STATE OF ILLINOIS
ILLINOIS COMMERCE COMMISSION

EVS: THE BENEFICIAL ELECTRIFICATION OF TRANSPORTATION

POLICY SESSION

Wednesday, January 8, 2020, at 1:00 p.m.

PRESENT:

CARRIE ZALEWSKI, Chairman
BRIEN J. SHEAHAN, Commissioner
D. ETHAN KIMBREL, Commissioner
SADZI M. OLIVA, Commissioner
MARIA S. BOCANEGRA, Commissioner

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CHAIRMAN ZALEWSKI: Good afternoon. Welcome. Pursuant
to the Illinois Open Meetings Act, I call to order the Illinois
Commerce Commission's first Policy Session of 2020, EVs, the
Beneficial Electrification of Transportation. With me here in
Chicago are Commissioners Oliva, Kimbrel, Bocanegra, and Sheahan,
so we have a quorum.

Our guests and panelists should be aware that
a court reporter is present and that a transcript of the
session will be posted on the Commission's web site.

I'd like to thank every one today. I'd like
to thank all of the presenters today for their efforts and for
putting in all of the hard work. We're very excited to hear
all of this very important information.

I'd also like to thank Commissioner Bocanegra
and her advisors who put a lot of hard work into it. And I'm
excited to hear the robust discussion. The Electrification
Transportation System is a timely and important issue. I think
you all agree by looking at the size of the audience. So we
look forward to hearing what our experts have to say.

Because of that robust agenda, I'm going to go
ahead and just turn it over to Commissioner Bocanegra.

COMMISSIONER BOCANEGRA: Good afternoon, everybody.
Thank you for your patience. I know we are at capacity, which we were expected to be, so we are excited about that.

Thank you, Chair Zalewski and to my fellow Commissioners, my advisors, and our staff for helping and continuing to support this endeavor. We are excited to present to you guys the first Policy Session of 2020 here at the ICC.

A couple of things that I wanted to share with you guys. We set out to plan this; and in a lot of our research we felt that two things became abundantly clear. The first is that the discussion around EVs and electrification has moved so far beyond the stereotypical someone driving around in a really expensive EV and driving it only back and forth to their house. What we're seeing is a more holistic conversation taking place at all levels around a variety of topics.

Some of those topics include low income, carbon reduction, deployment and integration, workforce development issues, interagency planning, fleet transitions, right to charge laws, and even regional coordinations, to name a few things that we've seen.

The second thing that we are seeing is a massive growth in our sister Commissions addressing this very holistic conversation. We can now point to workshops,
conferences, and filings being held in some of our sister
Commissions, like Wisconsin, Maryland. Washington stands out
as a great example. Florida; Missouri. I could go on.

At last count, I think my team researched
something like 35 states and around 133-plus filings; and
that's all since the last time former Commissioner Palivos had
a similar discussion. So we're happy to share that with you.

And I want to point out that a lot of those
Commissions are addressing these very issues in a variety of
ways, and some of them include -- or through these workshops,
and/or through these inquires, and through these filings --
things like education and awareness; party emissions; low
income, time of use; time of day; subscriptions; flat rates;
some metering; commercial charging; rebates, just to name a few
of the filings and conferences taking place around these timely
topics.

So today we put together a variety of those
industry perspectives so that you guys can capture what's going
on nationally and how that conversation might fit in,
appropriately, here in Illinois.

So with that said, I'm happy to introduce our
first set of speakers. With us we have Britta Gross. She's
the Managing Director for Mobility at Rocky Mountain Institute.

Second, we have Daniel Bowermaster, Electric Program Manager for Electric Transportation at EPRI. And, last but not least, we have Nick Nigro. He's the founder of Atlas Public Policy and Senior Advisor to Alliance for Transportation.

So with that said, we will get started, and I'll hand it over to Ms. Gross.

MS. BRITTA GROSS: Thank you. Thank you very much, Commissioner.

I spent a lot of my career at General Motors and recently left to join Rocky Mountain to work on electrification both hydrogen vehicles and also on hydrogen electrical vehicles. So let me try -- as a kick-off speaker here, let me try to just paint the landscape a little bit and touch on as many key topics as I can. And these other guys will fill in all of the gaps that I, obviously, will miss along the way.

Let me start just by saying and explaining why transportation really matters and why electrification transportation really matters. Transportation is the Number One largest carbon-emitting sector in the United States. Transportation causes 29 percent of carbon emissions in the
country. 59 percent of those 29 percent of carbon emissions in the United States are caused by light-duty vehicles. There's another 23 percent that comes from the medium and heavy-duty trucks, so a much smaller share of the emissions. Aircraft only accounts for 9 percent of the total carbon emissions in this country. Rail ships, buses, motorcycles, all of that other stuff only adds up to another 89 percent or so. So there is virtually no way to do any kind of carbon goal. Pick whatever you want, wherever you can assess to go. There's virtually no way to address any carbon goals without addressing the light-duty vehicle sector. I just wanted to give you that for context to understand why we sit here and talk a lot about cars. It's surprisingly a very, very important part of the carbon emission issue in this country.

So what's it going to take to grow the EV market? And I'll explain some of these in a little bit more detail as I move along through the presentation. But let me just mention that there are really three things that jump out as really key challenges to the address electrification.

The first one is, clearly, cost and affordability. If auto makers could make these vehicles for $15,000 or $25,000, we wouldn't probably be sitting here
talking. There would be a lot of industry demand. People would turn their heads quickly and say, "Tell me more about that electric vehicle".

That's not what happens today. It's too easy to get gasoline. It's too easy and comfortable to go to the gas station. You think it's an okay procedure until you actually experience plugging in a vehicle, which is a really delightful experience and really seamless and comfortable in the safety and security and work of your garage, or carport, or driveway. So the big key for the auto makers is to take the cost out of the technology. So that's clearly our number one priority. But very quickly on its heels is, What are we going to do about infrastructure? And so installing charging infrastructure at a fast pace, including a very, very important and critical role by the utilities, is absolutely critical.

There are two ways to look at infrastructure. One is the perception that the consumers have about whether there's enough infrastructure. That is especially important when you try to get people to pay attention to you talking about electric vehicles; and do they think there's enough infrastructure. They don't have any idea of whether they're going to use public charging, or workplace charging, or home
charging.

So the perception is something that's very visible. It's in a public space. And that has to be addressed through DC public charging corridors, through key destination, the museums, the parks, the rivers, the national monuments that we want to visit. It's all about story-telling and making sure that everything connects seamlessly.

But the real work horse of EVs is going to be home and work construction, especially when we talk about the light-duty vehicle segment. Home and workplace probably do about 85 to 95 percent -- or account for 85 to 95 percent of all charging that goes into EVs today; and that's true for the last 10 years.

So it's a really important way to look at sort of the revenue opportunity that the utilities will have, what it means to consumers, and what it means to the utilities and the revenue staying within your state and growing that little curve in the states, and what it means to actually download, managing the charging so it's done with the right type of data.

And then the third real key tenet here -- and it cannot ever be overstated -- and that's building EV awareness, just getting the attention of the consumers. And a
little bit of it has to do with are the vehicles really affordable and it gets consumers' notice, or is there enough -- and/or is there enough infrastructure to get them to notice and they understand that there's something here's that's crazy, but it's really just something exciting going on. Those two will help, but there has be a direct effort to get the attention of consumers and educate them about why there are social advantages.

There are social advantages. There are Domestic U.S. social benefits. There are consumer pocket book advantages. The advantages sort of cross every sector. And it's almost one of the only times that I've ever seen something's that's win, win, win all the way across the board. Who benefits from electrification? The jobs, the economy, global leadership and technology, what it does for a consumer and so on. So getting those messages out to consumers is very, very important. You can do that through the web's campaigns. The utilities are actually very well-suited to provide that very educated guidance about how electricity can be used to move your vehicle to place to place, but also policies can be used to help accentuate through incentives. These are also forms of awareness campaigns.
Let's go to the next slide. Let's start with -- drill down into some of those top three barriers of what's going on. Incredible progress has been made over the last 10 years in reducing the price of added technology. This is the BNEF (phonetic) slide. BNEF is a quite respected analysis. It also takes away some of the standard. It does a lot of surveying, and it has some pretty good data.

And if you take a look at how badly the prices have dropped from 2010 to 2018, you'll see it's been really incredibly important. So if you're an OEM that's lucky enough to be sourcing batteries in the year 2018, you'll see that you might only be paying $176 a kilowatt hour. Whereas, if you're stuck back in the 2015 context from the early movers, or let alone in 2010 when you bought your battery resource from suppliers, you'll see that, if you're buying them today, you'll look like you got a pretty cheap battery at 176.

But I just always caution folks. Take a look at $176 a kilowatt hour. Multiply that by how many kilowatt hours it takes to move a vehicle like the Chevrolet Bolt, which is 60 kilowatts, and you get to a number like $10,560 for the battery. I can build a transmission and engine system for about 3 to $4,000.
And this is the challenge that auto makers have -- bus makers, truck makers, all of them -- to try to get an affordable technology out there. So while they're working on that in parallel and bringing vehicles to market we have to be responsible and create that environment for the demand for those vehicles, knowing that they are actually sitting on top of the (inaudible) to make this happen; but, in the end, it's the right goal to have.

If we take a look now at their -- even though it's happening in the country, let's just take a look at the map up there in the top left of corner. This is the US market share in the last year. The darkness of the state shows you where the load penetration is. Of course Colorado and California leads in this area.

If I look across at all states, it's about a 2 percent -- a 2.29 percent market share. So that's all new vehicles sold last year, within the last year, how many of them were EV? It was about 2.29 percent. If I look all the way back to January of 2013, they were down to maybe 1.13 percent. So we've doubled the market share in just the recent history.

So we're getting a lot of progress with EVs. They're getting much more traction, much more attention by
consumers, and work product offerings in the field.

Let's take a look and drill down now to the Illinois data. So if I look at the top sales by -- or top states by EV sales -- so just pure sales, not market sharing now, just the sales, EV sales -- and you think it would correlate to population or vehicle registrations. You see, if I look down this list here, Illinois is ranked No. 4 in total vehicle registrations as a state but No. 9 in EV registration, so a little bit below where it probably ought to logically fall if you look at the ranks.

And then if you pop over to the right-hand bar there, where does Illinois rank if you were in the market share? Well, I have to actually go below the graft here and go down to No. 17. So by market share, the penetration of how many --

Of all vehicles sold today, new vehicles sold in the state, how many are EV? Illinois is sitting at about 1.1-and-a-half percent market share. So Illinois is probably under-represented in EV sales; and that's something that we're here to discuss today, aren't we?

So let's talk about what drives EV sales.

There are a number of things. Nick is going to go into this in
a lot more detail. But if I just sort of look at some of the
top motivators and policies and things that states can do --
the federal government can also do these kinds of things; but
at the state level certainly here's the top dozen of the things
that you can do:

You can offer state incentives for the
vehicles and help the auto makers offset that incremental cost
of EVs today. You can offer HLV lane exemptions so that people
in the suburbs can get down to work. They may have an
exemption for fees or whatever on the HLV line. You might have
charging incentives. Utilities may be putting in place public
charging. There are a lot of things that you can do.

If I sort of look at the state map of who's
doing -- of the top 12 marketing key incentives, who's doing
what. You look at California, some of the 9 of 12 things
they're doing. And that's the sort of multifaceted approach
that they have. They sort of -- they've attacked EV
penetration and environmental goals by sort of -- in many, many
directions. It's not just an HOV lane. It's not just an EV
incentive. It's not just an EV awareness campaign. It's that,
that, that. It's two governors in a row that were from
different global parties, and they just keep a regular drum
beats (phonetic). They work very hard at it. I think a lot of people do it. The rest of us have to work a little bit harder in the other states.

But if you look at this, here's Illinois. Illinois has done three of the 10. Sometimes it's a little bit -- we have a decent sense; but still there's some room for improvement there, looking at what we do when the sun varies. It was just building codes. It was just simply an EV ready building code for the new construction. So those are the things that we were looking at.

Let's take a look at infrastructure. Again, it's of the landscape. And we talked briefly about -- sort of a little bit about everything. If we look at just what's happened in the last few years on EV charging infrastructure, there's been a lot of progress. So I try to isolate DC fast-charging because it goes back to that infrastructure slide that I talked about as a key barrier, especially when you're talking about DC fast-charging and public perception of whether there are enough places to charge, whether or not they know they're going to need it down the road or not, the perception is there that they have to have much more access to EV infrastructure.
Look at the map in 2015. In 2015 there were 204 EV charging stations, fast-chargers across the country. Today, 5 years later, 2,000 chargers, charging sites, with 4,200 chargers cumulative across those sites. So a lot of progress has been made.

