

Zoe Haseman: The urgent need for us to tackle the climate crisis.

Jens Nielsen: Yeah. So it's really a crucial [inaudible]

Zoe Haseman: Impacts of climate change and the risks that these pose to our society.

Jens Nielsen: We need specific plans and actions to drive the CO2 emissions down in the short term.

Zoe Haseman: The climate crisis is the world's most critical challenge right now.

Jens Nielsen: Hello and welcome to the Sparks podcast series. I'm Jens Nielsen.

Zoe Haseman: And I'm Zoe Haseman.

Jens Nielsen: And we'll be your host throughout this special edition podcast series, brought to you by the World Climate Foundation and Jacobs. Come with us as we take you on a journey around world to explore how different countries are taking their climate challenges, sparking ideas and inspiration.

From clean energy innovations in Scotland to sustainable buildings in Dubai, we'll be interviewing global green leaders, financiers and entrepreneurs about the policies, investments, and innovations that are accelerating our progress towards a resilient and sustainable world. Our podcast hopes to educate and inspire, sparking real conversations with the intention to collaborate, act, commit to real change.

Zoe Haseman: With a heavy focus on car based mobility, America's transport network is one of the largest sources of greenhouse gas emissions in the country. With the return to the Paris agreement by the Biden administration and the strong commitments to net zero emissions by many companies in America's transport industry, has marked an important turning point for the country. As America's transport system begins its transition, we're also presented with a window of opportunity to plan a more equitable network to support a healthier, fairer and more resilient future.

Jens Nielsen: In this episode, we'll explore some of the challenges surrounding America's green transportation transition, how innovative solutions could expand electric mobility options and how placing social value at the heart of infrastructure planning will be key to creating a successful network.

Joining us today are two of America's most influential leaders helping shape the future of transportation. We would like to welcome Nick Albanese, head of Intelligent Mobility, Bloomberg New Energy Finance. And Beth Osborn, director transportation for America. Thank you both for joining us today.

Beth Osborn: Thanks for having us.

Nick Albanese: Great to be here. Thank you.

Jens Nielsen: You're welcome. Beth, in addressing the challenges of building the transportation infrastructure of the 21st century, you've underlined the importance of not repeating the mistakes of urban renewable initiatives of the 1950s and sixties. What are the two to three most impactful policy goals you've recommended that can help invest for sustainable and equitable growth?

Beth Osborn: Absolutely. I think the first thing is we need to acknowledge that mistakes are not in the past. This is not us cleaning up damage we did in the fifties and sixties. These are mistakes we're continuing to make today. In fact, this past weekend, the Washington post covered two projects in one paper, one in South Carolina and one in Virginia that is continuing to cause damage to communities of color in the name of moving vehicles quickly.

So we need to come to grips with the fact that we're continuing to dig our inequitable hole even deeper. And the ways we can pull ourselves out of that is we really need to focus on how well we connect people to jobs and essential services by all modes of travel. And this is something that even back in the fifties, all the experts said were the appropriate ways to measure transportation success, but we didn't have the technological ability to do it then.

It would've required measuring every little trip from every census block, which would've taken years and tons of money and tons of people. And by the time you did it, the data would be stale. Now, we carry that data in our phones through things like Google Maps. And so applying that here would help. Right now, we're using the 1950s proxy for it, which is how fast the cars moving. If the cars are moving faster, the driver's trips must be shorter.

Therefore they have better access. We've actually found over the years that's not true and it leaves out everyone not driving. So we're really not getting the results we want at all. In fact, that's what's leading to a lot of access blockage. So that's a big one. And I think the part of that is to specifically look at those outcomes for people of color and vulnerable communities.

And then the second thing I would say is we need to do a better job of defining economic benefit in transportation. Right now, we define only really one economic benefit. Again, it's based on how quickly vehicles move. Assuming if they move fast, your trips are shorter and you save time. And we need to look at what the impact of the transportation system is on the community it touches.

