Erich Lange:

Hello listeners. I'm Erich Lange.

Andrew Carpenter:

And I'm Andrew Carpenter.

Erich Lange:

In 2017, Josephine County Transit began their transition to battery electric buses, and today two BEBs with two more on the way are rolling throughout the county. This critical transition is full of procurement, operational, and funding considerations that may seem daunting, but as JCT has shown, there are ways to navigate this transition.

Erich Lange:

We are joined today by Scott Chancey, Transit Manager with Josephine County Transit, located in beautiful Grants Pass Oregon.

Andrew Carpenter:

So Scott, thank you for joining us today. We're excited to hear more about your transition to battery electric buses. But first could you tell us a little bit about yourself?

Scott Chancey:

Well, first of all, thanks for having me. So I'm the transit manager of Josephine County, so we're a small urban transit agency and there's no governing body. So Josephine County is my operating or my service area. So we're not a distinct boundary. I've been here since 2009 and I actually helped design this system from another agency in 2000. So in 2009, I became re-involved with Josephine County because they needed to update some planning work that they were having done. So I jumped in on that and learned the manager was leaving and I couldn't miss the opportunity to implement everything that I had designed in 2000, 9 years later. So been here ever since. Been the transition from rural to small urban, which is, there's some tremendous changes in our funding streams and availability with that. We are an MPO as well, and we have a neighboring MPO to the south of us, and we provide connecting services between the two of us. So we essentially operate across Josephine County as well as the neighboring Jackson County in a connection to an additional transit agency over there.

Scott Chancey:

We are barely small urban, so when we were declared it would've been 2010, I think we were 50,200. They pulled in two cities from the adjacent county. So our planning activities also encompassed two counties and not just Josephine County. So we operate still rural services throughout Josephine County outside the urbanized core, and then obviously demand response and para transit services. So when I got here, as a rural provider, we were operating small cutaways vehicles between 14 passenger to 19 passenger. And when I came through and started to implement some of the designs that I had originally envisioned for Josephine County, our ridership grew about 166% over a five year period. So at that point, it became apparent that we needed larger vehicles when we needed to transition into class A vehicles.

And so that's kind of what started my whole intro into battery electric buses because I knew that we were going to have to get class A vehicles in the life cycle of a class A vehicles at least 12 years. It's supposed to be 12 years. And so I knew whatever purchase that I went forward with was going to be with us for a while. And I saw the electric vehicles is an opportunity that if I don't do something now, it's going to be 12 years from now at least before I have this opportunity because we only have so many vehicles that we need to replace. And once we start down that road, there's a time lag. So I felt pretty energetic in terms of, hey, let's move forward on this and let's see what's going to happen. It was a big step for a small agency such as ours, but I felt between me and my staff that we could take it on.

Scott Chancey:

We're in Southern Oregon, so we're in the southern portion of the state. We're actually probably 50 miles from the California border. So all of the urbanized areas in Oregon, other than the one just to the south of us, which is the Rogue Valley Transportation District, everybody's to the north and they're considerable distance to the north. And the way that Oregon works is the large population centers, they typically dictate policy in terms of transit technology and things like that. I didn't want to wait and see what other large urbanized areas as experiences were with battery electric buses because I wanted to see if this is a technology that could be implemented at a smaller level, at a scale smaller than you would see in a large urbanized area.

And in doing so, that would provide a learning step for other agencies that are our size or even smaller, that hey, this is a technology that can be implemented in your service area. And it's not just for large urbanized areas. This technology is transferable down to smaller agencies such as myself. And so that was a very, very important step of what I wanted to do. And also is an important step why our MPO was behind us as well as the Oregon Department of Transportation. They've been very supportive of what we've been doing. So we were, I think the third in the state to put vehicles into revenue service.

Andrew Carpenter:

So speaking of that, and you mentioned wanting to get ahead of the curve state wise and test it out so what drew your attention to BEBs and made you want to test these out other than knowing that this was your chance?

Scott Chancey:

It's kind of a crazy story because somebody from the general public called and they somehow knew about the LoNo opportunities from the FTA.

Andrew Carpenter:

Wow. That is an involved citizen.

Scott Chancey:

so she calls up and says, hey, we need to be applying for this LoNo opportunity and we need to buy battery electric buses. And next thing I knew, somebody from Proterra contacted me and they were bringing a bus through our area to bring it to the Northern California coast.

So they said, hey, we're bringing it through. You want to look at it? I'm like, sure, yeah, bring it by. And so that was my first introduction. And then there was a person at ODOT, and that was basically my regional transit coordinator. And so she on her own had a lot of interest in battery electric buses and put together a work group that was a monthly phone call between basically maintenance and operations managers that were deploying BEB technology across the entire United States. And so I would be involved in those monthly phone calls, and that's when I said, hey, this is probably something that's doable and I'm changing out my fleet anyway. I figured yeah, this is something that we can take on.

