything you know where you got wrong and that you have someone who is there to be able to cover and be sure that the system can get back up and running as soon as possible.

Calvin Jones: You know it's funny, I think those things are common probably about through just about all of the alternative fuel choices when you're looking at green energy selection. I mean whether you were talking about hydrogen, if you were talking about fuel also that becomes a very similar challenge as well.

Those challenges are becoming pretty much the same. I think a lot of us are operating on demand, right? Typically, there's usually some overreacting requirement that's requiring the move to zero emissions because it's not always cheaper suddenly.

There are a lot of times folks will talk about it in the context of it being cheaper than traditionally fossil fuel vehicles, and there are some elements of it that may be cheaper but traditionally there are going to be some additional costs and it's typically going to be surrounded around infrastructure where you're going to have to make shop improvement, you're going to have to make improvements, and if you'll be able to charge fuel vehicles.

You do have to do some soul searching, so to speak, really, really work hard to identify your project upfront and to identify what your energy needs are both globally when you talk about your entire fleet but also power up as we're finding out with electrification. You start looking at your energy needs on board per route and then start and look to find options that can support you and those....it could be quite a bit too.



Marcela Moreno: Thank you. Michael, do you have anything to add?

Michael Yambrach: No. The only thing I think that you know, Calvin hit on it is that electric buses operate differently than traditional diesel buses or other forms of fuel that you're using out there. I think the transit agencies are going to have to go through a reevaluation of how they schedule routes, where they put charging stations, what the runs are going to look like.

And realizing that they may have to be buying more buses to handle the same loads but that may not be a negative factor in system. It's just going to cost a little more money but again there are ways that may mitigate some of those additional costs.

Drew Turro: Right and then one more piece, I will say. If you are locating something like solar energy on site, you are pairing that with charging, work with your utility to figure out if there's a rate structure that you can put together that is going to allow you to charge at a lower cost, what that's going to look like, and what the agreement is going to be as far as whether it's not bettering.

Just kind of taking the gross energy or the total energy that you're using and the solar energy that the solar system is producing, and spinning the meter backwards or if it's going to be different types of day, provide different pricing structures.

Just kind of understanding how the solar is going to play into if you are using it to fuel electric vehicles or to provide services for onsite electrolysis or anything like that for hydrogen vehicles, how that's going to work with your utility rate structure and what that's going to look like from a revenue perspective if you are able to monetize some of those things.

Michael Yambrach: Right. If you do it as a construction project and you're relying just on the utility, those are the concerns you have to take to worry about. The reason we didn't do that is that we don't care what the utility is going to do, we are building the microgrid, and we know what our costs are so we've got them fixed.

The utility could move rates all over. Everybody saw what happened in Texas about a month ago. What happened with the utility rates, we're not subject to any of those fluctuations. We've got a little more confidence in what we're doing.

Marcela Moreno: Those are some great things to keep in mind. We've got a couple more questions in the box. One from Jeremy for Calvin and Michael, what state are you in and what is your population based for the transit system that this project is serving.



Calvin Jones: We are located in the state of Maryland, just outside of D. C. just northwest of D. C., and we support the Washington part region that supports a population of about a million people. Yeah.

Michael Yambrach: Actually, where those buses are going to be traveling or where the routes are going to be running are going to be right against the D. C. Maryland border.

Marcela Moreno: There you go. The next question is from Rad. If looking at energy were a service, what sort of timeline would you plan prior to moving to order vehicles?

Calvin Jones: Actually, if energy is a service, actually, it's funny. It actually moves a lot faster than the vehicle ordering process does. You figure out by the time, depending on when you can get manufacturing space.

It's generally safe to assume that the lead time is probably going to be about a year, a year or so, depending on whether or not you have a contract in place already to get buses delivered. Usually for us, I think you have to be moving at least a year. You need to be planning at least a year ahead to get the buses because the site, well for us energy is a service went fairly quickly once we got a contract in place.

Michael Yambrach: The way I look, I think Calvin and I look at the same way as that. We both have to go through a procurement process. Okay. He has to go through a procurement process on the buses. I have to go through a procurement process on the infrastructure.

We can time the procurement process so we know how many buses he's buying and our contract coincides with his purchase order for the buses. Then we can build out the infrastructure about the same time that his buses arrive. Now, our contract negotiations on the energy as a service took about a year.

I'm looking for about a year for the contracting process and then probably about another 10 to 12 months for the construction. Again, a lot of it depends on what the site is like, how much prep they're going to do, what you're permitting processes are like if you've got to go through any type of other jurisdiction overviews or whatever. All those have to be factored into it.

Marcela Moreno: Awesome. That's great. We have about three minutes left. If anyone has any burning questions, please put them into the Q&A box. In the meantime, I have a question. Based on what we were talking about before we hopped into the webinar, it is no/low grant season.

What are some other funding streams that agencies should keep in mind as they're thinking about financing these types of projects?



Drew Turro: With low notes, there are stipulations if you are planning to include something like on-site solar in your application. The FDA has some of those guidelines available if you are applying for that.

Outside of that on the vehicle side of things, depending on where your status with Volkswagen settlement funds, I know there have been some outlays there for transit agencies who are looking to purchase buses and then an issue that other kind of state incentives are probably the way to go as far as looking for funding for vehicles.

On the infrastructure side of things, I know actually in the past that they have grant programs for travel agencies who are looking to put green energy on site. Apart from that, I would say again, it's going to differ state by state. In the guidebook, we do have a section on green energy procurement.

There are some resources in there that will have links to essential funding opportunities and different state incentive programs. You'll be able to find there. It depends on where you are but I would say start by looking there and then also just looking at your utility to see if they have any kind of incentive programs that they have built in as well.

Marcela Moreno: Awesome. Thank you. We are one minute out from 2 p.m. I just want to be cognizant of everyone's time and thank you to Drew, Calvin and Michael for joining us and sharing all of this really great information for agencies and their partners.

The slides and the recorded webinar will be available on N-CATT's website, which is n-catt.org and you can follow us on social media, sign up for a newsletter and stay tuned on our website for more webinars like this. Andrew just entered the website in the chat. Follow us for more information on emerging transit technologies. Thanks you all.