And we find actually that where the travel is the slowest, where the vehicles move the slowest is where the value of the property is the highest. So we are counting as an economic benefit, the thing that undermines our economy. And so we need to start pointing ourselves in the right direction for the objectives and the goals we claim we want. And then we might be able to get different

results in the ones we've gotten since the fifties and sixties that have been so tragic and inequitable.

Jens Nielsen: Do you feel that the key decision makers are aware of these elements to tackle?

Beth Osborn: No. I think our policy leaders are incredibly ignorant on the program, how it functions and what it gives us. I think that the United States has messed up in an epic way by creating a trust fund to fund transportation. This is a very unpopular opinion by the way. But basically Congress, the white house, they do not have to revisit transportation spending on an annual basis and analyze it and oversee it.

It takes care of itself because we take gas taxes and put it into a trust fund. And so votes only come up every six to eight years. This does not build a great oversight and policy chops in our legislature by having them say, "Well, we spent this money. What did we get for it?"

Instead, it basically means once or twice a decade, we look at how much money we have in a pot and we hand it around and we put out a press release saying, "This is how much money you're getting." If transportation had to go through the same process as almost every other program did, it would be much easier for electeds to both have staff that spots the problems in the program and members that are scrutinized the program to a much greater extent than we do today. I think that that ignorance is what leads to our continuing bad policy.

Jens Nielsen: Thank you.

Zoe Haseman: So Beth, on that with likely investment and further funding in the future, how can a massive investment in infrastructure address these inequalities and provide more innovative transportation solutions that help all communities?

Beth Osborn: So I've been tussling in my brain about which way, if I want to go in a positive direction or the negative. The good news is a sizeable expenditure that is very different than what we you've done could be incredibly impactful. It could be transformative. Unfortunately, that's not what we're going to do.

Bad news is we are going to do a massive investment in the exact same way we have been investing in transportation for the last 70 years. So what we'll do is supercharge every problem we have in the transportation system. That was done on a very bipartisan basis because bipartisanship on transportation in the United States of America is an exercise by which both parties give up all their priorities in order to get something done.

It's very even. They both, the Republicans and Democrats abandon all of their priorities to spend vast amounts of cash. The Republicans give up on trying to save taxpayer dollars, charge the economy and create jobs to get money under the ground quickly. And the Democrats give up on equity, public health, climate, also economic in order to pass a big bill. And so we get a bill that does none of

those things, but spends a lot of money. I'm not happy with the bill. Can you tell?

Zoe Haseman: I can. You're kind of giving that away a little bit.

Beth Osborn: Yeah.

Zoe Haseman: But appreciate the honesty because it's an important discussion and good to get those opinions out there.

Beth Osborn: I will just add that infrastructure is often used, many terms in transportation are used as a euphemism. So infrastructure is meant to communicate those projects that you personally think should be built without having to say any of them. So everyone sees themselves in the program in spite of the fact that most of them aren't in the program. But it gives everyone comfort because they all see the project they care about when infrastructure is spoken.

It's the same thing when we say words like congestion. The typical traveler means that stop and go traffic that really slows down their commute. The typical transportation engineer means any slow down from free flow traffic. But they say the same word and they think that they're talking to each other. And I think that's been another danger is infrastructure makes everyone feel included when most everyone is being excluded.

Jens Nielsen: Beth, you've been actively engaged in a green new deal for city and suburban transportation. Could you provide the insights on how its federal policy recommendations for reducing emissions from the transportation sector and citizen suburbs can also make communities healthier, more and prosperous?

Beth Osborn: Yeah, we have really incredible opportunity. And if you look at what our house of representatives did in their transportation reauthorization, it had the potential to be greatly transformative. We'll be working to bring a lot of these policy ideas I'm going to talk about into the implementation, whatever's passed by Congress. But the things we focus on, we like to call it a fix it first strategy, where we have a policy where we take care of the infrastructure we have currently before we build new things that we can't afford to take care of.

And that includes a redesign of what we have. So we might have built a roadway 30 years ago in an area wasn't heavily developed yet. So it was built more like a rural road and designed that way. But now it has infrastructure on all sides, all kinds of buildings. And it requires a revisiting of that design.