At that point, I had already purchased two large class A diesel vehicles, EL Dorados, and we were putting those into service. And so the ridership wasn't going anywhere. And what was going on as our vehicles were essentially so crowded that they were breaking down, we were having to put assisting brake systems on the drive lines and things like that because there was so much weight in our buses. We were going through entire brake systems in 8,000 miles. So it just became a maintenance thing as well that our ridership, we were dealing with crush load passengers. That weight was breaking our vehicles down. Our vehicles needed to be heavy duty anyway. And so I just jumped on it and went for it. And so the unique opportunity that we had here as we're in a non-attainment area for CO and PM10 is what the parameter was at that time.

So we were eligible for congestion mitigation and air quality funds. So that was right when we became an MPO. And so the MPO decides how to distribute those funds at the local level. And so obviously no one really had a whole lot of experience with CMAQ funds and no one had any projects. I stepped forward and said, hey, not only can I buy buses, but I can buy electric buses and let's try this out. And the MPO was fully supportive. So I applied for CMAQ funds and got them and subsequently applied again and got more, and here we are. And so with the fund application, I went ahead and made sure that there was nothing in there for charging infrastructure and all the support equipment. So I didn't just kind of dive into this with my eyes shut. I kind of knew what was going on, especially since I had almost spent six months or more, it seems like it was even probably eight months talking to other agencies that were deploying this technology, not thinking about it, but actually doing it. I got some work with the infrastructure in terms of charging facilities, things like that. I needed to start thinking about parking. I need to start thinking about my maintenance department and can my maintenance department support this type of equipment? Are they going to be scared or apprehensive? So there was a lot of moving parts, and I think the piece has just fell into place that made this a very unique opportunity for us as well as an opportunity for the state of Oregon.

Erich Lange:

That's a really wonderful high level kind of rundown through this process, but I wanted to go back to procurement. I think we found this really fascinating. You got to the point of wanting to kind of dive in and figure out what type of battery electric bus that you were going to bring on. Can you walk us through your thought process in relations to procuring a vehicle?

Scott Chancey:

We're a small agency, so the biggest thing for me in terms of procurement is I just don't have the time to sit down and write out specifications for a fixed route vehicle. And so everything that I buy is coming off an existing contract from either at the state level or another agency. So the key for me was to, one, find an agency I could partner with because at this time, there was no battery electric buses on the Oregon State contract that I could purchase.

Scott Chancey:

I rely on the state to do all that paperwork and make sure all those requirements such as by America and things like that, and SAM verification is valid. All those things are in place. And so that was my first step. Besides the Proterra bus, BYD brought a vehicle through, we were able to look at it. And then the other one at that time was Complete Coach Works. And so Complete Coach Works actually brought their vehicle down for I think it was four or five days, and they actually let my drivers drive it. We did a couple test runs. when they were testing it, I told the driver that was supposed to test it in the morning because he was supposed to jump in it at 6:30 in the morning.

~~So~~ When he got off his shift the prior day, I'm like, hey, Dave, you get to drive the electric bus tomorrow. And he's like, what? I'm like, oh yeah, it's no problem. There are trainers here. He'll be able to walk you through it'll be no problem. He's like, well, I don't feel super confident about it, so how about I start my shift at 6:00 instead of 6:30 so that way I have enough time to walk through it and get in it and familiarize myself with it, and then I'll be more comfortable driving it. So I come into work, Dave's already driven it and came back and I'm like, hey, so how was it? Did you have to do a lot of training? He's like, no, that's just all the other buses that we have or the other two diesels that we have. It was identical.

There's nothing different. All the controls are the same. so there's some familiarity across the drivers, so that's something that they don't have to be scared of. And at that time I was watching Proterra and BYD and there's Green Power, and they were talking about training drivers for their vehicles and having online training modules and simulators. And I'm like, it's a bus. It shouldn't take all this to gear it up. And that was one of the reasons why I ended up choosing Complete Coach Works. So at that point, I kind of had an idea of the vehicle that I wanted, so then I just needed to go out and see what contract I could find. And they had done work in Washington, and so they were actually on the Washington Department of Transportation's Procurement List.

The Complete Coach Works, they take a diesel bus that's beyond its useful life and they completely tear it down to the frame and rebuild it and then refurbish it with electric motors, all the components, and then the battery system. So essentially what you're getting is a battery electric bus that's in an existing platform, and that platform has already been tested for years. GILLIG is a staple in the transit industry and the supply chains are there. I knew I wasn't going to have to worry about replacement parts, when I'm talking things like that I'm talking blinkers, windshields, all the other components that are needed, breaking components, all that stuff that's needed to keep a bus up and operating.

