

Paul Thies:

According to the US Environmental Protection Agency, greenhouse gas emissions from transportation account for about 29% of total US greenhouse gas emissions, making it the largest contributor of such emissions in the United States. Between 1990 and 2021, greenhouse gas emissions in the transportation sector increased more in absolute terms than any other sector. Recognizing the challenge, we are seeing municipalities across the United States taking steps to mitigate the impacts of their transportation programs. It's not something that can be done overnight, as it requires careful planning, innovative thinking in a collaborative spirit, and they are turning to solutions providers such as Jacobs, to help them to strategize and deploy environmentally positive programs.

Hello, I'm your host, **Paul Thies**, and on this episode of If/When I was joined by **Marc DeSchamp**, program manager and a leader in the transportation decarbonization practice at Jacobs. Marc's particular focus is on delivering fleet electrification solutions. In his 15-year career in the transit industry, Marc has managed transit bus procurements, led strategic planning efforts, and served as program manager for transit bus and facility programs. On this episode, he shared his insights on trends we're seeing in green transportation, including some of the challenges that municipalities face when deploying a green transportation program, as well as the opportunities and technologies that are helping to make more sustainable and environmentally friendly public transportation a reality.

Well, Marc, thank you so much for joining me. I'm looking forward to talking with you today about the topic of green transportation. Everybody's talking about green and sustainability, and of course with all the cars and vehicles on the road, there's obviously a connection on things we can do to be more efficient, and better stewards of the environment with our transportation methodology. I'm really looking forward to unpacking this with you, and thank you so much for joining me today.

Marc DeSchamp:

Yeah, happy to be here, Paul. Really looking forward to the conversation.

Paul Thies:

All right, fantastic. Well, let me start. We'll just ask a broad question to help us get into the topic. From where you sit, and you're in the transportation group within Jacobs, based in Boston, heart of data science, and a lot of cutting edge technology and stuff. It's a great confluence of subject matter expertise there. From where you sit, what are some trends that we're seeing in green transportation currently?

Marc DeSchamp:

Yeah. I think that one of the biggest trends we're seeing right now is simply one of acceleration. Green transportation has been around for a while, and it's been around at a very small scale, in general. We've had, particularly in the transit space, where we've seen heavy duty fleets with mandates to electrify their operations, or decarbonize their operations by 2040, or 2035, whatever the date might be. Those mandates, in many cases, were published five years ago. Agencies and other client types have started off with these smaller scale demonstration projects, where they've gotten a little bit of familiarity with the technology, and what it might mean for their operations.

I think because of the disruptive nature of this transition, we've seen a little bit of hesitancy to jump in with both feet. Now that we're not in 2018 anymore, we're in 2023, it's starting to get late around here. In terms of how these types of projects roll out, as Yogi Berra once said, "It sure gets late earlier around here," and I think a lot of our clients are starting to see that.

We're seeing these projects start to accelerate, where instead of having, say, 10 vehicles in service, people are now starting to go to 100, or they're starting to go to look at 500. We've got one client who's looking at having 1,500 vehicles, electric buses on the road. This is the New York MTA, something along the lines of 1,500 electric vehicles on the road by 2029, and right now it's 2023. In public procurement timeframes, 2029 is right around the corner.

Paul Thies:

Right.

Marc DeSchamp:

Especially when you consider the complexity of the programs that are involved. I think the biggest trend we see is clients in different sectors, not just in transit, but in other fleets, looking at the calendar and saying, "Boy, we've really got to start to get moving." Then similarly, our utility clients, who are on the supply side, are facing the same challenge but from the other end. On the transportation side of things, we've got clients who are trying to put their fleet electrification plans together, and start their infrastructure works. Then utility providers are trying to respond to those requests for service, and figure out how much power they need to supply, and where, where they need to bring it from, and how they balance that in terms of the grid.

We're moving from that demonstration stage to the early implementation at scale stage. That really presents some big challenges in terms of capital funding, in terms of organizational thought, and really in focus. I'd say none of these agencies or clients were looking for a new day job. They all had an operation that they were trying to complete every day before they were told that they needed to change it from fossil fuel to zero emissions. All of this gets added on top, and it makes for a real challenge.