Let's go down to Illinois, down here. You can see that there are 49 DC fast-chargers across the state, and much of them are here centered in Chicago. Not bad. 91 chargers at those 49 sites. But if I sort of drill down and say, "Well, I'm a person who really wants to get an EV, a pure battery electric vehicle, and my range in my Chevrolet Bolt is 238 miles, it's 209 miles from Chicago down to Effingham, which is as quick a juncture between the 57 and the 70; so I don't know if I'm really ready to buy an EV if I make a lot of trips down South in the state — you know, to other neighboring states. I'm just thinking that this is not sort of the message that you want to be sending to consumers to get them excited about this technology.

All right. Let's look at what NREL did. It was about a year and a half ago. They did a really nice model of the analysis of how much infrastructure would be required. At least it's a place to put a stick in the grass and say,
What do they say? You need to support 15 million plug-in electrical vehicles in 2030. Just for the sake of the graph let's say that there are $15$ million EVs, whereas today there are about 1.3 million EVs in the country today.

So we assumed this, and we assumed all homes had home chargers, which is a really important assumption here. What you find out is, if I just look at that across the line, down there, in the U.S., they project based on intensity of the EVs, the city environments, and towns, and what you do for the corridors to connect them for the perception of the EVs. You need about 8,500 charges locations. And so, if you compare that to the number on the previous slide, which I think is about 2,000, we have a ways to go on just the location and availability charges.

Let's look at the Illinois breakdown. They actually broke it down by state, again, looking at the vehicle registrations and so on. And you see that Illinois is moving at a speed of 880. Compare that to the 49 charges that I have on the previous slide; so a lot of room to grow here.

Let me quickly go through these last three slides that I want to show you about how to do this cost-effectively. What are sort of the three tips that I can
think of to look for cost-effective ways to think about and strategize your infrastructure? One is this really cool map that Missouri did. Maybe you guys have done it. I don't think so. I don't think a lot of states have done this.

It's got the utilities organized across the State of Missouri. They all got in a room over a period of a few months. And you can see how you had the investors of the utilities. Like, Ameren has power right now, together with the co-ops, a bunch of co-ops, and together with a bunch of muni's; and they, together, organized a map process of "I'm covering this service territory. I'll commit to putting something in the juncture, at least a couple of highways".

IDOT doesn't need to be covered, so you pass through here. I mean, this is a strategy. Talk about communicating with the other players here to make sure that there's a plan and no one's overlapping or underlapping. And that's a very responsible way to go at this.

I also wanted to highlight today building codes. Building codes -- if you don't start today, you're just delaying, for another couple of years, the availability of putting in place wiring -- just some wiring or even the panel capacity in homes to put in a charger. Whereas, today wiring a
home that's not pre-wired for an EV charger can be, on average, perhaps $1400 for your Level 2 charger if you don't want to just plug it into the regular outlet.

Putting in the codes in advance and just laying out, again, the capacity of the panel and maybe even some -- the race wires (phonetic) to make sure that the wires could be added simply later on is a huge cost savings down the road for homeowners, dwellers, and common dwellers.

And so this code -- I'm very excited to say that just weeks ago the 2021 version of the IECC -- this is the International Energy Conservation Codes -- were approved that included EV readiness for both commercial and residential areas. This is really exciting. This effort was made over a couple years time period, and they finally actually did push through.

If you look down here at these maps, who actually pays attention to IECC codes? Well, Illinois does.

There are only a few states that actually don't adopt IECC codes eventually; and you see them in white (indicating).

Eventually -- otherwise, commercial buildings and residential buildings, some -- the darker green have adoption within about 2 or 4 years; and then in Illinois you can see adoption within
maybe 5, 6, 7, 8.

This is something that Illinois can jump on.

Just jump on that right now. Grab the IECC codes. There's a lot of people in this community right here that do a lot of EV work. They all contributed to defining what would be the minimum requirements. It's not egregious. It's actually pretty good.

And then, finally, I was asked to take a look at the demand -- some work that we did online recently here, looking at demand charges for EVs. When you're looking at an early market and you're trying to put infrastructure in place, you're trying to inspire third parties and utilities and others to put in place infrastructure; and when you're faced with costs that can be absorbed, it can be hundreds of dollars a year. It can be thousands of dollars a year, because we're just at point where there's very little utilization at these stations, especially these DC fast-chargers -- maybe 5 percent utilization. You don't have the revenue to offset the costs that you put into it, so the demand charges can stick out like a really sore thumb.

So what we did to our -- we took a look at three different -- I didn't go into detail. We took a look
at -- we did this for the Colorado Energy Office. We looked at what was proposed for ED rates. We looked at -- we proposed a new sliding scale that actually offered and put in place lower demand charge. We had lower utilization stations, like 5 percent; but the demand charges grow over time with utilization of the stations.

That's a logical way to approach this so you don't set up new barriers for entrance to installing infrastructure. And then we compared this to what PG & E was doing out in California and found that this sort of sliding scale infrastructure was really important.

And, lastly, because I have zero minutes to go, I just want to say if you want information about sliding scale, rate design; or if you want, we have a brand-new infrastructure cost that's coming out this week, that's available at all of these other studies that are really pivotal and talk about -- kind of answer the questions that are really key on your minds. All of these are down below and on our web site. I'll be happy to answer questions afterwards. Thank you.

MR. DANIEL BOWERMASTER: Hi, everyone. So I'm Dan Bowermaster from EPRI. So EPRI, in case you don't know, we're
a nonprofit. We've been around since the early '70s. We do research on behalf of Society of Illinois Electric Grid (phonetic). Our electric transportation group has looked at EVs, big and small, for 3 decades now. So one of the themes that's kind of funny that's a juxtaposition, sort of a dichotomy, is that there's really big picture stuff and then there's really local stuff, both on the vehicles themselves as well as the infrastructure.

For example, the car companies, they exist in the global market. China is the largest market. Right now the EDU, as of a few days ago, has some of the strongest regulations. You know, so they -- every business has to make short and long-term decisions to execute on this long-term probability. That's something on the car side. I think that that's important to remember when we kind of start talking about minuta.

On the other side, from the customers -- and I'm not talking fleet matters here. But each of us as individuals, if we buy a car today, personal decision. It's the second largest financial expenditure after a house. There's emotions to a varying degree associated with what car or truck you buy. There's obviously kind of your position in
life, if you're a single or have a family or what have you. So
the point is that there's this kind of, like, tension between
the big picture stuff as well as the individual.

And on the infrastructure side there's billions that have been invested in this across North America,
and we'll get into that in a minute. The same time when it
comes down to -- like Britta just said, there's codes and
standards. There's the setup of your house or apartment or
condo; it's the local -- what does the local fire department
say. There's all of this little, little tiny stuff that
actually makes a big difference in whether or not
infrastructure gets adopted, or gets installed, or a vehicle
gets purchased. I think it's important to keep that in mind.

So sales -- and I didn't realize that this was
washed out. It's hard to see. The next slide shows Illinois.
We're about 2 percent of the market. There's about 1.3 -- or
as of '23, there will 1.3 million EVs on the road.

And the county level sales range from zero
percent in some counties to 75 percent in other counties. And
out in California it's normally 22 percent; so it really
varies, as far as how these are being adopted. About half the
vehicles sold are in California. Right now that number is
decreasing slowly, but it's in the upper 40s.

Looking at Illinois, you can kind of see the county level sales, again, is a 12-month average. Anyone who distributes from Illinois you can probably come up with this slide on your own. One of the challenges facing the market right now is that there's about 40 plug-ins that are available in, largely, the ZEV states (phonetic), not quite, and then about a dozen that are available in non-ZEV states. So that's the first kind of level. And then the second level down from that is whatever the dealers choose to stock. But that's something else to remember is that the car companies have zero control over these dealers. Each dealer is an independent business, and they make their own decisions, again, to execute their own goals.

And the good news, looking ahead, is right now there aren't -- the U.S. car market is largely -- is about 60 percent SUVs, 4 percent cars. And we've seen headlines about how SUVs have exploded in popularity. Also, the big trucks are the best selling cars in the U.S. year after year. 7 of the 10 best selling cars are actually trucks, SUVs, crossovers.

But the point is that, if you look at -- the blue -- that blue section of the truck there is the number of
SUVs, crossovers, and trucks -- or excuse me -- SUVs and crossovers that are announced by the OEMC (phonetic), released after 2023. So point is that customers, maybe not today, but over the next, say, 2 or 3 years are going to have more plug-ins to choose from than, say, maybe the more broader vehicle market is doing today.

Yesterday the CES showed Vegas, Jeep, plug-in hybrids, crossovers, SUVs that were plug-ins from Audi, BMW, and Toyota, and others. So this is coming; but right now, you know, if you're in the market for, say, an all-wheel drive plug-in, they're in a relative area. There might be a few in the future there. And, yes, there are plug-in pickups coming from companies, big and small, in a few years.

It's also important to remember the larger vehicles that -- we'll have later speakers talking in more detail about this, but there's more than 2 dozen different kind of vehicles ranging from garbage trucks to tractors and ferries and et cetera, and all kind various states of development. You know, electric transit buses I would say are some of the furthest along; and Kate will talk about that later.

It's important to remember that all of these vehicles, they have a job to do, so this is not an emotional
vehicle. This is a job that picks up your trash, or delivers your kids to school; or, if there's people around laying outside -- you know, they have a very specific job to do. And these fleet managers have been burned by all fuels over the year. So between their mission as well as they're history, it's understandable that a fleet manager would have been reluctant to switch to fuel; and that's even before you add in the financial -- you know, however the finances are structured. But the point is that these are coming. We've seen a big swing over the last 4 years. You know, on the larger vehicle side there used to be a huge push for compressed natural gas; and that continues in some spot. You know, it's kind of an all of the above type fuel strategy. We're seeing more battery electrics, plug-in efforts, and even some measuring fuels.

So what are the utilities doing? So this maps looks at the North American, Canadian friends proposed or approved utility infrastructure programs. It's important to remember, you know, as Britta mentioned, that these all -- in addition to the charging infrastructure, nearly all of these included a degree of customer education and outreach; and I agree that's a very important factor.
You know, these -- for those of you who aren't involved in the regulatory process -- again, EPRI doesn't involve you one way or the other on policy, but there's a lot of discussion who owns the last 10 feet or who owns the last 20 feet, and that will continue regardless of, you know, all of the utility work to that last 10 feet.

The point is that it's a significant amount of money. You know, Nick is going to go into more detail about this. But how I see it is there's kind of, like, one or four tronches (phonetic) right now for infrastructure funding. There's kind of the stimulus package that Wall Street put together 5 or 6 years ago. There's been government money since. There's utility money. And I'm sure there's one I'm missing; but the point is, again, it's an all of the above type strategy. It's how do you maximize that dollar spent for that infrastructure.

Looking at Illinois, it says -- basically, we're just going to look at the data that represents the location of charging stations that develop over time of both Level 2, which is compartmental (phonetic) charging as well as fast charging.

I was asked to kind of talk about lessons
learned that was, from our perspective, these two final sides, one on EV and one on infrastructure. You know, at the end of the day, like, very few of us in this room can impact what EVs are designed. It's important to note that EV technology has improved a lot over the last couple of decades not just on the batteries, but that's a big one that Britta talked about, the cost going down.

Sales are impacted by policy and incentives and customer choice. We just did a study on, basically -- we tried to answer the question of if the Utility had a dollar amount that they invested to grow -- to increase EV sales, if that was what they were directed do; and, you know, I said, "Do they put a dollar under the hood of the car. Do they do rates? Do they encourage carpooling access?" And what we found is that, yes, money, basically, across the U.S. -- money affects every one.

Then the next interesting thing to me was, basically, kind of where the customer was. If you're in an area of high congestion and carpooling and the EV gave you access, and that was to if you're in a place that definitely has much other in the ways of infrastructure programs, then infrastructure goes down too. If you're in that area of high
fuel prices and high electricity prices, then off-peek rates
are the second kind incentive for customers. So, again, this
is an example of the utilities from kind of coast to coast; and
it was interesting to see what the study said.

So on the infrastructure side this is, again,
more of the utility than EPRI. The first thing that I want to
say is the grid can handle EV charging. When we talk about
this, you know, breaking the grid down, it's more that the
utilities provide safe power every day. You know, when we talk
about I-power charging, that's kind of like the Walmart; so
we're not talking about, like, Walmart breaking down the grid.
I'm not trying to say that it's not without consequence. It's
just a ton of hard work goes into keeping the lights on not
just for the utility, but everyone involved.

And it's more of a -- at least from where I
sit it's more of a question of -- when we start talking about
these, especially like the high power charges, it's like how do
we do this where it meets the customer's expectations, whether
that's a homeowner, or a private company-- how do we meet that
expectation, which is usually kind of customer service and how
long it takes to get power there. And what's the cost to them?
What's the overall cost to the ratepayers, sort of the broader
appearance of customers in that area. And that's where the
big, kind of, like, future aid comes in; and that's good.
That's what we should have.

What we've also found is that -- and this is
the fully electrics -- there is public charging infrastructure
that's needed that's higher power, in terms of how much, where
and when. I that map, that picture of Missouri. That's a
great way to look at it. Because there's -- I would caution
people -- I would caution all of us to think about -- the
answer might not be opening high power charging everywhere. I
think it's more of a portfolio strategy.