I wasn't worried about a supply chain breakdown, and this was back in 2019. So there was a lot of things that I was looking at, and some of those looked very appealing, especially since one, my drivers were familiar with it. So they were very familiar with the platform, my drivers, my maintenance staff, then the passengers. So then at that point it was how much does it cost? And the conversions are slightly cheaper, a couple hundred thousand cheaper per vehicle. And that seemed pretty appealing for me, especially since I'm trying to be as efficient as I most possibly could. So that's why I went that direction.

Most agencies their biggest consideration was range, and they wanted to make sure that they were getting enough range out of their vehicles. And what I was seeing is a lot of manufacturers were over promising, and then were kind of on the hook in terms of saying, hey, you told us that this vehicle could make it 200 miles. It can't, therefore we're not going to pay you and we're not going to order the rest of our 30 buses that we promised. And so there was some action on the manufacturer's side where they were going in and putting opportunity, charging along routes, and they were just paying for it to make sure that they got their range.

And it was never my biggest concern because I had plans to operate both of these vehicles that we ordered in succession, meaning that I knew I wasn't going to go all day. But there was opportunities in terms of the way that our service was laid out, that there's natural breaks throughout the day that I could pull these vehicles out of service and charge and then send them out again or pull one from service and swap it out with the other one and make the entire service day. So that was my biggest concern. What I would look at a little differently is my focus would've been on reliability instead of a range component in terms of the warranty, it would've been reliability. And there would've been specific... And I'm working on this now with our two buses that are still to be delivered to say, hey, I need a guarantee that these vehicles are going to run 20,000 miles over the next six months.

So there's some impetus on the manufacturer's side to make sure that we're supported and those vehicles are out and running as fast as we can possibly get them out there. And if that threshold or target for reliability is not met, then I'm going to say, hey, then the warranty needs to be extended by another year or something of that. And so that's what I'm working on now. We haven't fully figured it out how it's going to look, but hindsight it's 2020, I would've done that with the first ones. But the thing that I learned through all of this is especially talking to all the operations managers and the maintenance managers, is I wasn't talking to a general manager or I wasn't talking to the CEO of a large agency. I was talking to the people on the ground that were deploying this technology, so they're brutally honest.

And so they were telling us what we could expect. And what I realized is there was problems, everyone was having problems, whether it be the chargers or the manufacturer or what, everyone was having a problem. And so I realized coming out that we're going to have problems too, but what I didn't realize is our problems were going to be completely different than everyone. And then again, in hindsight, I can see that now that everyone's problems still are different. So the issues that we ran into here, were not necessarily duplicated at other agencies that were doing the same thing. I think it's a growing experience across the entire industry.

Andrew Carpenter:

Can you walk us through a little bit what your unique challenges or lessons learned were in this case?

Scott Chancey:

The manufacturer did work with us to make sure that we overcame them. So the first one was we got the vehicles here, it was summertime, things were great, we're running them, everything's working perfectly. And I'm like, man, this is going pretty smooth. And then it got to be winter and it gets kind of cold here. It doesn't get super cold, but it does get below 30 degrees. And we have these vehicles outside at night. And what was going on is, and we didn't know this, and they had to do some analysis, but the batteries became unbalanced because there's heater pads under the batteries to keep them at a certain temperature. ~~And so~~ when the temperature falls below 45 degrees, I think it was that these heaters kick on or these, there's basically, it's a heat pad sitting underneath the battery pack and that these heaters go on and with a battery electric bus not all of the battery cells are linked together.

You have cells of batteries and there might be 9,000 lithium ion batteries per cell. So then you link all these cells up. And so what the heaters do is for our vehicles there's 12 different cells of battery packs. So when the heaters kick on, they kick on and they heat up cell one, and then they go to cell two, and then they go to three, four all the way through 12. What was going on is our system was skipping like cells 7, 8, 9, and then double charging 12, 1, and 2. So we were overheating some cells and not heating the other cells, and it was causing battery failure, so the vehicles just wouldn't work. Once everything came up to temperature later in the day, then they would work. And so it took some analysis in terms of their engineers figuring out what was going on.

We fixed that and I'm like, okay, yeah, that one's behind us. Then we learned that lesson. And then just the next one was just this weird thing. It was a weird winter and we got into springtime and it was extremely wet. So it was extremely rainy, and there was a seal on the back of one of the vehicles that allowed rainwater to blow in, and that rainwater blew in and it was on one of the battery packs cells and which is not that big of a deal, but that battery pack was, or that individual cell system, it wasn't put together correctly, so it had a leak in it. So now the rainwater was coming in because of the faulty seal that no one noticed, and that water was dripping into a battery cell that wasn't completely sealed.

So then it filled that one full of water, and then that system went down exactly, and then that system went down and then on we went. So when these vehicles, when they're on ready to go, there's certain lights that are on in the vehicles. So I had a driver come in at night at the end of their shift and it's like nine something and there's no one here. And this driver sees that the lights are on and this bus, so what do they do? Because the driver knows where the high voltage on and off switch is, and they know where the 24 volt system on off is. So they go and turn the high voltage system off.