Paul Thies:

First of all, I want to give you some props for having the courage, as someone from Boston, to quote a New York Yankee. I love it. I love Yogi. I remember seeing a couple of years ago this push for electrification, and the political will is out there. A lot of city management, mayors, and whatnot, are going out, and they're pushing for the electrification of their public transportation fleets. But then it's the question of, "Okay, you've gone out. You've made some bold projections on what you're wanting to do, but your electricity grid may not be ready for that draw."

I also understand because the electric battery packs on electric vehicles create a heavier vehicle, which then can degrade the concrete on the roadways more rapidly than, say, a petroleum-based vehicle and stuff. Then there's infrastructure challenges on top of that as well. The flesh is willing, but the spirit is weak, or whatnot. It's like they want to do it, but they're not sure. There's things that have to be thought through and worked through. Can you talk to us a little bit about what are some of the barriers, blockers, challenges that slows down the growth of green transportation, and how can we overcome those? Especially, as you have rightly noted, our timeframe is starting to truncate.

Marc DeSchamp:

Yeah, absolutely. We, here at Jacobs, like to approach our green transportation clients with a roadmap approach, and we break it down into a few key areas. It all starts with, in our minds, it all starts with the service planning. What is the job you are trying to do with these vehicles? What's the job that you do today, and how does that job get done with a different vehicle type? We like to say that electric vehicles perform differently than diesel vehicles. That's like me saying that I have different abilities of basketball

than Jason Tatum. That's a true statement, but it glosses over the fact that I'm never going to be Jason Tatum.

In terms of range, battery vehicles don't have the same range as a fossil fuel vehicle. We have clients right now who have vehicles, they don't have fuel gauges on board, because the driver doesn't need to know how much fuel is in the vehicle. It's always going to be enough. They fill them up every night, they go out, they do their entire day service, and they fill them up at the end of the day again, and the driver never needs to know. Bring that to an electric vehicle, and you've got an entirely different arrangement. That needs to be front and center as to how much energy is left on board the vehicle.

What that does from a client standpoint is it means that they need to rethink their operation. We want to get the same job done, and we've got a vehicle that's got a different capability. Now early on, that led to clients saying, "We need two vehicles for every one that we're going to replace, because the range is only half of what it would've been." Now it's a bar napkin calculation. What we have found, by applying some rigor and some simulation techniques to it, is that we can really advance the mission with a lot less vehicles than people think by mixing and matching the jobs that the individual vehicles are doing, to match up one short route with one long route, rather than having a bunch of short routes tied together, and then a couple of long ones, and the service breaks. If you're clever about it, and methodical about it, you can make it work a lot better.

That's the foundation, that's the starting point. What that informs is how much power you need, and when you need it. If you look at, "Okay, we've got 100 vehicles in the depot, and they're going to charge at 150 kilowatts," you say, "All right, we need 15 megawatts of power." Well, again, that's bar napkin math, and it would result in you putting probably twice as much power infrastructure on your site as you need to. If we map this out, we want to be efficient, conservative, because you want to be prepared for a bad day. Conservative, but efficient, in terms of how we map out our power needs, which can help inform your operations costs. What's your electric bill going to be every month, and then how much stuff do you need to put into your facility?

The next step is the facility. What's the site that you're working with? How much stuff do you need to put into it? How much room do you have? Was the building built for these types of vehicles? Almost certainly it wasn't, but can they be accommodated? We have some clients that have depots with ceilings that are too low. You can't fit an electric vehicle inside the building, which that's a challenge you can't overcome. I have one client, here in Boston, they have a depot, this is the MBTA.

They have a depot that was originally built for horse-drawn carriages, so it's fully depreciated, as we like to say. We helped them identify a new site for a depot, for a new build. We've done the preliminary design, taken that to 30%. We're the program manager for that program for their entire bus facility network. Now that facility, the bids are opening soon, and they're going to be building their first new depot in 25 years. It'll be ready for zero emissions vehicles on day one.

They're not always going to be new builds. Sometimes we have to retrofit, and you have to decide whether we've got assets worth keeping, or whether we need to start fresh. The next thing we do is we look at the vehicles. This is where a lot of people start, and you can run into trouble if you go out and buy a bunch of vehicles, and you haven't done all the upfront work, because you either don't know how to use them, or you don't know how much power you need, or you find that you can't get the power in time, or that the facility isn't ready. The vehicles come next. That's when you start procuring equipment, working the kinks out. A lot of times you'll have a small demonstration fleet first, so you can do some of the pre-work, but before you start buying them in mass, you really need to do a lot of upfront effort.