My boss came up with that charging pyramid
years ago. The thought there was always, like, about 75 to 80
percent happens at home, largely overnight. The 15 or 20
percent happens at work. The remaining kind of 1 to 5 percent
is public. And public's important because it's like on
Thanksgiving when you want to drive to your grandma's house, or
December when you want to drive to the next town and go faster.
So that public part is important. We can't ignore it. But
what we've found from some additional data is that number
really is like 80 percent. We have 15, 16 percent happen at
work. And then you're at 2 or 3 percent for public. So, you
know, you don't want the tail to wag the dog when it comes to public charging. That's quite important. It's also important to keep things in perspective.

As we think about that, then it's like what can we do broadly as a stakeholder. There's been a ton of work already done. Building codes are mentioned. There's a lot with fire and local planning. How do you help your customer, again, whether it's a fleet or individual or workplace? When it comes down to it, we're all humans. We can exist without it, but we all have a million and one other things going on. I'm sure the people in this room have a million and one other things going on. We have a life. We don't want to figure how much is the kilowatt hour and what does that mean in dollars per ounce. We're humans. I'm an engineer not a psychologist, so take this with a grain of salt. But we're used to, like, getting gas. It's a dollar per gallon. We all get that. Going to the gas station is not -- one you switch to an EV it's more like a phone. This is great. I wake up in the morning. The car doesn't stay over night. You program it once, and that's great; but, you know, there's this human part, too, that I think is extremely important. This goes back to that education piece. And, you know, it's not just the utilities
doing the education, or the companies, or the nonprofits, I
think it really takes a village. And that's something that
we've learned out of the past.

So I think I will leave it at that. And I
look forward to your questions. Thank you.

MS. NICK NIGRO: Thanks. So first I just want to say
thank you to Commissioner Bocanegra and the other Commissioners
here, and all of the Staff for organizing such a great event.
Britta and I were talking about, just before things got
started, this is the best organized event. Printing our names
on both sides of the tent cards, this is some real thought that
went into putting this all together, so thank you for that.

So for my slides now, my name is Nick Nigro.
I work. I work in Atlas Public Policy. I'm also the senior
advisor for the Alliance For Transportation Electrification.
So I was asked to talk about public policy, rules of utilities,
what goes on with funding opportunities. Before I get into
those details, I just want to rate some of the points from my
colleagues here.

First, the reason that electric vehicles are
so successful and, in my opinion -- or at least the opportunity
for transportation electrification is so big is because of that
progress with batteries. I just want to reiterate that point.

The steep, steep decline in the costs for a kilowatt hour of energy from a battery is making the tent for electrification significantly bigger than any of us who has been working in this space for 10 years would have thought were possible back when we first started.

In the beginning it was all about plugging in hybrids, trying to get people into 75-mile-an-hour commuter cars. Now we're talking about Class A tractor-trailer electric vehicles. Transit buses are cost competitive with -- electric transit buses are cost competitive with diesel transit buses on a total cost margin basis now because of what we've done with batteries.

The tent is big. Also the opportunity is big. We have a product that's called EV hub where we track data on this space, and we've tracked over $350 billion in announced investments by private companies into this space. So where is the United States? How much of that money is going to get invested here? In my opinion, that's up to us as folks who work in public policy to make sure that this is an attractive market for those dollars to be invested. And for those dollars to be invested we have to be an attractive market for the
product. So we have more work to do, but the opportunity is clear. The 2010s were kind of about getting started, honestly and having a 75-mile-an-hour range Nissan LEAF, which was great but didn't fit a lot of people's needs. The Chevy Bolt, which was a great piece of engineering; but the 2020s could be the last decade where internal combustion engines are the undisputed leader of transportation. That's the opportunity.

So what we have to do now, as people who work in policy, try to lay the groundwork so that we can -- the U.S. at least -- can be competitive because the rest of the world is not sitting idle and saying, Oh, what's the U.S. going to do on this. Let's follow that. They're in front of us in a lot of cases.

That's my company. We started about 5 years ago. We're not quite as old as EPRI, but we do a lot of work in this space, in transportation electrification. What we're trying to do is bring data to this space, to our customers and people who are in public agencies, like the state of Washington, the state of Tennessee, the state of New York. We also work with nonprofit advocacy organizations to make sure
that they're grounded in fact and also some private companies
as well. So we try to sit at the intersection of all of the
people working in policy.

I mentioned this product EV Hub we have. If
you work at a public agency, it's free. If you work at a
private company or NGO, you will find it would be pretty
affordable, but really the intent of the product is to try to
give all of the information that you need if you're working in
policy transportation electrification in one spot.

Just out of curiosity, who had heard of EV Hub
before this event? I just want to know.

(Hands raised.)

MS. NICK NIGRO: Great. It's working. So to the first
slide I wanted to talk about is -- before I get into the
utilities, and Volkswagens, and settlement funding and such is
a critical program that kind of lays the groundwork for state
action in transportation electrification. Unfortunately where
I'm from in DC we're not doing very much in Congress and the
federal government right now to advance this technology -- or
at least as nearly as much as we could be doing.

And so as with so many other issues, we look
to the states to take the lead in experiment and trying new
things. And the ZEV program is one of corner stones of a lot of the states that have been leaders in this space. It's not Panacea (phonetic). Being part of the zero initiative vehicle program started by California some years ago is not going to guarantee that you're going to have vehicles sold in the state, but it is an important part of that.

And for the first time in many, many years the number of states that are a part of the ZEV program started to grow last year. And I think that was a reaction, frankly, to the need for states to start to lead and to try to create more demand for the products in their regions. So Colorado, New Mexico, Minnesota all took steps. Colorado actually joined the ZEV program. Minnesota and Mexico took the first steps towards it.

When I think of a state like Illinois where you'll have a great start at trying to make a vehicle in this state. I think that it's important. If you want to be a part of the ZE program, that would be a way of helping to encourage that. That's not something that the Commission is going to do, but it is something that I think is important. And one last stab on that. Almost two-thirds of the EV sales are in ZEV states.
So I'm sure everybody's heard of the Volkswagen settlement. It was the single largest environmental settlement in U.S. history done right after the Obama Administration. And it is infusing billions of dollars into reducing emissions from the transportation sector. And for -- the good news for folks who are working in electrification, a lot of money is going to be going into transportation electrification. $2 billion dollars of that settlement is just for a subsidiary for a Volkswagen that's called Electrify America. They're building fast charging stations all over the United States including here in Illinois.

But that's only one part it. The part that's a lot more nuanced and a lot more wonky, if you will, is the environmental mitigation trust; and that's controlled by the states. Every state got a tranche of money from -- as part of the settlement based on the number of Volkswagens that they actually had their states. So Illinois has millions of dollars to spend.

And if you look at how that's going so far, how is electric technology competing against alternative technologies. Because the settlement is not saying let's get EVs out there, necessarily. It's about let's reducing
emissions from the transportation sector. So far
electrification is competing really well. And I can go back to
my original point about where the opportunity is.

A lot of states are seeing -- this is not
something that we expected to have as a state, all of these
millions of dollars. So let's make a long-term investment.
And to that end, about 50 percent of the money that's been
awarded so far from the settlement is going toward
transportation electrification. It might not be easy to read,
this pie chart. But the biggest piece of that chart are those
transit buses, because I think, in my opinion also, not just
the opinion from the data, but transit buses are probably the
most promising near-term opportunity for EV energy
electrification, and it's evident from the numbers: federal
government, federal transe administration pouring hundreds of
millions of dollars into doing electric transit buses. Lots of
cities have committed to going all electric. So a lot of
problems there. And the Volkswagen settlement is a great kind
of kick start for that.

Charging stations are also very popular for
deploying these funds, light-duty electric vehicle charging
station. I know Illinois now, I believe, allocating the
maximum 15 percent of their funds towards that. Most states are doing that. Nearly every state is putting at least some money toward light-duty infrastructure. And that's helped fill in a lot of that charging gap that Britta mentioned from the Natural Illinois Energy Lab Study.

So, in total, about half the states have made awards for transportation electrification; as of last month, almost $200 million dollars. School buses, too. You know, I would say that school buses are further behind than transit buses in the same way sort of where trucks are right now. They're not an easily mass marketed product. They're still just in their infancy, but these are great opportunities to start to get some of these vehicles out there into fleets so that they can start to experiment and understand how those vehicles made it successfully into their daily operations.

Moving on to utilities. So Volkswagen Settlement, billions of dollars. Private sector, lots of money as well. The other big funding opportunity for infrastructure in the near term is from the electric utility industry. We track all of the proceedings that are going on across the United States related to transportation for EV Hubs, our product. And on what you're seeing here is the current status,
essentially. $1.3 billion dollars has been approved by Commissions across the country $1.4 billion dollars is on the table. A lot of that money is for charging infrastructure. Some of it's for actually rebates and discounts on vehicles themselves, but a lot of that money is going to go into infrastructure. Some of it is going to go into consumer education.

To Britta's point about where the utilities are going to be placed around the world, there's just, essentially -- this is where a lot of the action is, if you will, on the infrastructure side of things and really laying the ground work for those second generation of electrical vehicles that are coming this year, next year, and the year after.

There are some denials, too. And I know we're probably going to get into that in the discussion. So it's not always on the -- it's not a slam dunk. The utilities aren't batting a thousand, essentially, when they try to do these proposals. So there is a process that's being established slowly but surely, in terms of good practice. And what I will say right near the top of that good practice is what we're doing here, getting the community engaged early on in this
process, making sure people are on the same page about what the opportunities are, what the proper goal is for the utilities in supporting this industry. Having these kinds of forums is critical to success.

So it's not just the coast, if you will, that's really engaging from the utility perspective. It's all over the country. In fact, the Midwest was some of the first utilities to issue proposals for transportation some years ago.

What you will notice from that slide is lot of this activity by your neighbors. So it's good to see that, and I think Illinois -- you guys have an opportunity to help lead in this region, and it's something where --

As utilities issue initial filings, sort of pilot projects, to learn about what they might do, what their role might be, that's sort of the first steps of the follow on proposals that come out of California. They're more about scaling up. So that's generally been the progress so far, but you can see it's widespread throughout the country.

On the top here of this chart is the timeline; and, basically, that ramp-up is kind of very similar to the ramp up of sales, frankly, from a passenger vehicle perspective as the market was evidently growing. As more vehicles got on
the road it was clear that the electric utilities need to play
a stronger role into ensuring that there would be an adequate
amount of infrastructure for those vehicles. So we saw a
considerable ramp-up in 2018, even more new proposals in 2019,
and I can -- there's no reason to expect that that will slow
down in 2020.

And so what are the Utilities proposing so
far? A lot of it is about infrastructure, which makes sense,
charging station. And to what extent is the Utility -- what
role are they playing? It really varies by the state, by the
utility, what their strategy is. In some cases they do rebates
for charging stations, for residences. Sometimes it's, "We're
go to own and operate and fill in the gaps in the charging
infrastructure that the private market is not doing. Sometimes
they'll fund programs where -- which are known as make-ready
programs where they will, essentially, cover the costs all the
way up to the charging station onto the equipment. That's
usually about 3 quarters of the cost of the installation, so
that can be a considerable advantage to a third-party that's
trying to install infrastructure.

So really where, and how, and who they're
targeting, all of that kind of depends on the program and the
state where the gaps are. EV rates are also an important part of this in ensuring that vehicle grid integration is done smoothly. We didn't talk about this yet, but there's been a lot of research, essentially, that's been out. In theory, electric vehicles, when charged properly, will generate a lot of benefits for the ratepayer. A lot of studies have been done. EPRI did a study. The U.S. DOE (phonetic) did a study. Lots of independent institutions have done studies. We're starting to get data on that finally to see how that's played out. You can look at California to kind of see where the future might, considering how many vehicles they have on the road today. And the data that came out last year indicates that there were a considerable amount of additional revenue for the utility for those programs than what their programs cost. Essentially, a huge benefit to the ratepayer that was generated from these charging programs by California.

That was additional revenue that ended up going back to the ratepayer in some form in that state. So that's good news. It was just theory. There was also some practice there to demonstrate that benefit.

Okay. Just in time.
(Laughter)

COMMISSION MODERATOR: Thank you all of our panelists for the first discussion. That was excellent. We have some time for questions. I'd like to begin first with asking any of the Commissioners have questions for our panelists?

COMMISSIONER OLIVA: Nick, based on your experience, why are other commissions denying electrification proposals or pilots?

MS. NICK NIGRO: So the answer to that is it kind of depends. In some cases the utility proposal is unexpected. There was a lot -- there were some first movers early in the day in some states, Missouri, for example, where the proposal wasn't sort of expected by the Utility -- by the Commission, I should say; and so the role of the Utility was unclear at that point.

In addition, there are other states where there wasn't as much, I would say, buy-in from the stakeholder community. A good example there is in Michigan where the Commission was supportive of utility engagement in this industry, but it wasn't clear exactly if the proposals that were put forward were a reflection of what the community believed was the proper role; and so those denials were led to
subsequent filings that were a product more of community
engagement and such, and those subsequent filings were
approved.