Well, the thing is that high voltage system is what's used to charge the 24 volt system, which runs the entire bus. So then we get here in the morning and the bus doesn't move. And I had to go through videotape trying to figure out who did this, and they thought they were doing us a favor. And so it's things like that. We ended up, because at our parking facility here, we didn't have adequate power. ~~So~~ I was parking in them, charging them at another county facility. ~~So~~ I'm part of Josephine County, so there's 20 something departments here and a lot of facilities across the city of Grant's Pass. And so we were charging them at another facility about a mile away from where we park.

A driver would go park the bus, plug the charger in, and then get a ride back to our office or swap out another bus. sometimes the driver would plug it in correctly. Sometimes the driver would actually verify that it was charging and sometimes they wouldn't and when you don't, that's a very big problem because that charging system, the inverter, it's maintaining the batteries. So it's imperative for battery health that even if your vehicle it doesn't need the charge, that it's plugged in because it's balancing things and it's maintaining those charge levels. And so what that system's doing is it's charging to a certain level and then taking a little bit off and charging and taking a little bit off.

~~So~~ the batteries are being used, they're being activated. And so that was extremely important. We didn't realize that. And so there's just things like that. So it was one thing after another. And sometimes though we got them fixed quickly, and sometimes it took a lot of analysis. It's just working through it. Is it frustrating? Yeah, it's really frustrating and it's frustrating as well I'm doing this specifically as a cost saving measure.

I know that we can run them cheaper. There's less maintenance. There's all those things involved and less moving parts, no fuel that we're having to pay for. The electricity to diesel equivalent, still less expensive. That's why I was doing this. Because as a small agency, our operating funding is limited. So the most precious part of my funding stream that I get very defensive about is my operating money, because capital funds are one thing. You can get grants and things like that, but it's day-to-day operations that is very difficult and tricky. And so that's what the public sees. If I can't pay to keep a bus on the road or if I don't have the funds to do it, then the public suffers. the general public, they don't kind of the nuances of all of our funding, but they do know what they see on the road.

And if I have to take vehicles off the road because we don't have enough operating funds, that directly impacts them. So anything I can do to save or reduce our day-to-day operating expenses, I wanted to try. And so that's kind of what I was doing. That's where I started. Now granted, there were some environmental leanings that people were very grateful for that I was doing it. And "thank you, Scott, you're saving the planet." And I'm just like, oh, you're welcome, but I'm really doing this for operating expenses. But they didn't care about that side. And so I'm just kind of embraced it.

I'm getting two more vehicles, we'll see what happens with those. Like I said, I'm putting some parameters in there with the manufacturer that, hey, we need to have these specific benchmarks met or you're going to extend the warranty and we'll see where that goes.

Erich Lange:

So you're clearly making this work and there's clearly with any transition or operational change, there's growing pains. You mentioned earlier about the charging infrastructure in the considerations that you had to make. It sounds like there's a couple options that you had at your disposal that would change how your routes could run or maybe even influence or elongate how long the vehicle could be on the road. And I was wondering if you could maybe explain what those kind of categories were where there was, basic plugin, depot charging and the wireless charging side of it, and then dive into why you went down a certain route.

Scott Chancey:

So one of the things that also made me select the vehicle that I selected or the manufacturer was because they didn't have a third party charging system that the bus got plugged into and every other platform did. So their inverter is basically built into the vehicle. So I plugged the vehicle into direct power and then it converts it and sends it from AC to DC and then charges everything. So being that it was not a third party issue, or sorry, not a third party product, that's what I wanted. Because what I was hearing from everyone else is if the buses didn't work, it was like blame that guy. And it was the buses didn't work because the charger didn't work, and then the charger didn't work because the bus and it was this circular argument that I wanted to avoid.

So then at that point I went, okay, so now how am I going to charge them? At the time, I wasn't necessarily, again, like I said, I wasn't worried about range because we have commuter routes. It takes them to do one run into the neighboring county, it's like 60 something miles and it takes them a couple hours and then it doesn't go back to back to back. So we have runs at like let's say 6, 7, 9, noon, 2, 4, and 5. I can send one out there, bring it back to the office, charge it because I'm not going to be running out on that commuter route for another two hours anyway, pick up a charge and send it out again. Or I could keep it in town, change it out during lunch, charge it, and then send it on a commuter route.

I have all this flexibility between operations and where these vehicles need to go. I still need a vehicle. And so why not charge it while it's here at the office? And so that was my second point that I was kind of trying to figure out. I started to look into wireless charging, inductive charging. And the reason is because based on my early experience, which was also recent with the diesel buses and seeing drivers plug them in or failed to plug them in, which we experienced with the electric bus as well or failed to unplug them at beginning of the shift, there was issues. Because of the cold weather, we have block heaters on our diesel buses.