A lot of the fix it first means taking care of existing communities and looking to see if the infrastructure that we're replacing is still relevant to that community, or if it needs a refresh. And also, making sure that we're not just cutting a ribbon on the latest flashy new thing, but we're doing the hard work of

maintenance and caring for existing communities and putting them in their strongest position economically.

The second thing we really focus on is giving people access to moving around outside of a car. And that really comes down to vehicle speeds. We've seen interestingly over the last year and a half as we've lost rush hour due to COVID, that speeds have gone way up across the country. Apparently traffic congestion was one of our greatest safety interventions. Because without the traffic congestion, we have found that fatalities have gone through the roof.

In the first six months of 2020, we saw the first indication. By the end of 2020, we've learned that it was at the highest increase in the rate of fatalities that we've seen in 96 years. And it's almost entirely due to speeds. We're seeing it continue in you this year as well, because rush hour really hasn't come back. We've seen traffic come back, but it's more evenly distributed throughout the day because it's different trips driving it.

So really bringing down speeds where people are likely to be, where there's lots of points of conflict is going to be super important. The last is that notion of access to job and essential services by all modes of travel and really using that as the lens by which we judge all of the transportation system, whether it's successful or not.

It's really an exciting way to look at transportation because it's truly an outcome. It's particularly those non-work trips, grocery, schools, healthcare, childcare, retail. The more accessible those are the fewer cars that people tend to own for household, the less they spend on transportation, the more active they are, the better the public health outcomes, the higher the property values, because those neighborhoods are so rare in the United States and we don't really allow them to be built very easily.

Also, the lower your overall household costs are, and the lower your emissions are. So that's really powerful. It also can look at land use and transportation on the same plane, because you can improve access by bringing things people need closer to them, not just by adding transportation infrastructure.

And I will mention, we really got into lately bringing transit, spending up to the level of highway spending. It's always been kept down at 20% of the spending of highways. If we really want to invest in a robust transit system in the United States of America, we need to put the same focus on that as we did on the highway side over the last 70 years. And we've just simply never made that commitment to transit in this country.

Nick Albanese:

And Beth, on that note, I think you make a really good point about the importance of tackling this from a demand side perspective. In many ways, we've been locked into a trajectory of continuing to subsidize private car ownership through a variety of means in the United States. And we've been

under-investing in public transit, as you say, and not doing enough to reimagine urban city centers to make alternative modes of transportation like scooter sharing, bike sharing, all these other modes of transits safer and more accessible.

So I think that's incredibly important to note. And just to put an emissions angle on this, we spend a bit of time at BNEF thinking about where transport emissions from the road transport space will go over the next two decades, looking at existing trends related to electrification and where private versus shared car ownership goes. And on that note, I think a few things that are important to know. The first year, just off the bat is that of course transport sector is now the largest source of greenhouse gas emissions in the United States.

That's been the case for five years in a row now. That's because although transport emissions have been relatively flat, the power sector has been doing a lot of heavy lifting in pushing down US carbon emissions. So about 20% of generation for the power sector comes from renewables in the US. And another 20% is coming from nuclear. So transport is now in the spotlight, even with rising EV sales over the next decade, next two decades. In BNEF's view, it looks like road transport emissions will continue rising at the global level through 2030.

So just electrifying passenger vehicle sales is not going to do enough to turn the tide, so to speak on climate change. And even through 2050, it looks like North America and China will continue to be the top emitters. And that those are of course, the markets that are seeing the fastest adoption of electric vehicles. So really need a lot of additional policies and investments from corporates to try to jumpstart this emissions trajectory a little bit faster.

Zoe Haseman: Some great data points there, Nick. Thank you. And also the perfect segue for my next question to Beth. So what parts of the transportation economy do you believe will be the first and also the last decarbonized?