So the short answer is it depends, but I think
the long answer is I think you want to ensure that the
community -- these forums like we're doing here -- take place
so that the role of the utility is clear. Success often comes
through signals from policymakers, whether it be governor or
the legislature, that indicates that there is a proper role
for the utility. I think having a forum like this is a good
way of helping to establish what that role should be.

CHAIRMAN ZALEWSKI: I think all of you mentioned the
benefits to consumers. And I'm wondering -- you kind of talked
a little bit about costs for consumers. Is that in regard to
absorbing some of the intermittency for renewables for the time
of use, or is that for a different reason? Can you just expand
more on what you meant? In your last slide you talked about
how it was beneficial to consumers.

MS. NICK NIGRO: So the amount of revenue that gets
generated into kilowatt hours that are used in the system
generates a lot more revenue for the utility. At least in the
case of California, from an evidence standpoint and from nearly
all of the research that has been done on this topic from a theoretical standpoint, there's more revenue that gets generated than the cost of the programs. It's fairly as simple as that.

There is going to be -- you'll have to make sure that some charging is done at the appropriate times, but in the case of California, you know, that to me is so far the best example where you see tens of millions of dollars of additional revenue that will go back to the ratepayer.

COMMISSION MODERATOR: Any other questions from the Commissioners?

(No response.)

COMMISSION MODERATOR: Does anybody in the public have any questions?

(Hands raised.)

COMMISSION MODERATOR: Also, when you ask your question, please state your name very slowly for the court reporter.

MR. CHRIS PENA (PHONETIC): Chris Pena from Siemens. I'm going to pick on you Britta.

In the recent congressional tax package, the incentives for tax credits for most vehicles and the charging equipment were not included. I'm wondering what you think that
might do, in terms of the effect on the market.

MS. BRITTA GROSS: Well, if George is any example, right, the $5,000 State tax credit for electric vehicles was in place and fell away in 2015, and EV sales just plummeted. There's going to be some of that. It might be -- you know, with an Atlas gain now for 9 years of two automakers, Tesla and General Motors, who have now reached a point where they've sold 200,000 and reached that cap, which means now incentives is now expired. It's really unfortunate. This is politics at play. And that was really unfortunate. It is the number one way to motivate sales. It's what Norway did. It's what China did. It's what the Netherlands have done. Where you have success is where you're going to stay. Whoever said it here, Dan or Nick, where we don't have a national vision the states are going to have to -- let's get active and pay attention to what this means to the revenue equation for your state, either detracting federal dollars for the state by putting in the infrastructure and drawing several thousands is really what the state does. It's really important what the state does. At one point, for financial reasons it stopped a few years ago.

It's really important. I don't give up hope.
I think that because you saw the battery numbers, I want to explain how you do math to understand what the incremental cost of these batteries until we get to something more, like, $70 a kilowatt hour, which that's in the foreseeable future just not today, I think in a couple of years let's see if maybe we can have a real national industrial strategy and energy strategy combined that really looks at this and says this is in our national interest to have a very strong program here, and it will be -- it may need some incentives just for a few years.

MR. CHRIS KENYA: And I think it's good news that Tesla sales were strong.

MS. NICK NIGRO: If I can build off that last point that you just made. Tesla's sales were very strong outside of the United States this year in part because the incentive wasn't there. They were moving to where they were easily selling vehicles, so they sold a lot of vehicles abroad. This goes back to me point about whether or not the United States is going to be an attractive market to create demand for this product in the near term. That's up to us in the policy making community.

Because the tech is going to get there. They're going to get to cross parity. They already are in cost
parity from total cost perspective in a lot situations, but
they're going to get there in the upfront perspective in the
immediate term in this decade. So it's up to us to have a
policy free market in place, but it kind of sets us up for
having that demand in this country.

MR. CHRIS KENYA: Thank you.

COMMISSION MODERATOR: Anyone else? We have time for one
more question.

MS. JULIANA PINO: Thank you. My name is Juliana Pino.
I am the Little Village Environmental Justice Organization. My
question pertains to policies and programs specifically focused
on expanding access to all consumers.

You know, in hearing the studies, the general
perception from communities, there is still a feeling amongst
many consumers that electric vehicles are luxury goods and that
they're not delivering additional benefits, nor will they
benefit the entirety of the society.

I'm wondering if you have examples from other
states that really focused on the issue of low income access
and that look at what kinds of principals and practices have
been successful at truly equitably delivering the benefits of
electric vehicles.
MR. DANIEL BOWERMASTER: So let me just tell you what EPRI'S observed. So it's a great question. There's a couple of ways to think about it. There's, first, the vehicles themselves. And it's important for all of us to remember that most of the car market is actually used cars. So think about electric vehicles, money not owed not just for the first owner but money owed for the second owner. A lot of these vehicles -- I think it's north of 65 percent -- there's an actual lease, so that means they're only in the hands of their first owner for, say, 3 years.

But to your question, then by the time you get that charging infrastructure installed, whether it's from the community, or home, or what have you, and they're a renter, by the time you install those kinds of barriers, I think that a key portion. There have been different examples around the country that have done that.

And the second thing to think about when we they about, you know, in terms of benefits -- so the greenhouse gas piece gets talked about a lot. The piece that doesn't get talked about a lot is the improvement to air quality. So when I talk to family around the Thanksgiving table, it's like "Oh, greenhouse gas is like stove and you slowly turn it up; or, if
you're a kid, building a fort and putting your head under the blanket. The other part is all of the tail pipe emission, and that directly impacts human health. It doesn't matter kind of where you are. It's the oxides, the nitrogen, it's the soot coming out of a tail pipe that that impacts all of our health, and especially for the very young and very old.

So there are benefits for people in general. There's no shortage of challenges, especially when you think about the infrastructure installation piece, but it does benefit society in addition to the financials of it.

MS. BRITTA GROSS: And I would just add transit -- it's very exciting to see money being spent on transit buses. And, again, a lot of people will benefit from that, having exposure to either school bus or transit buses that are electrified; health benefits, and air quality benefits, and then you know pocket book benefits too. So I think that's really important here, too.

COMMISSION MODERATOR: Okay. Thank you so much for that. We need to take a break right now so that we don't run over too much. Thank you to all of our panelists.

(Appause.)

(Whereupon, a brief recess was taken.)
COMMISSION MODERATOR: Thank you for everyone coming back in a timely fashion. Now we're going to start with our second panel entitled Driving Forward in the Public Interest: How Demand, Fleet Investments, and Deployment Shape EV Integration. I'm going to introduce our three panelists. As before, there will be the presentations and we'll have some time for questions at the end.

First with us today is Alexander Keros from -- he's the lead architect for EV infrastructure at General Motors. Next to him is Kate Tomford. She's the senior analyst for the Finance Department at the Chicago Transit Authority, which Chicago knows as the CTA. And then there's Phil Jones, the executive director of the Alliance For Transportation and Electrification. Thank you.

MR. ALEXANDER KEROS: Thanks, again, for organizing Commissioner and a great dialogue. Maybe before I jump too into the details, you know, sort of reflecting on some of my best friends from the last 10 years and the words they said over the last hour; but there was words about sort of taking a village to make this work and the need for community involvement to be successful.

And the way I like to sort of characterize it
and have is my son Andrew was born right about the same time
that we were launching the Bolt. He's now 9, and he is going
into third grade and struggling with what third-graders
struggle with, which is he's sort of popular, he's sort of not.
He's trying to figure out, "Do I grow up and get smart, or do I
play more sports; and, if I'm not good at sports, then what
does that mean?

And the point I make is, like all of us who
raise kids or have a family with kids in it, it takes a lot;
right? We don't kick their butt out of the door at Year 3.
Usually it takes about 18.

(Laughter.)

Alabama: Usually it takes 18 years in many respects, and
sometimes sooner and sometimes longer, to get them into a
position to be successful. And it's fun for me to judge where
we're at in life against my son and where I'm at as a father
and where he's at in his growth development period. And he's
also to blame for this voice, so I apologize. But it's a need
to see how things have to grow up and really to echo what they
said; and certainly my perspective and General Motors'
perspective is to do this successfully, A, it's possibly more
of a marathon than a sprint, which sucks. I think we all want
it to be a sprint. But also it takes a lot of energy and a lot of thought into making it right. My family comes from the restaurant business, so I liken it to recipes; right? You can have regional recipes that all work, but you need multiple ingredients in that recipe to make that work. And all of us in this room, I think, have an ingredient to offer or thoughts about how to adjust those things.

So, as this is, hopefully, one of many conversations in the future in Illinois on how to make the Illinois recipe successful. You know, I just give you that little bit of insight of, "This is not easy. It's hard work, and it takes a lot of time and effort amongst all of us to be successful". You know, we -- I think when Mary announced this sort of 000, it was a really neat way of coalescing around some really important things in sort of the development of transportation. She has famously said, you know, transportation doesn't change in the last 5 or 10 years more than within the last 50. And she's spot on. And this is really a rallying call for our team; and I am blessed internally to be able work on, essentially, all three of these, both on the electrification side and the mobility side. But this is, as it says, our driving force to be successful.
Also, you know, I think Britta, Dan, and Nick sort of characterized this as well, but it's also important for you to here it out of an automaker's point of view. What sort of matters in this market and what have we learned over the last 10 years. As an owner of three different EVs how do we get this market better and how do we expand it over time? And they certainly hit on key aspects. Longer range. People need to feel comfortable with the vehicle and the affordability of that range are very important.

Infrastructure continues to raise as a key issue. As Britta said, as Dan said, the triangle of home, work, and workplace -- or home, work, and public; but how do those pieces come together are really, really critical. And I think we see ourselves as important lynch man in making sure that's successful.

And also the what, the performance of the utility, the form factor of the vehicle become very very important. We were obviously on the record over the last couple of years of bringing the Bolt. It's not 237 miles anymore. It's 259 in the 2020 Bolt EV; and our goal is to continue to expand that while lowering costs; right? We have to do both at the same time to bring it into mass market; but
this as well. The form function of these cars -- not everybody wants a 4-door small sedan. Not everybody want's an SUV. The form factors of these cars really need to be for different individuals.

And to take my GM commercialization hat off, not everybody wants a GM product either. Not everybody's a Chevys man or a Cadillac, and they love their BMWs, and they love their Fords. Everything has to be on the table for this industry, again, to transform. That was not a commercial for those folks.

(Laughter.)

MR. ALEXANDER KEROS: And of course this idea I think everybody here knows this. I don't want to repeat it. It's also got to be profitable. And I, on a daily basis, have to add to my leadership on how are we getting there. Right? When we talk about sustainability, I hope everybody keeps in mind the economic sustainability of these things to be able to invest continuously as we move forward.

You know, also the battery, we talked about cutting down the costs. GM has also publicly stated how quickly we're coming down the cost curve, but it's still a big piece of this puzzle. And if people are paying attention, a
few week ago, in the early December, we made an announcement
with LG (phonetic) venture for a plant in other states, but
really around driving down the costs and really pairing what
we're good at, manufacturing, as well as LG Kemp (phonetic) is
really good at, which is the advanced technology. That is
another step. Right? This is a billion dollars investment,
2.3 billion to be specific, in trying to drive it, right, it's,
bringing 1100 cars to an area. That's also equally important.
These things will continue to happen and need to continue to
happen further to really drive the costs out of batteries.

Also -- and I'm keeping my comments short, so
perhaps we can get to more questions; but, you know, my
responsibility within GM and what I'm charged with is really
the infrastructure piece. And when Britta and I started this
10 or 15 years ago, a lot of it was around sort of readiness
and just getting prepared and if figuring out sort of the what.
I think today when you would ask my leadership what's my job
really? How scarce is the job in general? It's to make sure
that infrastructure encourages the adoption of EVs. Right?
It's not a competitor. It's that it encourages. And what we
failed to do as an industry -- and we can all be better at it
is -- for example, when I ask people how long does it take to
charge a car, everybody says it's always the 3 kilowatts or 7 kilowatts in 4 hours or those things.

The real answer is 99 percent of the time it takes you about 10 seconds to get your butt out of the car and plug it in. That's the answer, because none of you know how long it takes to charge a phone. If you do, maybe we should talk.

(Laughter.)

Alabama: It really is not something 99 percent of the time that you're going to have to worry about, because you're going to bring it home, you're going to plug it in. The place where you live, you're going to have placed to charge at work. And that is really what my charge is, is how to figure out this and how to think about it across these verticals.

What I want to reinforce -- and I think Dan and his boss would agree with me -- when you think about that triangle, do not think about that triangle as a priority. Do not think about it as because we have most of the charging at home we should focus most of all of our effort in the home. It's probably more about how do we balance the priorities and make sure they're all addressed appropriately to be able to encourage the market. So if you're at home, you have access to
it. And if you live in an apartment maybe you're relying more on the workplace or you're relying more on the public side of things. And if you're commuting longer, then you have sort of reliable points in between.