So the driver would have to plug them in at night when they ended their shift because I don't have maintenance staff dedicated to this. We're a small agency, so if the driver's doing it, the drivers are fueling our vehicles too. So this was just part of their job. And they were also in charge of unplugging it before they drove away in the morning. And we saw issues on both sides where people wouldn't plug them in or they would not unplug them and drive off through the parking lot and yank out all the equipment to keep the vehicles warm so the block heater. So I'm like, man, if there was only a way that I wouldn't have to worry about the drivers, because it's one thing for me to replace a little post and the wiring and the plugin versus ripping out an entire electric bus charging system because somebody failed to unplug it.

Granted, there's safety mechanisms and the bus isn't supposed to move if it's plugged in. And there's all kinds of things like that, which I know all can be overridden and it's the nature of the business, so to speak. And then the other thing was is I didn't want the charging equipment, not cluttering, but lined up across our vehicle parking area. So if we had above ground charging typical that was plugged in or the vehicles were plugged in, now I got two issues. I got the drivers unplugging it or plugging it in, and then I got the drivers not hitting the equipment as they're pulling in or parking or pulling out. And so I just saw the inductive charging is the ability to eliminate all of that.

Scott Chancey:

The inducting charging, there's charging equipment and then that equipment runs power, essentially cables, to what's called a bathtub, which is buried in the ground or not buried in the ground. It's put in the ground and cemented in and then there's a charging plate that sits above that. And so what happens is the vehicle pulls over that inductive charging plate and then a connection is made between the vehicle system and that charging plate. And then they talk to each other and it's a handshake essentially. And then the charge begins. So there's no plugin and there's no equipment that's above ground that you have to worry about hitting. And the charging equipment could be 50 feet, typically it's up to 50 feet away and you can use bollards and things like that to make sure that people don't run into it. It's not something that needs to be looked at daily for this charging system to work.

So it completely simplified the whole system. And I didn't have to worry about drivers, I didn't have to worry about equipment getting hit, I didn't have to worry about anything getting plugged in. And it really worked for our needs. And I had the money to do this. And at the time there was people that were looking at overhead pantograph charging and things like that. And I was just hearing nightmares on that. Vehicles not being able to line up correctly so they weren't getting the charge that they needed. And that's critical if you're doing opportunity charging, you got seven minutes, you better get as much charge as you possibly can. This seemed like a logical solution to all the problems that I saw that were happening and all the other problems that I could envision in my head with the conventional type systems that were out there.

And again, I had CMAQ money to do this, so I figured, okay, if I'm going to make an attempt to test this technology out, I want to give myself the best opportunity to succeed as I possibly can. Regardless of the cost or the technology or anything that was going, I want to be able to see if I can succeed doing this. And so that was my underlying intention and goal throughout the whole thing. ~~In~~ This inductive charging seems like the way to go. It still seems like. I see other agencies that are discussing these issues and it's a little bit cheaper to go this way long term, but also I don't have all this infrastructure in my parking lot that I have to manage.

I think I got 23 vehicles and at full pullout, which is in full peak service just with the fixed and commuter routes, it takes me 12 buses. I can't imagine if I had, let's say half the fleet was electric buses, I can't imagine having 10 standalone charging units in my parking lot or even five. So let's say one can do two vehicles, I can't even imagine five because I know one, they're expensive, but it's a fixed object that is of relatively high expense. And the drivers are drivers and they're going to hit it.

If you think about it, I kind of joke about it, but it's the nature of the game. I mean, we travel 500,000 miles a year and all 20 of those vehicles, if we pull them all out every day, so that's 20 pullouts and 20 parkings every day, 252 days a year, accidents are going to happen. So I kind of joke about it and I kind of say that, oh, well yeah, the drivers are drivers, but the truth is it's just inevitability and I can't imagine that on a larger scale in terms of expense and headache. So that's where I was going with with the inductive charging.

Erich Lange:

That makes a lot of sense. Obviously just reducing any collisions in the yard, the chance of it is going to be beneficial on many grounds. For the opportunity charging side of it, is there anything you can share with us, give us a sense of say five minute layover to opportunity charge gives you X number of miles, or it gives you throughout the course of a day, it gives you one more lap, something like that, paint a picture of what that looks like for us?

Scott Chancey:

So there's two types of charging, there's opportunity charging and then there's depot charging. Depot charging is typically overnight. So I was looking at it's just depot charging here overnight or in between commuter runs that I can get two hours of charge and I knew that would be enough. So then the opportunity charging is you hit that vehicle every couple intervals. So if you have a cycle time of one hour and that vehicle cycles in and out of your, let's say a transfer facility or transit hub that you operate out of, if it comes in and it cycle times every hour, typically you have a layover time built into that schedule in case that vehicle is late or you run into traffic.