Beth Osborn: One of the big complications in transportation as opposed to utilities is that there are so many points of input. There's so many different actors in the space. And it can be very complicated just to understand across the United States, even the basic ownership of roads. So if you're in a place like Virginia or Delaware, the states own almost every road. But if you're in a place like Wisconsin, it's really the county that are dominant in road ownership.

And in most states, you've got the state owning some, the counties owning some, the localities owning some, the transit agencies are almost totally different from any of those groupings. And often, in one metropolitan area, you have multiple transit agencies and then you've got each individual actor in terms of people trying to get around. You've got the commercial vehicles as well. And the way our communities are laid out has a big impact.

So each development is an input into our transportation system as well. So I think we're going to see decarbonization happen faster in places that have more full control over a fleet. I think it will be easier for more of a unified approach. Surprisingly in aviation, there are technical difficulties there, but there are just fewer players. Same thing with the heavy duty fleets, just because there, again, fewer players. There are entire fields looking for ways to make the system more efficient from a cost perspective. It allows a little more top down control.

And so I really think it's going to be the [inaudible] level travel that's going to be the last. And mostly that's because of the complete lack of leadership on this at the federal or state level. I don't mean to say there's none. There's been some extraordinary leadership from people like Peter DeFazio, who's the transportation lead in the house of representatives.

And put forward some of the most visionary approaches to transportation I've ever seen. But it is sadly few and far between, and it's going to require a much bolder approach from those that manage transportation systems and most of the money, which is at the federal and state level. And so far, they have really ducked their responsibility. So I think that's where it will be the slowest.

Zoe Haseman: Thanks, Beth.

Jens Nielsen: Nick, of the current obstacles to mass vehicle electrification, which do you believe will be the easiest and the most challenging to address? And perhaps, can you also provide some context by explaining how electric shared and autonomous mobility adoption stands today?

Nick Albanese: Absolutely. So I think building off Beth's point, I think I'd agree with that the passenger vehicle segment is lagging in many regards in terms of electrification. So if you think about each of the more major segments within road transport, of course we have passenger vehicles. That is in many ways the most important segment, because it's the largest in terms of the number of vehicles on the road today. And it's also the largest market in terms of dollars spent.

So about two trillion spent on the automotive market annually. But only about 4% of passenger car sales globally are electric today. And if you zoom in on the United States, it's even lower. So we're lagging the global average there with under 2% of sales being electric. So very early days for the passenger vehicle segment. Unfortunately, the light and heavy duty segment in trucking is even further behind.

So less than 1% of sales are electric. That could change quickly over the next five to 10 years as new models come to market. To be clear, that has been a big roadblock in the United States. So if you're a trucking company or an Amazon, you maybe have needed to invest directly in a company like Rivian rather than be able to procure an off the shelf commercial truck from one of your normal corporate partners like a Ford or an FCA or another company like that.

So that trajectory could change, but it's not off to a great start. I think two other areas to note is that there have been some incredible successes in electrifying two and three wheelers, as well as buses. Of course, two and three wheelers are not a primary means of transportation United States, more important in emerging markets and to a lesser extent, some European countries. Just want to share that those have already electrified at a rate of 36% of sales globally.

And buses are already at a 44% electrification rate. So public transit agencies that are buying diesel or natural gas buses today are walking their transit riders into outdated technologies. They really should be pushing the envelope, challenging themselves to switch [inaudible] trains and realize those economic savings today. So a bit of a varied picture across all of those. The good news is that lithium ion battery pack prices are falling rapidly. This is something that we spend a lot of time tracking closely at BNEF.

So each year we sign nondisclosure agreements with battery manufacturers around the world and across the [inaudible] segments to get real world pricing data. And from that exercise, some of our listeners might know this, there's been about a 90% reduction in the volume weighted price of lithium ion battery packs to date. So we're now around \$150 per kilowatt hour down from over a thousand just a decade ago. So if we're starting to get to the point where passenger EVs could be price competitive with internal combustion engine cars on an upfront basis without subsidies.