And so we really do need to think about this as a holistic ecosystem for charging that layers things on managed charging and vehicle grid integration overall. So these vehicles become assets to the grid and not hindering points, which all of the evidence points to that they can be. Plugging in when you need to plug in versus plugging in when it's beneficial to the grid won't make sense. And there's ways and mechanisms to ensure that that value is there.

And so what's our role? What's General Motor's role? What's my job? What's my team's job? To give you some sense of it it's really, at home make it easier, make it seamless, make it encouraging. You know, those us who still have cable boxes -- I'm dating myself a little bit -- but it's easy. You get a cable box, and you forget about. Right? That's -- I'll say the mentality -- I don't know if it's the way we need to do it; but that's the type of mentality of how do we get charging inside of the people homes. And GM really is thinking about what are the types of partnerships and
relationships that we have to encourage that -- Humara (phonetic) is one of them -- to really create a seamless -- I won't get into the details right now.

Workplace; dealing with workplace charging challenges. It's now sort of not there, but for those of us who are around such a critical piece of vehicle adoption, right, in places like California where there is an over abundance and they're curtailing renewables in the middle of the day, we need those cars plugged in to gobble up that solar. Right? It can be a really important asset. If you don't have charging in your apartment, awesome, right? Now I've got one really good firm place that I know I can charge. How do you put the right programs in place to really encourage those sorts of things.

So GM is, A, the leader in this space; and then, B, we need to really think about how do we encourage the right programs, the right employers to participate. More to come on that in the coming months for GM. Another one equally as important is what's General Motor's role in sort of a public space. We certainly, to address the elephant in the room, we've be accused of not participating in public development of public infrastructure as much as we could. I would argue that
we've been very active self in trying to put in the right partnerships, but earlier last year, in May or so, we came out and made an announcement that we're working on a collaboration with Bachtel -- Bachtel is the largest construction firm in the country -- to really think about how would we create the installation of thousands of additional public charging stations in the ground.

And so while I can't talk much about it right now because we're in the middle of putting that recipe together, I can tell you that it's a very important piece of leverage in general, our scale, our data, our knowledge, and our ability to put cars in the right places to get it charging when they should be charging together.

And then also, you know, simple things about making it more seamless. So those who have a Bolt you might know you have an app from My Chevy. Within that app there's a feature called My Energy Assist. That energy assist feature is a way finding feature, but it also does other things, allowing you to essentially allow multiple charging station providers in the single app create start stop, for example, payment schemes, those sorts of things are very important. Again, I liken these things to sort of push button start. And those who don't have
push button start I'm sorry. Those who have push button start
and you get a key, you're like why do I have a key. Right?
Like, this is so annoying. If you go back. But when you get
push button start, it becomes, like, man, "This is the new
normal". And we need to have EVs fit into our lives in that
normal.

And to the point about education opportunity,
we have to be able to let people know, like, "How long does it
take to charge?" 10 seconds. Get out and plug it in. Right?
That's the new norm that we have to start to bring in. We have
to bring features like the Energy Assist app where it's so
seamless. You don't have to think about it. You plug it in
and you walk away from it. And it really starts to get at
people's heart strings. And this is just better, right,

driving an EV. And most of us driving an EV believe that that
experience needs to translate more into the masses. And think
of what we're working on -- a lot of what I'm charged with is
really around that piece of the puzzle.

Again, I thank you. I apologize for the
voice. I really do appreciate the opportunity here, and I look
forward to questions. Thank you.

MS. KATE TOMFORD: Good afternoon. I'm Kate Tomford with
CTA. Again, I want to thank the Commission and particularly Commissioner Bocanegra and her staff for the invitation today. Also, I wanted to play off of Alex's metaphor with the recipe. We have a lot of ingredients here in Chicago and many of them are in the room. So I wanted to say thank you to all of our CTA partners for being a part of this CTA electrification effort. We certainly couldn't do what we've done and what we hope to accomplish without all of your support; so thank you.

Also just excited to provide some perspective on heavy duty electrification because it's a little bit different in some respects, particularly in the transit realm in comparison to the regular passenger market. For context, we are one of many cities around the country now that have set targets for full transit bus electrification. You can see we're here in the middle of the country. Our major cities and transit agencies along the coast have also set goals. And this is by no means an exhaustive map. There are many other agencies around the country that have done this, many smaller than us and other large agencies too.

Just to highlight, the entire state of California has a goal by 2040. That's 14,000 buses. For a comparison, here in Chicago we have 1,860 buses in our fleet.
Our goal is also 2040. Some are articulated as zero emissions. Some are electric buses. Ours happens to be electric buses. We, basically, have 20 years to get there.

Also, I'm going to talk today a little bit about how we're progressing so far and what we plan to do. So far we have two electric buses that have been operating in our fleet now for over 5 years. They were introduced at the end of 2014. They're all electric new fire buses. We recently sent them back to Winnipeg to get retrofitted. They're now back in operation in our fleet. They were originally charging in our garages, and now we're going to have the capability to charge them on an overhead faster charger.

So these have been sort of our test buses. Although, they have been in revenue service this whole time. So people see them out on the street and then ride it likes it's any other normal CTA bus. These buses, as I said, started off having just depot charging so they were operating on a number of different routes around the city. They are going to be going back into service in the next few months and using a high-powered overhead charger at our midway terminal. That's where you connect. You get out of the plane at Midway or take the Orange Line to the end of Midway Station there and you
transfer to a bus. You'll see the charger there.

Under construction now we are also in the middle of a contract with Proterra (phonetic) for another tranche of buses. We entered this contract in 2018, and we're in the process of getting a delivery of the buses now. We got five of them last month, which was very exciting. We're getting 6 next month, so that will be our first order of 6 buses. Then the remaining of that base order up to 20 buses is coming over the course of the next year.

By the end of 2020, early 2021, we should have about 25 electric buses and fleets. The Proterras are also going to be using an on-route overhead high-powered charger. It's going to be -- they're going to be operating on our Chicago route, which is a 27 -- 24/7 route that runs around the clock. It's about a 10-mile route, and the buses just go back and forth on that east-west route, charging at either end of the route.

I was very impressed to see this press release come out from New York City's MTA in December. They have a capital bill -- a capital plan, rather. I'm in the Finance Department of the CTA, so we spend a lot time in the fourth quarter putting together our the budget plans. The capital
plan is a 5-year plan. And they have included in their capital plan $1.1 billion dollars to go toward fleet electrification. They have bigger fleet than we do; but this is specifically for 500 buses, and the associated upgrades that they'll need to make to depots in order to have those buses charging at depots.

What impress me about this is that the cost of electric bus is running just under a million dollars a bus, around 900,000 or so in our contract. So you can estimate 500 million of that 1.1 billion is going to buses. The entire remainder is going to infrastructure; and that's similar to what we're seeing here in Chicago is that there's a really a high cost for the investment in infrastructure.

They also have this goal, when it's mentioned, of Sony buying electric buses starting in 2029. That's also something that we're putting a lot of thought toward, because transit buses have a life time of around 15 years. So to get a 2040 target we have to be buying electric buses, only electric buses, starting in 2025.

So one of the key concentrations, as I mentioned, is the infrastructure. These are some examples of infrastructure around the world. Just going clockwise, in the upper left corner that's a depot that's been entirely converted
to electric buses in London. The upper right-hand corner is in
L.A. That's an on-route station where passengers can board on
the light while buses start getting overhead chargers.

On the lower right is a demo project at the
Dimo Chrysler (phonetic) plant in Germany. As you can see,
they have all the switch gears, transformers up on that deck
above the chargers, and the charges are overhead Panorex
(phonetic), again, charging buses as they pull in to park for
overnight charging.

And then on the left photo that one of my
colleagues in our engineering department took of an example in
the Netherlands, again, sort of an overhead Panorex system with
a drop-down Panorex that's contacted within the bus, and it
could be in a parking lot or a depot like that.

We're trying to figure out what our
infrastructure is going to look like and what's the most cost
effective way to install it. And considerations go beyond
putting in this specific equipment. We have the equipment
itself and the physical structure that's supporting chargers.
We also have all of the electrical upgrades that need to be
made in order to bring the service to the site of the charger.
We've been working very closely with ComEd to understand what
that will look like and what the associated costs might be. Again, as just a background and context, CTA has seven bus garages, so our 1800 buses are distributed amongst those, 250 buses per garage, give or take. And each garage currently has 1 or 2 megawatts of service. We think we'll need at least 10 megawatts of service, perhaps 15 megawatts of service if we're charging at those depots with most of our buses overnight. We want to do some charge management of course to hopefully lower that peak, but it is a hug increase for us across our side and then of course on ComEd's side as well.

In addition, we have the fact that our facilities are very old and in many cases outdated. They're hundred year old buildings, so they are not into what we call in transit industry's state of good repair. We make a lot of upgrades just to get them to a current state of good functioning. And if we go and convert them all to electric bus depots, electric buses will be associated with the costs. And it's not that they're necessarily -- those upgrades are not necessarily because of electric buses. They just need to be made anyway. But if we're going to go through the trouble of making the upgrades, we're going to make it with those
additional costs.

Another consideration is that our current seven garages are over capacity. So if we're going to start doing all of this construction to upgrade our transit and our charging infrastructure, then where are we going to house our buses in the meantime? There's a big looming question of whether we should have or need a garage that just serves as the overflow for all of this shuffling around. So all of those things add up to a lot of costs.

I want to just talk a little bit about a study that we're doing right now so we can try to understand what this electrification pathway might look like over the last 20 years. We were fortunate to receive some funding from the Joyce Foundation (phonetic) and we're working with our partner Sammy Schwartz (phonetic). Some of you might be familiar with our transit leasing partner who is helping us do some of the modeling from and the study.

We have three initial parts of the study. One is underway right now. We're taking all of our data on the current bus schedule, where all of the buses run, the routes that they run, the schedules that they follow, and what we call vehicle watts, the mileage that a bus runs from the time it
leaves the garage to when it returns to the garage. And we're seeing whether all of that scheduled data can be accommodated with current technology, a moderate improvement in technology, or a significant improvement in technology, whether the buses are charging at depots or if they need to charge somewhere. So, basically, we're seeing how bus services and schedules match up against technology.

The second piece of this is understanding the upgrades that our facilities will need in order to accommodate depot charging, also potentially on route charging, too -- a mix. And then we have the third elements of this that's an equity analysis. We're working with some data from the Chicago Department of Public Health to understand how the benefits of electric buses will be distributed or could be distributed optimally around the city in terms of health impacts especially. And our first panel, I think it was Nick who mentioned the local air qualities of benefits -- it was Dan. Dan mentioned the local air quality benefits, and that's something that we're paying particular attention to, in terms of effective populations here in Chicago.

All of these first three analysis will inform our development of scenarios for the pathway to actually
replace our full diesel buses and by new electric buses and
make those investments upgrading the garages, whether we do all
of that in the first 5 years or we wait and we're do more of it
in 2030 decade. I'm trying to figure out what that sequencing
will look like -- where, when, and how the buses will be
converted. And then once we have the scenarios in place we're
going to model them with cost analysis to compare them against
each other, essentially, in terms of costs.

All of this is happening over the next 6
months, so we hope by the end of the second quarter we should
have some data that we can share with everyone. And we do plan
to publish a report. It'll be on our web site, so we hope
everyone checks back in with that.

Lastly, I just want to emphasize that there
are many other considerations that CTA has that overlay with
our process of electrification. Our bus ridership has been
decoming over the last several years. I think the peak was in
2012. And we're seeing declines much like many other urban
areas across the country.

So do we have to electrify 1800 buses? Maybe
we only have to electrify 1500, and that will be sufficient for
bus service in 2040. There's a question of autonomous vehicles
and how that will overlay with electrification. We don't really know. I will say one thing to our benefit is that we've been running an electric rail system for a hundred years, so we have a lot of experience, and we hope to translate a lot of that to our electric bus program as we go forward.

It's a very exciting time to be at CTA. Look out for the electric buses as they roll out in the next few months. And I'm glad to hear, and I'm glad to take questions and comments. Thank you.

MR. PHIL JONES: My name is Phillips Jones. I'm the Executive Director of the Alliance for Transportation for Electrification. I'm a former regulator, and I'm here to help the Commissioners today. So just a little background on me. I served 12 years as Commissioner in Washington State, served as president of NARUC. I served on the board of NRRI (phonetic), one of the research institutes for the regulators. And I currently served with Commissioner Oliva on the Emery Advisory Council (phonetic) and some other issues.

I've had a long-standing interest in technology, how to set just and reasonable rates, how to incorporate those things into the grid. And so when I retired from the Commission 2 years ago, I had an opportunity do this
work, and I jumped at it. This is a very exciting time. I think both panelists have said it here. We are at a have -- I don't know if you'd call it a tipping point, a crossroads. It may happen in bumps. It may not be a smooth road, but we are undergoing a fundamental transformation in three industries in this country: information technologies; namely, software and energy systems, the automotive industry that Alex represents and also your industry in transit and then the electric power industry.