So typically that layover time is going to be anywhere scheduled between 7 to 10 minutes. And if you're lucky, you're getting 5 minutes on a regular basis, but that's 5 minutes every hour throughout the service day. And so what's going on is that vehicle starts out with a hundred percent charge in the morning and then you put it into service and it's taken 5 minutes every hour throughout the entire service day. And then you see, doing that because you can calculate this or at least the charging equipment engineers will do this for you. They'll calculate how far can you get that vehicle, into its service day? So then the question is not only how far you can get it, but can you get it far enough to not damage your batteries and it's going to quit on the middle of the road.

So there's a buffer in there. So typically, every single one of our routes could do that. And one of them would have enough charge because it had a cycle time of every 30 minutes. So it's coming in every 30 minutes as well as 10 minutes on every hour. That vehicle, I wouldn't even need to put on a charger at the end of the night. Not that I would do that because I already learned my lesson about not having a vehicle on the charger at night. So which means is it would have 70 plus percent of its power left. And so also when you're talking about this kind of technique, you need to make sure that you're not completely draining your battery.

So it's one thing to say, oh yeah, that vehicle can go 200 miles and with this opportunity charging, we can extend that throughout the entire service day of a thousand miles or whatever it might be. But you want to make sure on that last run of the day that you're not with your fingers crossed going, is that vehicle going to make it in or do we have enough charge? And so typically you're going to get another, I don't know, I'm thinking it's like 20, 30 miles at least off of that seven to eight minute charge that you're pulling in. The biggest contributing factor of that is the power. How much power does your charger have or how much you're trying to put into the bus. The ones that we are looking at are I think 250 kilowatt. And then they also make another one that's 125.

My original plan was these depot chargers at the end of the night using a lower voltage. If I charge at a lower voltage over a longer period of time, the battery will last longer. So here we are and no one knows how long the batteries are going to last, what the life expectancy is. It hasn't really been fully tested now. Now it's been tested, so we know a little bit more. So I'm thinking, lower charge at the end of the day, this is going to work perfect. I'm going to preserve my battery life as much as possible. And then we secured money and funding to build a transit hub in downtown Grants Pass. So at that point I'm like, wait a minute, okay, I'm building the transit hub, so I probably should look at putting inductive charging at the transit hub just in case.

Now I know that wasn't my original plan and I was going to do depot charging with certain kilowatts, but I'm going to look at it anyway and be just because I have the opportunity, we're digging everything up, we're rebuilding it while we're in this process for construction, So that's what I was doing. But then I learned that the charge for the opportunity at a transit hub, the need is greater than the charge that I would be doing at our depot. And then the charger that I was looking at for our depot wouldn't have been sufficient enough to charge our vehicles at the transit hub as an opportunity charge. Basically, it's not enough power. So the ones in our yard would've been 125 kilowatts and the ones that are needed for the depot are 250 and they're not interchangeable.

And so I could either go with one or the other. So that's what I'm in the process of doing now. I'm looking at plug-in chargers at our office and then this opportunity charging at our depot that will give me the most bang for my buck, so to speak, and will eliminate the range problem that I really didn't was concerned about in the very beginning. But it seems like a good opportunity that if I can eliminate that as a problem, then I'm going to, and so again, it comes down to me being able to operate a vehicle as much as I possibly can in whatever circumstances that I can. So now, like I said, range wasn't an issue, but now if I can eliminate ranges as an issue in terms of being able to operate all day, it seems more efficient and cost-effective to do that.

I learned a lot along the way, but we've been slowed down, but what it's allowed me to do is kind of pivot and reevaluate what our priorities are and how to accomplish those in the most efficient way that we possibly can.

Andrew Carpenter:

So you have two buses on the way out and running. So what does the current operational environment for your battery buses look like?

Scott Chancey:

It looks the same as it did because we don't have the inductive charging in. So we're changing our vehicles at lunch. So because that's the most optimal time to change them out. So I'm not pressing them as far as we possibly could. So they're probably doing, so it's 18, 4, they're probably doing maybe 80 miles and then they get changed out with the driver because that's the time that I have somebody that's able to take that vehicle to the charger and I'm not disrupting my regular operations any more than I would hot seating and driver. So that's the way that we operate now, the only time that when that is going to change is when the transit hub is finished and we have the opportunity charging there, then it'll change because at that point we'll be pushing at least one or two of them all day.

Some of our routes go through hillier terrain and the battery electric bus has three gears. It has drive, neutral and reverse. That's it. So you can't downshift. So if we put them on some of our routes, they won't be able to perform safely. So meaning that at highway speeds or at least 55 miles an hour, that vehicle because of the hilly terrain, is going to drop down to 35 miles an hour or 40, which is not really a safe environment. So there's certain services that we provide that the battery electric buses will never be able to provide. So it's just I'm trying to maximize my fleet. So that was another kind of concern.