The next bucket of work is sustainability and equity, where we want to make sure that clients are meeting their sustainability targets, helping them to comply with any regulations that they may have, whether they're mandates or legislative targets. Then deploying capital, and deploying programs and

projects in an equitable way that's responsive to the communities. Particularly in the public sector space, although in the private sector as well, a lot of our clients are really prioritizing deploying electric vehicles in areas that are impacted by poor air quality, historically underserved communities, environmental justice communities, and that becomes really important to our clients.

Then last but not least, once you've figured out what is it we're trying to do, we look at the funding and the schedule, and that really is where it all comes together. We have this objective, we have this aggressive target. How do we do it? What are the projects that need to be executed? How much are they going to cost? What are the deadlines? When do we really need to start? I think that's the thing that people, a lot of times, don't appreciate, particularly when you start talking about all those prior work streams that I just laid out. You've got service planning, you've got vehicles, you've got facilities, you've got power.

You've got a lot of different stakeholders that all have their hand in this, and these are not folks that necessarily work together on a regular basis. When do you need to start your environmental permitting for your new facility? Probably a lot earlier than you might think. When do you need to contact a utility, and how long is it going to take them to bring the power in? You don't want to buy vehicles and find out that you've got nowhere to plug them in for two years. You don't want to deploy infrastructure and find out that you don't have vehicles to use them for a couple of years, because now you've got capital just sitting around idle.

This all becomes really important, incredibly complex. I think a lot of our clients, like I said before, they all have day jobs, and transforming their organization isn't it. It's delivering goods, or picking up garbage, or transporting passengers. It's that multifaceted, programmatic thinking that I think Jacobs really excels at, which is why I think we've got a real value proposition to our clients.

Paul Thies:

Yeah. I can see something like this. It's disruptive, of course. It's change. Then you have to justify expenditures and funding. Like you said, there has to be a proper amount of planning so there's not waste. You don't get ahead of your skis, so to speak, in terms of getting things rolled out that are not supportable. Then, of course, dealing with the political landscape, and stuff, and the competing interests of there's only so many resources that can be deployed against X, Y, and Z, and making that case. I'm assuming not only planning, but data science and stuff.

I know Jacobs has acquired a company called StreetLight Data, that does a lot of data science in the transportation sphere. I'm assuming that data science plays a role in transportation planning, and how something like this can come about. I wouldn't be surprised if there was digital twinning going on, with building out charging stations. I'm sure, too, in a place like Boston, for instance, with a lot of history, you can't just go in and just tear things down, or rip up streets and do things.

You've got to also have respect for the existing environment, and build in a way that is cohesive and not destructive. But that said, I'll get off my soapbox here. Can you share with us some exciting, or any exciting advances in green transportation that are being actualized now, and how you're seeing technology help push green transportation forward?

Marc DeSchamp:

Yeah, absolutely. You mentioned digital technology, and digital twinning, as well as StreetLight. We are working with StreetLight with some of our clients, in close coordination, to identify where is the best place to build the charging infrastructure based on usage patterns. For those who understand what StreetLight's capability is, that's a fairly obvious and really helpful way to use that capability. If we've got

a client who's trying to decide where they buy land, or where they want to invest first, the place where the vehicles are most likely to be, and most likely to need the charge is the best place to start.

With regard to digital twinning, yes, we've got some simulations that we've developed for a couple of clients that have constrained sites. You've got a small, well, it's a large site, but it's a tight envelope. When you start putting all those things inside of it, you need to figure out not just how does this facility work on paper, but how will it work in real life. If you've got 100 or 150 vehicles coming back in at some point during the day or the evening, and looking to charge, how do you make sure that vehicles that are fully charged don't get stuck behind vehicles that haven't started charging yet, or that you're not over straining certain pieces of equipment by trying to charge too many things at the same time.