So how we do this over the next 5, 10, 15 years is really, really important. We can really do it well, but we can really mess it up, too. And by messing it up I mean we don't encourage consumers to charge off-peek. They come home and charge all at the same time; pay high rates. We have to buy more gas fire papers for energy and capacity to fill that need.

Voltage authorities, cyber security, all of these network management systems can be hacked. All right? Software; we see what's going on in the world today. So as Alex said, this is tough work. This is going to take a lot of attention. We're all really focused on this, but I just want to start with a note of caution that this is -- as Alex said,
it's not a sprint. It's a marathon.

So I'm also a pitch hitter today. You were supposed to hear from Jim Thomas of Rivian (phonetic). Rivian is another member of my alliance. My alliance consists of utilities, auto OEMs. And, full disclosure, General Motors is on my board. Alex was on my board at General Motors when Britta was there, who was a founder member of the alliance. And then we have certain -- not all, but certain of the infrastructure.

So what we try to do is take a holistic approach towards infrastructure. We're totally focused on infrastructure. We are not so much focused adoption. Although, adoption comes in. But we're really focused on how to build out a robust infrastructure for EV charging that is interoperable, affordable, is not subject to technological lessons, and has a very strong utility role.

Just remember that the fuel for the vehicles of the future is kilowatt hours. It's not gasoline. It's not diesel. It's not propane. It's kilowatt hours. So who makes the kilowatt hours? The utilities. Who transmits them to the road? The utilities do. So that's why the Commission -- that's why you all in the Commission are in a very key position
right now along with the utilities.

I'm going to focus in my few minutes just on medium and heavy-duty cases. What we call medium and heavy duty, this is anything from a Class 2 to a Class A truck and Metra transit buses, school buses, what Rivian makes, a light-duty truck. They also are introducing a crossover SUV from their plant to Normal, Illinois that will start producing this year down state. I'm going to talk a little by the about the regulatory issues and a little bit about the path forward.

So why is this happening now? This is a very hot topic in the industry. I think one of the reasons -- and the first panel discussed this, too -- is that the focus of a fleet manager is very sharp on things like making it work, delivering products, delivering people for CTA.

For a light-duty vehicle it's more of a personal decision to purchase a vehicle over the last 12 years. You're going to drive it with your family and safety. Obviously, all of those things are important, but for fleets it's really more of a business decision; and we have business model issues that we have to discuss as well.

Battery costs are coming down, as Nick and Alex said and Britta. But also we have environmental factors. In
California -- you don't have this in Illinois, but in certain states there are very strong environmental Commission restrictions and things like that. Metra Transit has -- she just talked about this. Metra Transit agencies, not all of them, but Metra Transit agencies are getting very interested in that. Some of their elected officials are first to go all electric.

Utility filings. A lot of the utilities that I represent are filing all across the country. Nick put up a slide, and we have something to do with that of course. We encourage the utilities to have good filings. Many of these utilities just in the last year or so are including school bus and Metra Transit bus programs. Usually with a rebate, a pretty substantial rebate that you all will have to approve as Commissioners, but those filings are coming forward.

The VW settlement, as Nick said, is an important source of leverage. But just to put this in context for the Commissioners, there are other sources of funding here. So the utilities' funding I think is really important, but don't forget about the private sources of funding as well. There is going to be a mix. Alex just talked about a possible -- it's not done yet -- a possible venture between GM and Bechtal.
Obviously companies like Charge Point, EVO are raising money in the private equity and other markets. And Rivian, who's not here today -- Rivian has raised $2.9 billion dollars -- that's billion.

So there's big money. Is this a lot of money given the scale of the transformation over 30 years? No. This is going to take hundreds of billions of billions of dollars. So this -- as my friends a Rivian will say, this is just a start. That 2.9 billion that's going into your state of Illinois is just kind of a down payment, at least in Illinois.

So on Rivian, I'm not going to steal Jim Thompson's thunder. You can talk to him about the announcement. You all read about it, a thousand delivery trucks for Amazon. Amazon is in my hometown of Seattle, so people in Seattle are pretty jazzed up about this, too. A lot of details have to be worked out. Obviously Rivian is first coming up with those two vehicles I mentioned, so this Class 4 delivery truck is under development as we speak.

Rivian is not the only one. Dimland (phonetic), in Portland; Volvo trucks; UPS; FedEx and there are many others that have been working very hard in the medium and heavy-duty space; so stay tuned about that.
In terms of utilities that are doing a good job across the country, I'll just mention a few. Southern California Edison has a very big medium heavy-duty program approved by the Commission. San Diego gas and electric has a very big program, $109 million dollars that covers drains as well as medium and heavy-duty equipment. As well, PGNE (phonetic) up in the Bay area is having financial issues now, but they are proceeding with their ED program. And they are very active in the space, and they have a very innovative -- I'm going to talk briefly -- not in the weeds. I'm going to talk briefly about rate design. But they have a very interesting program called CEV, the Commercial EV rate, and it's a subscription rate.

So they try to estimate the daily load occurs and the vehicle and the load. They look at the building determinants and, they came up with kind of a monthly subscription plan for the customer rather than going through volume metric, and demand charges, and things like this. So you may want to take a look at that.

Excel Energy in Minnesota had some very good programs in in Colorado. Minnesota Excel Energy, helping service Colorado just approved kind of a very innovative --
it's like a CBD rated critical rate for RTD (phonetic), the local Metra transit agencies, because when they roll out their buses, they were paying far too much in demand charges. So Excel responded to that. There was a multi-party settlement approved by the Commission.

Duke Energy has filings pending in North Carolina and South Carolina with very good school bus and Metra Transit programs not approved by those Commission yet. And of course Exelon has some very good programs in Maryland, DC, and New Jersey. Some are pending. Some of it approved.

A little bit about infrastructure for medium and heavy-duty. It's different. As Kate was talking about, for bus charging you're talking about two types of charging; right? So one is equal charging overnight, and one is this pantograph, P-A-N-T-O-G-R-A-P-H, charging, which is higher voltage and more end routes, faster. So for quite a while the bus fleets and the commercial fleets were, like, depot charging. But, as Kate mentioned, CTA, Kane County Metro, many of the Metro Transit Agencies around the country are moving toward a mix of depot charging and more overhead charging.

Interoperability and standards. I urge you to take a look at this on the bus industry. I think it's done a
good job or the heavy-duty industry, coming around common plug standard. For those of you who don't know there are three plugs, transit plugs, that are not consistent with each other. For light-duty vehicles you have Tesla plug; you have a Chibole plug; you have a Fleece plug; and you have what is called a J1772 (phonetic) plug or what is called the CCS combo (phonetic).

The Metra Transit Agency, or the bus makers, are coming around that standard of the J1772 plug, which is good. So there's one or two exceptions to that. But I would argue that if you were using ratepayer funding to fund some these transit and school bus programs, you should work with your staff, work with the utility to ensure that these programs are as interoperable as possible.

On the back end, it's a little more difficult for the communications brought about between the cloud and charging. There's a standard called OCPP, Open Charging Point Protocol. Many of the bus and auto makers are coming around on that, but there's still more to be told on that. I would just urge you to take a look at the protocols and the standards.

The other thing that you need to take a look at these extreme charging loads that Kate just talked about.
These are not small loads on the system. So whether it was ComEd, or Ameren, or Mooney (phonetic), or whomever here in Illinois, when you're talking about adding one or two megawatts to a neighborhood where the substations is weak or the feeder is not accurate, you need to be looking at that. So you don't want to be introducing voltages abilities and problems with substations. So this is something where planning, whether it's integrated resource planning or whatever planning you do with a PJM contract like you have in your state at least in the North. Ameren is different in the South of course; but you should pay attention to the planning issues. Many commissions across the country are requiring the utilities to do comprehensive TE plans, what we call comprehensive transportation electrification plans.

Rate design issues. I'm not going to get into rate design. We will -- you know staff, Commission Bocanegra, if you need examples of different rate designs for medium, heavy-duty, light-duty across the country we have a ton of those. We can help you out with that.

So I really applaud Commissioner Bocanegra for taking this initiative today, for directing the NARUC task force on EVs, some of the leading -- and you have already been
out there talking to them, I think, Commissioner -- but Minnesota is a real leader in this. I would urge you to look at what they've done to excel on medium and heavy-duty vehicles. California is a leader. We've talked about that today. Many of the panelists, the CUDC (phonetic) -- not just the CUDC -- The Oregon CUDC has done a lot. They've done things with Trimet (phonetic), the Metra transit agency. They've done some interesting low income issues too for rebates, but they really encourage affordability and access in a variety of ways.

The Maryland PSC has some integrative programs. And, finally, as I said, Maryland. And I think Commissioner Stanek -- if I understand, Commissioner Stanek is the co-chair of the NARUC. So there's a good group of Commissions and Commissioners that you can refer to as you go forward with this work. This medium and heavy-duty work requires a separate workshop or maybe a separate session. The issues involved are quite different than the light-duty side, so that's something that you may want to consider. So thank you. I look forward to your questions.

COMMISSION MODERATOR: Thank you everybody. That was wonderful. We are going to have time for just one question.
We want to keep everybody on time and out of here by 4:00 or 5:00. We will go seamlessly into the next panel. Please stay in your seats. But if you do have to use the rest room, by all means do so if you need to.

So who has a question?

MR. H.G. CHISSELL: Good afternoon. My name is HG Chissell, founder and CEO of Advance Energy Group and Director of AG Chicago.

My question is -- we focused on electrification, but there is another focus, which is decarbonization. And when you have cities that make a commitment to be decarbonized by 2050, how do you see the best path to reconcile the commitments and aspirations of, say, GM to provide electric vehicles and proliferate those with a need to maximize the value of mass transit.

There somehow needs to be a reckoning where they can come together and create the best outcomes for our city that's committed to being carbon free in 2050. I'm interested to hear your thoughts on how best to spread that needle.

MR. ALEXANDER KEROS: Yeah, real quick. I'm actually on the technical advisory committee for the city of Ann Arbor.
It's looking at this. And, obviously, decarbonization is pretty broad; right? You have to think about everything from buildings, and facilities, all wooded transportation.

The other hat I did wear was I was Mavin (phonetic) smart city's chiefs. For those of you who know Mavin was GM's start-up around mobility and really rethinking how our relationship with automobiles as well as what are the opportunities for everything from walking and biking to taking mass transit.

My personal belief -- and I think we understand this -- is transit has to be the backbone of pretty much any urban transportation planning system. And how then all of these additional mobility factors are to integrate within that transit system, whether it's a shared vehicle, whether it's walking or biking and shared, you know, two-wheel vehicles, all of the way to personal vehicles, I am a believer that -- well, that's the backbone and why we have to do it. We have to think about thoughtfully investing in those things so people want to get into them as we move forward.

In my mind there's a lot to do there, to be honest, and a lot to figure out how to reconcile them; but I don't think on the surface that there's necessarily -- for
example, GM is sort of anti-mass transit or at least bumping
heads with a CTA. We have to actually sit down. I will admit
that GM has been out of the transportation playing discussions
for a very long time. And GM needs to be more involved to make
sure that our products, and our systems, and services fit well
into that type of model.

MS. KATE TOMFORD: It's really an existential question
for CTA. Our buses that are not full are completely -- I
mean, today with diesel buses I think that the break point is
something around 80 passengers. But if you have 80 passengers
or fewer, then you'd be better off just having people in same
walking distance of vehicles from the Commission's standpoint.
So don't quote me on that number, but I've seen it out there.

For us it's a question that we have to tackle
simultaneously. And we have many studies looking now at
mobility in a Chicago region and how that's going to be
transformed in the next decades. And we've seen a lot of
interest in it and actually movement in it.

CTA now has infrastructure projects that are
funded by the additional fee imposed on ride share vehicles
here. And that's gone up again now 2020 significantly. So
we're looking at ways that we can draw people toward transit
because it is a low carbon form of transportation and mobility; but it's part of this fabric with all of the other loads that Alex mentioned. If we can electrify our component of it, that obviously helps, but no one's taking our vehicles. There's really no point. So it's a multi-pronged challenge and one that we're looking at with many of our stakeholders to try to address the point.

COMMISSION MODERATOR: I'm going to cut in so we can go to our next panel. But I want thank Alex and Phil. (Applause.)

COMMISSION MODERATOR: At the end of today you will have an opportunity to ask questions afterwards, so please write them down or jot them down. Thank you.

COMMISSIONER BOCANEGRA: Okay. Everybody, while we're doing the transition I'm going to go ahead and start introducing the names of our next speakers. The final panel is considering how EVs promote carbon equity, grid resilience and development of the future workforce how EV to promote resilience and development in our future workforce.

So the first individual we have up today is Dr. Elizabeth Kocs. She works with NREL, is the Executive Energy Leader in 2019 and Director Of Partnerships And
Strategies at the UIC energy initiative. Second, we have Christie Hicks. She is senior attorney at the Environmental Defense Fund.