So in markets where you have subsidies, that crossover point could happen as soon as a year or two years from now. And even where subsidies are being phased out, at BNEF, we think that crossover point will happen by the end of this decade in most major markets. So that's not necessarily soon enough, but that is a good trajectory overall. So I would say falling lithium ion battery pack prices is a biggest enabler of electrification going forward. I think the challenges that still need to become are related to charging infrastructure.

So there's only a million publicly available charging points globally. And I think something like over a hundred thousand in the United States. The US is lagging in terms of building new charging stations. So determining where to build those and how many are needed and what power outputs are needed is still a big open question. And then there's also a lack of models that match US consumer preferences.

So from my perspective, there are a lot of negative externalities related to consumers wanting to buy more and more SUVs and large trucks, things like that. But if you look at the data, that's what consumers want. And so if you want to electrify car sales, you probably are going to be hoping for [inaudible], electric pickup truck to succeed, the Tesla cyber truck to succeed, et cetera. So that's something that's hopefully going to be worked out over the next few years.

And then the last thing, as Beth was talking to earlier is the fact that we need to do more to incentivize alternatives, to private car ownership. So zoom back just five years ago, the global passenger vehicle fleet was 200 plus million units smaller. So that's huge growth in just five years.

If that continues, the scope of the challenge of decarbonizing the fleet just becomes greater and greater and greater. And that's going to put more burdens on governments to subsidize the transition, which is not going to be an ideal outcome in my view. So I think thinking about ways that to provide alternatives is going to be increasingly important.

Beth Osborn: I just have to add that the negative or externalities of the transportation system go far beyond the notion that there are a bunch of little smoke stacks out there. It's not just the vehicle emission. We have pretty serious emissions that harm health from the tires, from the brakes, the very road ways themselves. Having massive roadways that result in high levels of fatalities.

We actually know the pavement emits on hot days, which are growing. Going through people's neighborhoods. Having so much pavement out, particularly in low income neighborhoods and neighborhoods of color have a heat island effect. The manufacture of the vehicles. There are huge emissions, public health and climate impacts of a transportation system that is electrified. So the idea that we are going to change nothing about our transportation system, but just replace the incredibly damaging system we have now with one covered with electric vehicles is, I mean, it's truly tragic.

We're going to confine people to a universe where they have to drive five to 10 miles more every decade for the rest of eternity and all of the negative externalities that go with it because we're trying to solve the emissions problem in a very fine tuned way, with a scalpel rather than create a system that's more affordable for the taxpayer, that's more affordable for the individual, that is full of options that actually meets market demand, as opposed to this one, which is not what the market wants at all. I think that there's a lot more opportunity out there, but somehow we're afraid to say that our 1950s approach might need a little update.

Zoe Haseman: So Nick, what needs to change for fleet operators to view transport decarbonization as an economic, rather than a social environmental benefit? And you touched on this earlier in your answer, but anything else to add to that?

Nick Albanese: Yeah. I think a few things at play here. One is simply put, lithium ion battery pack prices need to continue falling. Or on the flip side, we need to see more stringent government mandates requiring fleet operators to decarbonize their operations. So if you look at the global landscape for fuel economy regulations, most of those are targeting passenger vehicles. Fewer of those are requiring OEMs to make significant improvements in terms of trucking emissions.

So I think there's room for governments to sort of step up their regulatory pressure on trucks, particularly because as I mentioned, they're not electrifying or decarbonizing that quickly thus far. I think there's probably also a role for consumers to play here. So I think partly in response to demands from consumers, but also trying to sidestep the future regulations, we've seen notable commitments from most of the major ride hailing companies all over the world.

So Uber and Lyft, for example, want to fully decarbonize their fleets in the next decade in and develop markets, and by 2040 globally. There's an opportunity here for ride hailing companies to first movers into the EV space in emerging markets. So that would have some positive spillover effect if Uber or DD commit to, or rather get serious about actually achieving that 2040 target in a market like Mexico or Chile where EV sales are sort of in the hundreds of units and thousands of units range just really negligible.