I'm very aware that the battery electric buses is not a solution for everything that there's services out there that are going to be too long. There's conditions out there that are not going to be suited for them. But again, I think there's a tremendous value. We're still going through some growing pains, so to speak.

I also have staff they're scared that it's going to break down and not break down. It's going to run out of power out on the road. They're not fully up to speed on the voltage meter and what that actually means because it's not like a fuel gauge where it's full, empty. So the battery is just like, it has 375 kilowatt hours and at what point is it going to stop running?

And so there's no empty gauge where you can go, okay, we can push it and here's where it's going to stop. And so they're very conservative. So that's what my staff is dealing with. And so hopefully some of that'll be eliminated with our depot charging. Our construction project's probably going to start within a week and it's going to go for about eight months. So hopefully within eight months I've worked through all my charging issues and we'll have inductive opportunity charging down there and we'll be changing the way that we operate again.

Andrew Carpenter:

Forever evolving it.

Scott Chancey:

That's true. It's forever evolving. And I think that my maintenance staff has come on board excited about it, one staff member in particular not afraid of the high voltage, which is scary in its own right.

Andrew Carpenter:

Oh yeah.

Scott Chancey:

But he's not worried about working on it. When he is on the phone with the engineers at the manufacturer, he's not afraid to do what they're asking him to do.

Erich Lange:

Sounds like you went through a training phase with your staff at large, but also your mechanics.

Scott Chancey:

We had some training with emergency personnel as well as to what to do if a runaway thermal event, which is a long word for fire and how you deal with that. So we made sure we trained all of them, ODOT, the sheriff, the police, the fire department, EMS, anybody. And then the drivers got trained, my staff got trained, and then there was specific training from the manufacturer for my maintenance staff. And since that time, some of the maintenance staff has been turned over. But it was all provided by the manufacturer. And they actually had sent engineers up here to work on our vehicles because there were some issues that we couldn't resolve. And so there's some hands on training that goes on there.

And so that's been pretty much it. There are programs you can send your staff too, your maintenance staff too. We didn't follow that approach because I think that the manufacturers here working out some of our issues enough that my one main maintenance personnel or individual got some very good hands-on training and that's what translates to him not being apprehensive on working with this technology. But with that said, there's still a learning curve. In the beginning, you're not going to see a reduction in your maintenance costs that you might have fully expect because of training and because of just coming up to speed and things like that. We had a lot of issues with our 24 volt system, whether it was driver induced, manufacturer induced or induced by someone. But we've had to change out the battery systems multiple times and that starts to get expensive.

So any agencies going to go through that, and I anticipated it seemed to last about two years before, you can get through that and start to really see some of your savings. But I would say that our savings was substantial lately. And the reason is because the cost of diesel, now granted, we're a state agency, we don't pay state tax, we don't pay federal fuel tax on our fuel, but it's still expensive. And granted, we're buying 10,000 gallons at a time and it lasts for a longer amount of time. And so you can isolate yourself from the traditional price spikes or waves in the price, but you can still see it in terms of what your electrical equivalent charge is.

So I mean, if diesels at $5 a gallon or $4 a gallon, that that's significant because even though our whole fleet isn't going to be electric, but if we're running 500,000 miles a year, that is a significant savings. Now we'll see what happens when we're opportunity charging during the day because part of my savings is off peak charged cost. So I'm charging at night when electricity use is as low as it's going to be and the price is less. So I'm not quite sure what we're going to see what happens if we utilize this opportunity charging as much as we possibly can. So I don't know where that savings is going to be or if it's going to be eroded, but I still think it's worth it in terms of parts. There's no radiator, there's no transmission, there's no oil changes.

And again, it's those little things that matter because like I said, it 500,000 miles a year, that's like an oil change every other week. That's expensive. So it's like I said, everything that I'm trying to do is to reduce my overall operating charge it just means more service on the road for the public.

Andrew Carpenter:

So with all that in mind, is there anything that you wish you knew when you started this that you know now?

Scott Chancey:

Honestly, the only thing I would do different is I wouldn't have done it on my own. And this is something that I haven't mentioned. ~~So~~ Most agencies when they do this, especially if you get funding through a LoNo grant, you have to have an engineering team on board to help you. And I didn't. It was just me. Yeah, I had no engineer, nothing. And it was just me and I paid for that. In terms of time, it wasn't more expensive in hindsight, the way I'm looking at it, because everything just slowed down.

There was probably some things that an engineer would've understood that I didn't or would've understood enough to ask the manufacturer, whether that be the vehicle manufacturer or the charge equipment manufacturer that says, hey, what you just told me from an engineering perspective makes no sense, so I'm not buying it. So what's the truth here? And I think an engineer, as somebody that was versed in this, would've navigated all that a lot quicker than I did. I think it is just is still a learning curve. And I think it's just, like I said in the very beginning of this, I knew I was going to have problems.