We also are pleased to introduce Tim Drea who is the newly-elected president of the AFL-CIO here. And last but not least we have Mr. Mike Raikes. He is the business manager and financial secretary for IBEW Local 197. So we hope to give you a quick perspective of these different industries; and without further ado I'll turn it over to Elizabeth. Thank you.

DR. ELIZABETH KOCS: Good afternoon, everyone. I would like to thank Commissioner Bocanegra and her staff for the opportunity to talked about EVs today at today's EV Policy Session. Thank you also for the introduction and to where multiple hats. My main location is UIC's energy initiative. I have been participating in NREL's Energy's Equity Program and I'm also co-founder Center for Environmental Sustainability, which is the University of Illinois System.

So the question is why EVs? Why should we plan for them? Well, the best component options to focus on is opportunities across five areas and the need to consider EVUs, which is not just EVs, but also charging infrastructure for
them as partners with the grid. So EVs offer opportunities between grid and transportation industries. They are also allies for the environment of both targets, as we just talked about the previous panel.

They're also leaders when comes to economic value stacking. EVUs support nuclear energy job sectors, and the economy. They're also nexuses for consumer needs, the appeals of EVs and consumer adoption. They are also connecters across benefits for society. So EVs provide social, health, and equity benefits for humanity.

So I'm going to highlight some data from different sources that supports this framework. The first one is grid partnerships. So EV's electric make partners. Why? Transportation electrification is subjected to electricity demand. The figure on the left indicates total energy use for each sector in the U.S. The yellow outlined area indicates subsectors that do not use electric energy as a primary source, which is the larger section to the top and on the left.

Underneath that is both subsectors that actually use electricity. In the oval, red oval, it demonstrates the opportunity for electrification of over 50 percent of transportation sectors who from like medium-duty
vehicles. We've heard from both panels the importance of light-duty vehicles but also medium as well. And there's another 25 percent of freight trucking that we go beyond. The greatest impact is for light-duty cars and trucks with vehicle miles traveled, fuel use, and emissions.

They also have lower technological hurdles due to battery costs, density challenges and charging infrastructure. Transit buses, school buses both have been mentioned and they are prime candidates for electrification as battery and electrical vehicle costs continue to decline.

The figure on the right provides estimates on annual electricity consumption for three different adoption levels and compared these historical data. Wide spread electrification requires accelerated EV sales that are well beyond current levels. In the high scenario U.S. on-road transportation fleet is estimated to improve 240 million light-duty EVs, 7 million medium and heavy-duty plug-in electric trucks. 80,000 battery electric transit buses that are delivering up to 76 percent of vehicle miles traveled from electricity in 2050.

Electrification has the potential both to significantly increase overall demand for electricity and to
lead to historical unprecedented growth. The vast majority of this increase occurs in the transportation sector. From a partnering perspective let's look at revenue and overgrowth planning. The top left figure shows average PEV in Illinois. 2030 is projected to increase utility revenue by over $400 over its lifetime and 250 full EVs and service in 2050. This is assuming it's in your life and charging off-peak.

The bottom left figure estimates the project utility -- the projected utility revenue costs and that revenue for off-peak charge on different scenarios. There's two different ones. There's moderate and a high. Under moderate initiatives, off-peak charging will increase the MPV of annual utility net revenue by 23 million in 2030 and 46 million in 2050. For the high definition off-peak charging increases it to by 30 million -- 39 million in 2030 and 147 million in 2050.

When we think about EVs they are expected for Illinois to account for 3 to 10 percent of total electricity use by 2050. The interesting thing is there's also flexible loads that can be leveraged. So deploying instruction strategies, which is what we mentioned previously, incentives charging vehicles off peak. Now, this is out of state
utilities and customers since there's they excess electricity
and capacity which can now be sold while making a more
efficient use of the existing grid.

Additional revenue from these efficiencies can
be used to offset the grid additional load and EV charging.
Establishing the figures on right for you are highlighting the
opportunities with the grid, and also the bottom one is for
planning for EV load growth. I'm aware there's some
opportunities establishing connecting managed charging programs
that incentives customers to charge during off-peak hours. So
just providing managed charging is simply not enough, but
connecting it to vehicle where it makes it easier for the
consumer, provides additional incentive and information.

Charging Behavior, this is something that I
think Phil was mentioning, somebody who said that they were not
a psychologist. I'm not sure who that was. That was Dan. So
charging behavior can have a significant impact on environment,
and pairing it with charging -- charging -- I'm sorry. Pairing
charging with excess capacity provides environmental benefits
from increased renewable generation usage unless peak
generation. So I'll becoming to -- I'll be talking about human
behavior a little bit here and later on as well.
I am actually a human computer scientist, so this does fit under my purview. The left figure shows the effect of PEV charging on Illinois's electric grid under two different types of scenarios. The top one shows a load from 8:00 and 11:00 p.m. and charging peak system, afternoon peak. The bottom one is off-peak charging where it significantly reduces charging during afternoon peak load and creates a secondary peak during midnight to 3:00 a.m.

Off peak charging incentives can help early morning peak, which is why the generation is high. The figures on the right. Efficient charging actually goes beyond just managing off-peak charging. First you want to gain efficiencies by purposely planning and building a charging network to less embody the infrastructure costs per vehicle. This is being more environmentally responsible.

Many cars benefit from one public charging station. So if we think about the current model where everyone has their own charging station at home, that means that for every EV you have to plan for one charging station there's opportunities for Level 2 and Level 3 charging stations that create multiple for the environment.

Level 2 charges tend to be more efficient as
well. They should also meet Energy Star standards and charger power levels that reduce energy losses. Those will lead to few impacts on the environment. In addition to Illinois's current generation provides opportunity funding charging for EVs. It is expected for wind to increase 8,000 gigawatt hours per year between now and 2021. This is an ideal time to pair growth and renewables with a growing EV charging infrastructure. Additional EV charging loads will be absorbed by renewables coming online and less reliance on peak or fossil generation. Illinois's nuclear is zero emissions electricity generation, collect additional added environmental benefit for charging off based on nuclear. Supporting the development of an EV ecosystem has a number of economic values and opportunities. The EV industry is an asset with gas and vehicle infrastructure providing economic opportunities for costs in different sectors. You can correlate this to Alex's story about his son and the growth. It is a massive industry, and I have teenager, so I know that there's lots of gaps in their ability to be ready to fly on their own.

So the left figure shows current charging stations in Illinois. It seems like it may be additive, but it really isn't to support the growing demands and expectations
for EV consumers. Closing this gap would require increasing workplace and public Level 2 charges by seven and three fold, respectively, and DC fast chargers by three fold.

Policies and utility programs to encourage Level 2 installations and charging for multi-unit dwelling is critical for the market. Private industry is filling some strategic charging gaps here, including Tesla, Electrify America, and several auto companies, departmental charging providers; but this is still not enough. More actions across every major U.S. city and state are needed to better match charging infrastructure with the electric vehicle growth.

The figure on the right is actually very hard to see. I do believe this has been brought up a few times that shows the number of regulatory dockets by state for EVs and EV charging infrastructure for the year 2019. There's 53 listed in that area, in 2019.

Upper Midwest states have an issue discussion with stakeholders and identified pathways forward, as was mentioned previously about Minnesota, Michigan has also done some, so there are Midwest states that are taking the lead on this.

Parallel and complimentary government utility
involvement is needed as EV sales grow exponentially. And the focus really needs to be on areas of greatest impact and those would include developing that work space on revenue streams and for heightened utilization. So urban areas, fleet, future electrification subsectors for the future.

Utilizing best practices from other cities and states that support acceleration; support market development for the most challenges areas as well as disadvantage communities, transportation borders, and also match your state planning framework of economic, environmental, and social goals optimizing existing infrastructure and consumer needs as well.

Now we're going to go on to consumer needs. Why do we need to consider the consumer? Most consumers see transitions to view technology as challenging because it requires a change in behavior on their part. Some people are a little bit more stubborn than others and are resistant to change. I, myself, see change as good a thing. So electrification to have the greatest impact a reliable, affordable, and accessible EV charging infrastructure is needed.

Electric vehicles and battery technology are here, and they do deliver range. Yes, our consumers expecting
more, and for light-duty we are -- the technology is here. We're actually still using the same technology that was originally mass commercialized in 1991 by Sony. We are just simply -- we've found deficiencies in manufacturing and added information technologies to it to advance its efficiency and capabilities.

The charging network -- and we've heard this from numerous speakers on the panel before -- is not quite there yet. So an extensive EV charging network will alleviate two consumer adoption charges, access and opportunity. Most EV chargers -- EV owners charge at home; and this limits consumer adoption to those individuals that have that ability and have dedicated parking spaces.

Another hurdle is aligning EV charging with consumer behaviors. EV charging time is not comparable to ICE refueling. Technology is getting there, but it's not quite there. Alex also mentioned this, about charging your phone. And I think I laughed the loudest out of everyone because I have numerous different blocks for my phone and different wires depending on how much time I have to charge it. So opportunity charging is certainly needed. We have to accommodate that.

And then last but not least, the societal
benefits. There is a large societal benefit to EV adoption in
the form of climate change mitigation due to reduced green
house gas emissions. Utilities have gains there. Consumers
have gains there for reduced vehicle operating costs, and then
there's larger additional savings that consumers get, but
society also. The left figure shows me off-peak overnight
negative pricing structure. The benefit here comes from
charging during excess zero emissions generation. The top
right shows the overall benefits, including cost savings to
Illinois drivers, utility customer savings were produced, and
modified benefits of reduced GHE (phonetic) admissions.

The difference between the top on the right is
off-peak is on the top based on charges on the bottom. So the
increased benefits were baseline to off-peak accrue to the
utility customer, the additional reduction in their electric
bill. And those by 2050 are estimated to be over 959 million
and 3 billion for the high.

And I will leave it at that. And thank you
for your time. I look forward to your questions.

MS. CHRISTINE HICKS: Good afternoon, everyone. My name
is Christie Hicks. I'm a senior attorney with Environmental
Defense Fund. EDF is a national nonprofit that uses science,
economics, and the law to solve the most challenging
environmental problems of the day. I am based here in Chicago,
and it is a delight to be here. Thank you so much for the
invitation to speak.

It's exciting for me personally to see a lot
of familiar faces but also a lot of new faces here today. I'll
echo what a couple of others have said, and to get to sit on
this side. There's a lot of tape. There's four rolls of tape
back here, and we keep wondering what you all do.

(Laughter.)

MS. CHRISTINE HICKS: I'll move on.

So as Commissioner Bocanegra noted early on,
there has been a lot of progress just in the last year even on
electric vehicles, and electric vehicle policy across the
country. So I'm really glad that we're having this
conversation here today, and we do have a diverse set of
stakeholders because it is going to take a lot of different
perspectives not just to enable electrification but to do it
right.

And Illinois has been a leader in clean energy
in recent years but it lacking in electric vehicle policy, in
beneficial electrification in particular. Transportation
electrification, as you know, presents a remarkable opportunity
to improve the environment to improve health and the
likelihoods, particularly in communities that have historically
been the most energy in climate burdened.

It can decreases local pollution, and there
are a lot of opportunities to bring those communities into the
new clean energy economy. As is often the case, positive
environmental outcomes here can go hand in hand with a
resilient, growing economy.

I'm going to incentives some of the topics
that we talked about already and introduce them once. I'll
start with a little by of environmental and health information;
then some of the opportunities for regulators, like the
Commissioners, to address and enable; beneficial
electrification with the maximum benefits.

And I really want to emphasize, if there's one
thing that you leave here having heard me say today, it's that
in order to do this right electrification alone is not enough.
We have to be mindful of a lot of different variables here.
From the generation fuel sources to the affordability of the
transition and the impact on those energy and climate for our
communities. So I want to think about not just the "what" but
the "how" of electrification, because a comprehensive approach is what is going to be necessary, particularly to make this transmission.

Just a little bit of level setting here. Diesel emissions from trucks and buses, increased cancer risk, neurological and metabolic diseases can cause respiratory and cardiovascular damage and are, of course, a major source of climate pollution. And although emissions from the carbon sector have been declining, as we know, emission from the transportation sector are actually increasing and are now the leading sources of green house gas emission in the country; and diesel trucks were the leading factor in that increase.

We've talked a lot about light-duty vehicles. We've also talked some about fleets. Because we can see here that diesel was one of the primary drivers of an increases in green house gas emissions in 2018, which is my EDF commission before last year based on data from a couple of years prior. After several years of declining green house gas emissions we saw an increase. That was troubling for a lot of reasons; and we'll talk about some of things that we can do about that.

What's worse is that low income communities and communities of colors are bearing the worst impacts of
this. They are burdened with a disproportionate share of the
toxic hair pollutant; the affordability, or not, the energy
system; and, for a lot of reasons, are a really important part
of the conversation despite the fact that they are not
necessarily vehicle owners themselves.