These ride hailing operators will have to invest in charging stations that could be used by other players. They'll have to be lobbying governments to maybe offer subsidies to their drivers. There's an opportunity for them to be agents of change in other places where this EV transition has not even started yet and really needs to get underway in the next few years. So I think that's one space that we're looking at closely at BNEF.

Zoe Haseman: Then Nick, are you concerned that the transportation decarbonization will be hampered by an immature supply chain at all?

Nick Albanese: So at the moment at BNEF, we are not too concerned about this. I think if you look at the trajectory for lithium ion battery pack prices and how that will translate into rising consumer demand for electric vehicles, particularly in the passenger vehicle segment, it looks like there will be sufficient demand, both from a battery metals perspective, as well as from the battery manufacturing capacity side of things itself, at least for the next five plus years, based on all of the publicly available announcements.

So not a medium term problem, but potentially a long term one. If you actually want to flip the full fleet of 1.2 billion passenger cars to fully decarbonize vehicles by mid-century or by 2060, depending on the market that you're in, that's the point at which you could expect to see some pickups in the supply chain. So that would require significant investments in battery recycling facilities in all of the core auto markets around the world.

And to be honest, we haven't seen too much activity on that front in North America to date. It's quite a bit in China, but based on the Chinese policy actions around recycling, I wouldn't expect them to necessarily want to take used EV batteries from the US or Europe. So that is something that I think policy makers can start turning their attention to ensure that there's no supply crunches in 10 or 15 years.

Jens Nielsen: I'll direct this next question to you, Beth. What can be done to help assure that new transportation technologies and other mobility advancements are equitable?

Beth Osborn: Yeah. It's a really good question. I think it actually starts at a pretty fundamental level in terms of defining what we're trying to accomplish and then ensuring that whatever those benefits are, are being distributed equally. Frankly, I think it unfortunate that we are looking at this as a technological solution because I don't think it's up to technology to be equitable or inequitable. It's a tool. I think the bigger problem is in particularly in transportation, though this is true everywhere, the technology is entering into a fundamental inequitable system.

So when you put a new technology into a system that has fundamental inequities all through it, that technology can hardly help but be distributed inequitably. So for those in technology that want to ensure that their product is being used more equitably, they're going to have to fight against that system. And they're going to have to think about how the overall policy and system itself will interfere with their ability to distribute those technologies equitably.

I mean, one example is as we have deployed a lot of really great new mobility options like scooters or electric bikes and bike share, you can put those scooters and bikes in many communities. And we've talked about addressing the digital divide and the unbanked and things like that, but more fundamentally because communities that are walkable are so in demand, they've been priced up so much that vulnerable populations can't afford to live there anymore.

Those are the safest places to use a bike or a scooter because they make space for people to be outside of a car. And as we displace lower income people into those suburbs that were built to exclude anybody outside of a car, we have fundamentally denied them access to those products unless they want to put their own safety in jeopardy.

So that then falls on those very companies, providing e-bikes and scooters and bike share in general to fight for a complete and utter redesign of the fundamental transportation system. Now that is a big load to carry. But that's where we are as we in the United States address 70 or more years of a supercharged system only focused on people inside of a vehicle. Unwinding those inequities is too much for just the technology. It's going to require those bringing those technologies to bear, to think about how it can interact with that system to improve the overall equity as well.

Zoe Haseman: So on that Beth, what role do you see? Something like machine learning, having to improve mobility equity and the rest?

Beth Osborn: Yeah. This is a really good question. And I've been thinking a lot about it lately. And one of the things that-. There are two things that come to mind. One is I think it can help us just better understand how people behave and interact with

the transportation system or the built environment in general, in order to better predict that behavior and think about how our investments and designs will impact them. Having a better understanding for that can very much help us to use our money more effectively and get better results.

But specifically, think about for those kind of nerds like me that have spent time on YouTube, watching videos of AV testing. It's a really interesting exercise in that it's almost like being a parent where your kids kind of reintroduce you to the parts of the world that were once confusing to you but now you just kind of accept. The AV, the computer device is reminding me of how poorly our roadway system is designed.