Then I've realized everyone's problems are different. So I see other agencies in Oregon that are moving into this technology, and I've already told them, I'm like, yeah, here's my experience, but here's what yours is going to be and it's going to be nothing like mine. And so just be prepared for that. And all I can do is point out some of the obvious pitfalls and things to start thinking about in terms of how you park your vehicles, making sure that where you're parking your vehicles, you can isolate a vehicle if it does encounter some sort of runaway thermal event. So you have to be aware of that, and so you don't burn your entire fleet down. And these are just rule best practices that are being learned in the industry now.

And again, it's constantly evolving. And there's just different approaches to getting through some of these problems. So if you look at success stories and there's quite a few, but a lot of them are not typical in terms of their operating environment. So one of the ones that gets talked about a lot, and they are a giant success is Antelope Valley Transit Authority. Now it's flat, it's the same temperature which is warm, and so you don't have to deal with the coldness and the temperature swings that we do. So they have the ability to be super successful, but that doesn't mean that what other agencies are doing isn't successful as well.

So on a battery electric bus, the heater is essentially a metal surface that is charged with the high voltage system and then has air blown across it. That's not the most efficient way to heat your vehicle. And the drivers don't like it either because it doesn't work super well. So then there's some issues like that that the colder weather agencies have to deal with. And then as it gets colder, then your range falls significantly. So there's things like that that I think as an industry in total, if we would be super honest about these things, it would make us all better. the only agencies that I hear that are not talking about problems are those the ones that are not talking. And it's just like, I know everyone's having problems and let's talk about this kind of stuff. So that's kind of where I'm at now and what I'm trying to encourage everybody to do.

But I'm just tiny Josephine County, and I'm running four buses. Now, four buses, and it takes me a total of 12 in my full peak. That's significant. That's 30% of my fleet is electric, And there's some agencies that are running hundreds of buses. So it's just like even though if you're running a hundred buses, I think there's issues that I... And solutions too. There's solutions that everyone's coming across that we need to be sharing with each other. And I talk to one agency and I'm like, so what do you do with your drivers in the winter? I know they're cold based on what I'm hearing. They're like, oh, we just tell them to bundle up. And I'm like, that's not the answer.

One agency said, you know what, we went and got those construction jackets that you can plug battery into like a Milwaukee battery from a drill, and we give those to our drivers, ~~like brilliant.~~ There you go. Now there's a solution. And same thing about maybe there's heated socks or something. So one of the things we did is all of our electric vehicles have driver barriers. And that's something that we did that not because our drivers are in danger of assault.

I was looking at encapsulating the driver for comfort. And there's fans in those doors. So in the summertime, they're able to maintain a comfortable atmosphere in the driver compartment. So it's things like that. And I think as an industry, we need to have a more robust discussion because to say, hey, everything's great with my battery electric fleet. When I know it's not, that does nobody any good. So that's like, again, that's getting back to my mentality on this whole subject. I mean, it's one thing to say everything is great. And the other side of that spectrum is, this is the worst decision I've ever made. I wish I wouldn't have made it to somewhere in the middle is where the answer is. And I think if everyone came to the middle, we would progress a lot quicker and there would be other agencies that would be more willing to embrace this kind of technology because there's some agencies that aren't, and the reason they're not is because they don't trust anyone that's given them this information.

I'm the guy that's dealing with the operations and I'm the CEO saying, and it's just dishonest for me to say, oh yeah, everything's great when I know ~~it's not.~~ it could be better. And we've stumbled and fell, but we get back up and move at it again.

Erich Lange:

Yeah, we really appreciate that transparency in this process. I mean, you're clearly making it work, but not without its fair share of challenges, but it's being able to see it clearly and articulate that so others can also approach it with those realities is ultimately how people are going to learn and better adopt these new technologies.

Scott Chancey:

That was 100% correct, that's right where I'm coming from, because again, when I started this whole thing, it was not I had granted there. I wanted to be one of the first, and it was like, look at what we can do. But really that was an aspect of our ability to get this funding. But I honestly wanted to be someone that could say, hey, this is my experience and you don't need a big agency to do this. And some of these smaller agencies, here's how you can do it, and here's our experience and just be completely transparent and honest about it. And so I'm going to continue on that path.

Erich Lange:

Well, thank you very much. We appreciate your time.

Andrew Carpenter:

Yeah, thank you so much.

Scott Chancey:

You're welcome. All right guys.

Erich Lange:

All right. Take care, Scott.

Scott Chancey:

You too. Thank you.

Andrew Carpenter:

Have a great week.

Andrew Carpenter:

All right. Well thank you so much, Scott.