It's making sure that the facility doesn't work just in theory, but that it works in practice. It's still a simulation, but it's a much more granular simulation, that digital twin like you described. It really has helped us work with clients to explain some of the limitations that get introduced when you try to put this theory of operation into a physical space, particularly one that was designed for something else.

That's some of the things that we're doing. I think on the technological side, beyond that, I think the market is starting to see more of a move toward... The term charge management has been used a lot where that helps. There's a software that layers on top of the vehicle chargers, that interacts with the grid, and identifies when the optimal time to charge the vehicles might be to minimize your operating costs. We're seeing that those capabilities are now growing into more of an operations management, which not only looks at the charging and the cost of power, but also what the vehicle is being asked to do.

It'll look at the scheduling system and say, "Okay, this vehicle needs to go and run this particular route, and do this particular thing." It's also looking at the vehicle telematics system. The vehicle will let the system know where it is, and whether it's running late, or if it's ahead of schedule, or if there's traffic. Then it'll also check the power costs and the charging schedule. Now, I just described a system that sounds really elegant, and would be great to have, and we've had a lot of vendors describe those systems to us as well, but no one's deployed a great number of these yet.

I think the jury's still out on which individual technology providers will be able to deliver the goods, and which ones are going to go by the wayside. I think a lot of our clients on the transportation side, all of that uncertainty represents significant risk to them. It's easy enough for you and I to sit here and sketch out a theory of operations for a brand new system, but actually making it work is a completely different thing. We've got transportation clients who are in the business of delivering goods, or delivering people, every day, and it needs to work no matter what. They can't just take a flyer on some unproven system or technology.

Paul Thies:

No, absolutely. With cutting edge technology, I think about the advent of personal computing, and stuff. Just like what we've seen in the dot-com era, and startups, there's all kinds of technologies being rolled out and being tested. All kinds of promises are being made, and many of them do fail, or they don't live up to the promise. But regardless, you have to start somewhere. Innovation, so often, is about breaking things, and trying again, and stuff. Given where we're at with the climate, and stuff, obviously doing nothing is not an option.

Marc DeSchamp:

Yeah. Absolutely.

Paul Thies:

Let's talk a little bit, let's talk a about-

Marc DeSchamp:

Well, one thing though, Paul, I would say, just to elaborate on what you just said, I think that the Silicon Valley idea of failing fast is a great one, and I think that that works well for a company like Tesla, where you've got essentially a luxury item, or at least it used to be.

Paul Thies:

Yeah.

Marc DeSchamp:

But with a lot of our clients, whether it's someone whose job is to pick up garbage, or to transport passengers, these are not luxury services. We have incredibly risk averse organizations who don't have the luxury of things not working.

Paul Thies:

Right.

Marc DeSchamp:

People's lives depend on transit service working in large metro areas. If the bus doesn't show up, they don't make it to their doctor's appointment, they don't make it to their jobs. If school buses don't work in a cold day, then the kids don't get to school, or people's garbage don't get picked up if the garbage truck doesn't work. I think that the innovation, it's this interesting mashup, between the innovative spirit of new technology, versus the need for core services to be delivered. It creates quite a challenge for some of our core infrastructure clients.

Paul Thies:

Yeah. No, I fully agree with you. I think innovation has to be balanced. It has to be balanced appropriately with risk. But let me ask you about opportunities. I think a lot of what we've discussed today has been more about cost reduction efforts, efficiencies, things like that, mitigating risk. But what about, when we flip that over, where do you see opportunities within the green transportation sector to help organizations grow profitably? What are the positives, as opposed to just simply avoiding the negatives?

Marc DeSchamp:

Yeah, a few things. First, I would say that in the energy marketplace, particularly with global volatility and global uncertainty, the closer you can bring your supply to your home, the more secure and predictable it should be. Now, the US electric grid, it wasn't predesigned. It's a reactive, organically growing thing, but we are able to work with clients to supplemental infrastructure, whether it be a microgrid, or a stationary energy storage, basically big batteries on their sites to help manage their electric loads, implementing solar to help bring the costs of overall electric vehicle operations down by taking control of your own destiny. I think those present some opportunities.