And as I'm watching the testers struggle with their car, because the car can't figure out what to do if you're supposed to turn right, and a parking lane ends, but the right lane doesn't move into that space. Are you supposed to move over to the right? Are you supposed to stay where you are and turn with a lot of extra space?

The computer gets befuddled. And it occurs to me that we all kind of get befuddled a lot with this transportation system that is designed in a very confusing way. What I am hoping is rather than forcing the computer to continually figure out a poorly designed system, it reminds us to revisit that design and design it better and learn from the AV testing in a way that creates an overall better system every driver, whether human or computer can utilize and operate more effectively in.

Jens Nielsen: So Nick, how can we address the lack of EV charging infrastructure, especially in urban residential areas, where there are no driveways or garages for EV owners to plug in at night, for example?

Nick Albanese: It's a great question because it is one factor at BNEF that we see holding back the adoption of electric vehicles by mass market consumers over the next two decades. So just to give you some context on that outlook. We see based on existing techno economic trends, you could call them sales of EVs going from around 2% of total car sales today to upwards of 75% by 2040.

So if you take that number for granted, you can probably say, might be a little bit higher, a little bit lower. In our view, just to support a level of EV deploy it of that scale, you would likely need upwards of 1.5 million publicly available charging connectors by 2030. So that is a huge increase over the hundred thousand that we have today and would be three times bigger than what the Biden administration is targeting over the next few years.

They want 500,000 charging station deployed. Looks like they're trying to get funding for that. Unclear what the financing mechanisms exactly might be. But essentially, the gap to goal here is pretty significant. And of course, there's also still some residual challenges around lack of interoperability. So Tesla of course,

continues to dominate the US EV market, but there's a growing number of models from companies that will be available for sale soon.

And so ensuring that we are building charging stations that all EV drivers can take advantage of or particularly low income EV drivers will be very important to ensuring that this transition is able to continue and in fact accelerate. So I think probably what you need is additional government investment, more serious utility activity in this space.

And I think there's also, as I mentioned before, some space for ride hailing providers to really step up here and say, "If we're actually serious about hitting that 2030 goal, we need to be providing charging stations in urban city centers today so that we can decarbonize ride hailing operations." And I think on that front, we've seen a few early moves. So I think Uber has a few partnerships in Los Angeles. And a company called Revel, just opened a charging station in New York city. So there's a few early indications that this could take off, but I'm really hoping for more announcements on that front, I would say.

Zoe Haseman: So Nick, a question for you, do you believe that the world is on track to achieve net zero road transport emissions by 2040 or 2050? And if not, what do you think needs to be done to overcome that?

Nick Albanese: So, unfortunately, no. If you look at this on a vehicle segment by vehicle segment basis, I mentioned before that buses are already electrified very quickly, two and three wheelers are doing that as well. So by 2050, I think it's possible for sales to hit a hundred percent electrification rate. Those segments are essentially on track to decarbonizing. But if you look at passenger vehicles and then subsequently commercial vehicles, the passenger vehicle segment is probably lagging the transition that you would need to achieve by anywhere from three to five years.

So you really need to pull forward that adoption curve to get on track to fully decarbonizing the fleet. So that probably means you need to hit a hundred percent fully electric passenger car sales by 2035 at the very latest. Ideally you'd want to do it by 2030. And then on top of that, you would also need to push for early retirements of some of the existing internal combustion engine cars on the world's road.

So of course, that could be a cash for conker scheme, or it could be something else, but there's probably going to have to be a dollar motivation for some folks to want to do that. That is going to be key in that space.

And then in the commercial vehicle space, there's a more significant gap to goal between sort of our base case scenario and what we think would be necessary for net zero. So in that space, I think there's really an urgent need for mandates requiring decarbonization of light, medium and heavy duty trucks. Light is doing

okay, but medium and heavy duty are barely getting started. So that's where I think most of the regulatory pressure will need to be put.

Jens Nielsen: Thanks. I'll put this next question to you both. What should we watch out for in the next coming five years?

Nick Albanese: One is that I would expect to see additional major government policies put into place. As we've been discussing for provide alternatives to private car ownership. Right now, most of these efforts are sort of side projects for governments. During COVID, we saw, I think it was 15 plus European countries announced a few billion dollars for investments in cycling infrastructure and public transit within urban city centers.

And we've seen a few national governments propose official targets for the share of trips or the share of miles that they want to come from more efficient, they'll say modes of transportation than private cars. One notable indication of that is in the new US nationally determined contribution there's a line that says the US will strive to provide alternatives to private car ownership.

So I think as governments become more aware of just the full scope of decarbonizing the existing vehicle fleet, we're going to see new policies put into place, not only to accelerate electrification, but also to try to reduce the scope of the challenge in unit terms. So I think that's one thing to watch. And another is that I know the autonomous vehicle market has gone through several hype cycles over the past decade in terms of dollars raised and announcements about having autonomous robo taxi fleets in major city centers by 2017 or 2018, et cetera.

Having taken a hard look at what happened in 2020, just based on the significant ramp up in testing that took place in China, going from just around a hundred AVs on the world or on that country's roads to over 600 in a very short period of time, increasingly optimistic about the potential for robo taxis to scale in limited applications within urban city centers in the next five to 10 years. So that's probably going to be tier one cities like Beijing and Shanghai and San Francisco, DC, Austin, et cetera at first. But I think there is real potential now for that to start scaling into other cities and closer to the end of the decade.

Jens Nielsen: And over to you Beth.

Beth Osborn: Right now, because I think our transportation system and built environment makes it so impossible to share a car or share a trip, I think AVs will just make it possible to increase VMT and have just lots of [inaudible] vehicles. Our system's inefficient new technologies will be used inefficiently. However, I do feel like we're reaching an inflection point that I've not seen before and that I'm very hopeful about.

I actually think the problems with the existing infrastructure package will actually lead to a reckoning in US transportation policy. I'm noticing that states are starting to ask for help in understanding what are the drivers of how much people drive vehicle miles travel. And there is becoming a recognition that they're digging a deeper hole for themselves that they're hoping technology can build their way out of. That might not work so well.

That is really promising, believe it or not, because still today, most people that reducing carbon is an add on. So I'll build the dangerous highway, but I'll put a bike lane on the side of it because there's no place that children would rather bike than on the side of a ground level highway. It has been part of the yes and world of transportation.

I get to build the stuff I've always built, but I'll throw you a bone on an add on item at the end. I think that especially the more that we expose something that Nick said earlier, that we're actually going to see transportation emissions go up in rather a startling manner for probably another decade and maybe more until we have we're talking 50% of vehicle are EVs it's serving is a bit of a wake up call to folks. And I'm also really excited about change in the press.

The number of reporters that are looking at transportation is something other than how much money is spent discussion. It's not something I've ever seen in the in-depth analysis of what the outputs and the outcomes of transportation investments are that we're seeing now.

And I think that kind of scrutiny is going to upset most state DOTs, but I think it's also going to force us in a better direction. I just think, unfortunately, we're going to lurch in the wrong direction first for the next few years. I expect that, what is it that Churchill once said about the US that we'll do the right thing after we try everything else. We're going to finish trying everything else here. But I think we're about to lurch in the right direction.

Jens Nielsen:

Thank you very much to both of you. That's all we've had time for on this episode. Nick and Beth, thank you very much for taking the time to chat with us today. It's been an incredible insight into the real impacts vehicles have on our planet. As we've heard, greening transportation is one of the greatest challenges to solve for us to reach the net zero economy. And the US needs to lead the way on this.

Thank you also to our listeners for joining us once again, as we journey around the world. We hope you enjoyed the podcast and we'd love to hear your thoughts on America's green transportation transition, its challenges and its opportunities. Tune in next week as we head across to Asia Pacific to discuss energy transition, sparking real conversations with the intention to collaborate, act, commit to real change. Catch you, then.