I think electrical, excuse me, electric vehicles, in theory, I say in theory because the technology is still pretty new, but in theory have fewer moving parts, they're less complex than fossil fuel vehicles. The maintenance costs and operating costs for those vehicles should be lower. We haven't seen that yet,

because again, the technology is still in its early days, but when that technology has more years under its belt, the maintenance costs will go down for those vehicles. Then I think, as well, the thing I described earlier about taking a fresh look at the service that these various clients are operating, that does, to a certain extent, present an opportunity for a fresh start. A lot of times these routes and these services that are being delivered have... It's the way we've always done it.

That might be the reason why they're running a particular route or a particular way. If you're forced to change to deal with the new technology, take it as an opportunity to step back and say, "What's the best way to do it moving forward? Is there a better way to do it?" Then, as well, I think we've got opportunities for, in the next five to seven years, I would say, for vehicle automation to take on a more significant role. I'm not advocating for driverless school buses to go around picking up kids. I certainly wouldn't put my kids on a driverless school bus, but I think that it's not unreasonable for, a few years from now, for a bus to drive itself into a maintenance bay.

After the mechanic punches in the code, and in a controlled setting, a vehicle drives itself into a maintenance bay, and then they put it up on the lift and they do their inspection and they do their maintenance action. That kind of thing, I think, presents some real opportunities to improve workforce efficiency, and reduce accidents and injuries, and things like that. I think there are opportunities throughout the sector.

Paul Thies:

I know on piers, and ports, and stuff, they're looking now at autonomous trucking, and autonomous vehicles, and stuff.

Marc DeSchamp:

Absolutely.

Paul Thies:

It seems like probably not a far leap to bring that into the municipality proper in some of these public transportation sectors.

Marc DeSchamp:

Yeah.

Paul Thies:

My last question for you, where do you see things evolving, like say in the next five years or so?

Marc DeSchamp:

I would say that the next five years will be both inspirational and uncomfortable at the same time. I think we're going to see lots of projects, as I mentioned in the very beginning, start to scale up. We're going to see, instead of deployments of ones and twos, or fives and tens, we're going to see 100, or 200, maybe 500 vehicles, depending on the size and scale of the fleet that we're talking about. Some of those will go well, some of them will be awkward. There will be missteps, because these types of projects are incredibly complicated. They are multidisciplinary. They require your entire organization to react in a way that is collaborative, and is not that our client organizations don't collaborate, but to a degree that they're not used to. It's, as I said, their day job is doing one thing, and this is a different thing.

I think we're going to see some projects that go pretty well. We're going to see some projects that are, let's say, learning opportunities. I have to put it diplomatically. I think that the five years after that, hopefully, we're moving forward more effectively. Although I see the five years after that, I would say we'll probably know what needs to be done, and we won't have maybe as many missteps, but the ability of the industry to keep up with the scale of the change will probably be the next challenge. Honestly, I think that'll be an issue in the next five years as well.

Even in the transit bus markets space, which is where, that's where my roots are. We've had one major bus manufacturer leave the US market, and another one's currently in bankruptcy filings. The supply chain is shrinking. We're seeing system suppliers being acquired by others, and some market consolidation. I think those kind of trends, those market disruptions, will continue as well. That could make things, say, a little bit spicier than we're looking for as we put this press on. Like I said, it'll be inspiring, but challenging at the same time.

Paul Thies:

Yeah. I think that there's going to be a real push for collaboration, and stuff, because inaction is not really an option. The political will won't allow for it. Quite honestly, the climate conditions won't allow for it either.

Marc DeSchamp:

Yeah.

Paul Thies:

Organizations are going to have to do something. In a space like this, where it's new technologies, new ways of doing things, departments are going to have to start cooperating with each other maybe in ways they're not used to. Even organizations, they'll have to reach out, I suspect, to help smooth some of those wrinkles, but it will get there. They'll have to find ways to work together. I think operators, like Jacobs, who have that breadth, and scope, and expertise to be able to demonstrate the art of the possible, the benefits, and how to reduce risk and costs, I think. Obviously, a company like Jacobs is really well positioned to address those kinds of challenges.

Marc DeSchamp:

Absolutely.

Paul Thies:

Marc, I want to thank you so much for joining me today. Really fascinating conversation about green transportation, and I'm looking forward to seeing what Jacobs is going to be doing next in this sector. Thank you so much for joining us today.

Marc DeSchamp:

Thank you so much, Paul.