So I'm going to talk quickly about a case
study that EDF did using the mobile sensor technology in
Oakland, California. We mounted sensors on rural street new
cars. We've used these in a few different contexts. Here
the -- as the Google street view cars mapped Oakland, they were
monitoring for carbon and several nitrous oxides -- I'm
sorry -- nitrogen oxides. And using those sensors EDF found
that residents who took one particular freeway in Oakland were
exposed to concentrations of carbon and/or soot that were 80
percent higher than those located near a different freeway
that, because of policy years prior, doesn't have large diesel
trucks on it.

Even from one end of a block to another
localized air pollutants are actually sometimes vastly
different. Not surprisingly, the more polluted roadway also
produced -- I'm sorry -- 60 percent more nitrogen dioxide, a
lung irritating. Oakland is similar to Chicago in that it's an
important logistics (inaudible) region. A lot of diesel-powered ships, and trucks, and trains go through the city because the port of Oakland serves both the California market and then to move products into the markets nationwide. So then EDF layered the health data with the submissions data, and the results were exactly as you would expect. For many reasons areas with higher levels of diesel pollution on this map also had higher rates of pollution-related diseases and conditions. So we know transportation emissions are increasing. We know that diesel emissions are a tremendous threat to health and environment, and we know that medium and heavy-duty vehicles, because of their diesel nature disproportionately impact low income communities and communities of color. So we're today to talk about what can we do about that.

And the good new is there are many avenues for action from regulators in particular. The rate design charging infrastructure and number of other things. But as I mentioned, I want to talk not just about the "what" but the "how" of electrification so that we do so equitably. As we know the electricity distribution system...
is built to serve a few hours of highest demand, but that load could steeply increase with both transportation and bill electrification. If the system is simply built out further to accommodate sharp new demand peaks for building transportation electrification, we've risked it becoming unaffordable. It's imperative that we do not shift costs to communities that can at least afford their energy bills at present.

We talked about a few examples of what some other jurisdictions have been doing. I'm going to highlight three in particular that are regulatory actions especially; but of course there's a number of really innovative initiatives, large and small. In California, as was touched upon earlier, utilities like Pacific Gas and Electric, or PG & E, are gauging in low cost infrastructure projects that are aimed specifically at medium and heavy-duty vehicles, and the utility builds the necessary infrastructure upgrades from the transformer to the meter to support new vehicle chargers at the no cost to the customer under a few specific conditions.

The chargers themselves are also potentially eligible for several incentives. So the conditions are that, in exchange, the fleet owners must acquire at least two electric fleet vehicles. They must provide access to new data.
about their EV usage for 5 years and they must operate their
charges for at least 10 years.

    New York and New Jersey are similarly
investing hundreds of millions of dollars in EV
infrastructures, such as fast chargers along high traffic
routes. As we've heard about from Kate, with regards to the
CTA, I think that a lot of people when they think of the
economic hurdles of electric vehicles, they think of the cost
of the vehicles itself; but the infrastructure, as we know, is
often actually even more expensive, particularly for these
fleets.

    And in closer to home and in Minnesota Excel
ergy is investing in public fleet charging as well as working
on a subscription and EV pilot rate that would allow customers
to charge their electric vehicles off-peak for a flat monthly
price. And of course there's a lot of other examples. We can
talk about and that Illinois should consider here, but I will
continue to emphasize that while each of these might be one
piece of the puzzle, a piecemeal approach to clean energy
adoption is not going to be sufficient.

    It's maximized the environmental and economic
benefits of clean energy for all communities a holistic
approach is essential. Regulators, legislatures, utilities, and stakeholders will all have a role to play in this, and supporting that as we take steps that are particular realm can and that we're mindful of how that integrates with a larger clean energy transformation.

Energy efficiency, renewables energy storage, electrification, grid planning, and process transparency are all intrinsically linked and are all going to be important here in order to maximize benefits of clean energy for Illinois.

And for the reasons I discussed earlier EDF is particularly focused on fleet electrification because of all personal vehicle electrification is certainly going to be important transitioning fleet vehicle off of diesel burning gas reaches every citizen and, most quickly, we think addresses green house gas emissions increases overall air quality.

I will do just a couple of quick minutes because I know I'm running short on time. On the Clean Energy Jobs Act, which is a tremendous opportunity for Illinois that is being considered by the Illinois legislature. It does take the comprehensive strategic approach we need here in Illinois to improve the environment and the economy in the state. It's supported by the broad coalition of the Illinois environmental
consumer, environmental justice, community and fait-based organizations, including EDF.

Among the three programs that are a part of the Clean Energy Jobs Act, or CEJA; our electric vehicle access for all programs; availability of utilitywide the time of use rates; and incentives for fleet charging coupled with optimized charging and things that ensure that electrification is actually beneficial to the grid.

Legislation also requires comprehensive transparent planning and consideration of clean energy investments. And steeply increases the amount of clean energy that would be on the grid that these vehicles can be drawing from. Among the core tenets of CEJA is the related concept of beneficial electrification and the economic justice because transportation electrification along with the clean energy movement is an equity issue.

And ensuring affordable transition with opportunities for every community is absolutely essential. We're going to hear shortly about workforce development opportunities within the clean energy space and transportation electrification as well.

So I'll conclude. Again, I want to, again,
express my appreciation of the ability to be here today, and I look forward to hearing from my fellow panelists and taking any questions.

MR. TIM DREA: Good afternoon. My name is not Christie. My name is Tim Drea.

(Laughter.)

MR. TIM DREA: I have the privilege of being the president of the Illinois AFL-CIO, and we represent 900,000 members throughout the state in a variety of occupations. And because of that, I'm certainly not an expert as what the panelists are, but I appreciate the opportunity to talk today. Alex, you built the Chevy Bolt. And, Kate, we build buses and had the opportunity to drive those buses here in Chicago. So this is a very, very important issue for labor in Illinois. Just doing some cursory research we found that there were about 250,000 auto-related jobs in Illinois. That's manufacturing, repairing, selling, renting everything to do with automobiles; so it's a very, very big impact on wages, $16 billion dollars in wages. And a lot of communities, especially downstate, the selling of cars and vehicles is the largest sales tax base in these communities and they'd be lost without that sales tax. So it's very, very important to us.
Henry Ford, legend has it that he said he wanted to pay his workers $5 a day in order for them to buy his car. And that's kind of a half truth; but he really -- his big problem was the turnover. I think one year I saw a number that he had to hire 52,000 workers to fill 14,000 spots because the turnover was so great it was costing them too much money to keep re-training workers. So it makes sense that, as we evolve into a new era of automobile manufacturing and the EVs, that we make sure that workers are covered.

According to the UAW, United Auto Workers, Ford is told the investors that labor hours be cut by as much as 30 percent in the manufacture of electronic vehicles. Now, governmental policy to promote commercial use of electronic -- electric technology manufacturing vehicles need to orient their strategies towards high road employers, employers such as GM and others that pay a good living wage -- middle class wages.

Illinois CIO supports -- the government invested into technology and manufacturing of these vehicles; but the jobs produced need to be paid similar to the jobs that are lost as we might bring it away from current gasoline models. Specifically, government funding or any assistance to
employers need to make sure we re-invest in the workforce and
the jobs pay good middle class wages, provide adequate health
care for workers, and retirement security.

And I personally have been a victim -- I
shouldn't say, "victim", but I've felt the -- as a coal miner
in Central Illinois; and because of governmental policy and the
Clean Air Act in 1990 I was put out of work, but there was
retraining funds made available for me and my co-workers to be
retrained. Many people went into different healthcare -- an
industry such as healthcare, carpentry, construction, HVAC, and
things like that. And it was -- I think I was the only one
that went into this business, but anyway.

But we need to make sure that there's
retraining dollars available. And so if Illinois -- I say this
because Illinois invest in emerging technology, it must also
address the issue of displaced workers who were put out of work
due to this governmental action and not solely leave it to the
work marketplace because then workers just lose out.

Illinois is willing and ready to embrace new
and clean EV technology to leave our kids a better world is
what you said Katie with the air pollution and stuff; but we
also need to make sure that we invest in the Illinois workforce
to ensure that these jobs, current jobs, are protected or at least allowed to be retrained and keep these middle class jobs. Mike is going to go into more detail about what that would entail, so thank you very much.

MR. MIKE RAIKES: Well, thank you Commissioner for the invitation so speak about the impact jobs as a result of electrical vehicles. I may not be the best speaker today; however, I am the last, so I have that going for me.

(Laughter.)

MR. MIKE RAIKES: With the growth of the electrification of vehicles on the workforce, organized laborers in anticipating the growth of construction jobs and looks forward to being a partner in the solution by providing a skilled workforce. There's no light that the assembly line will change and more and more electrical workers will be needed to update new auto plants order bring new life to existing auto plants. Right now in Central Illinois we are seeing a lot of optimism and energy in what Rivian is doing. We're excited about the construction jobs that have already started and anticipate needing a much larger construction workforce in the near future to meet their needs and bring new life to the plant. The transition to the electric vehicles will require a
lot of investment and retooling in the existing auto plants that we do have now. The configuration of assembly lines will change, which also requires a sizable construction crews to perform those tasks.

Battery storage rooms will be needed, which requires updating and upgrading the electrical services that provide power for the manufacturing and storage of the batteries. These all lead to new jobs for a skilled laborer. Charging stations will be needed so consumers have the confidence that investing in an electric vehicle will meet their needs and they will be able to get from Point A to Point B.

Illinois should become a leader and provide infrastructure so that consumers have the confidence to purchase these vehicles and auto manufacturers have the confidence that they can make a return on their investment. When electric vehicles started to come on the scene a few years back, there were some municipalities that welcome the change and have the foresight to provide more investment than others. I believe this is probably a bigger reason why Rivian chose Normal, Illinois. Normal currently has over 50 charging stations in town, so a relatively small area. Normal's dubbed
the EV town.

The charging stations have been built with qualified electricians who have gone through a 5-year Department of Labor-approved electrical apprenticeship program. The key for these charging stations to be built efficiently and correctly is because the electricians performing the work have the knowledge, the skills, and the ability to complete the task. Our Commissioners are self-funded; meaning, for every hour an electrician works the employer and the workers put in a amount of money for education and training.

For my local in Bloomington every hour that is worked the worker agrees to take 50 cents out of their check and the contractor puts 50 cents. So you have a dollar an hour that goes back into the training fund to meet the needs of the customers.

Using qualified electricians to make the most sense and to who should be building the charging stations. We have a training model that works. We have apprenticeships throughout the state and country that use the same model. The classrooms are built. The classrooms are equipped with computers, and we have shop areas to actually do the hands-on work. We're able to properly size the gear, the conduits, the
As I mentioned earlier in Central, Illinois we're seeing the positive effects of electric vehicles. Good things are happening. Construction workers who have been working in other states due to a lack of construction jobs are able to come back home and find a job. We're getting calls from electricians from around the state but around the country as well wanting to know when these -- when the big infrastructure jobs are going to happen out at the plant.

This is an opportunity for Illinois to retain workers and recruit skilled workers from other states. Jobs that are attached with good paying benefits are what attract workers. The biggest challenge we see is communication or lack thereof from business. We can respect that there's a lot of technology that is priority in nature; however, we need to know a time line and an estimate amount of workers needed so that we can meet the needs of the customers.

Providing skilled labor is in our wheel house, and with little information we can help solve the problem of training the workforce. That's it. Thank you.

COMMISSION MODERATOR: Thank you. Thanks to our panelists.
COMMISSION MODERATOR: We do have some time for questions, so does anybody have questions?

MR. PAT GIORDANO: Hi. I'm Pat Giordano, Giordano & Associates Energy Law Firm. There's been really great presentations by everyone today. And I'd like to ask the question of Dr. Kocs. You threw a lot of numbers at us, which I love. I haven't had a chance to read them yet; but I was wondering about the number about the 3 percent to 10 percent increase in load.

Because from a gut perspective -- from an electric vehicle adoption by 2050 -- from a gut perspective I would have thought that it would be higher than that, if we're getting into, like 75 percent of vehicle miles being driven by electric vehicles. So I was just wondering about that. We're a big supporting of electric-fueled vehicles, but we want to make sure that there's sufficient load to meet the demand.

DR. ELIZABETH KOCS: Thank you for your question. Yes. The total electricity use in Illinois alone by 2050, so it's a reference number. So many of my other numbers I showed in my slides were typically moderate to high numbers, this is more of a reference number. So it's at the lower end.
MR. PAT GIORDANO: Thank you.

COMMISSION MODERATOR: Just as a reminder, we will post all of the presentations on our web site, so just go to ICC. It should be fairly easy to find.

Any other questions? Do the Commissioners have any questions?

MR. GREG BORALS (PHONETIC): Greg Borals from Exelon. There's been a lot of talk about battery costs and battery pack costs. I don't know if there's any comments around use of second-life applications and use of a battery post vehicle.

DR. ELIZABETH KOCS: I guess I'll start. So, yes, Greg, I work with George Crabtree, who's also a director of energy support national lab. He's also UIC energy initiative. And I think we have Ann Shleiker (phonetic), who is here, and Art as well.

So, yes, the battery themselves, they certainly -- there opportunities for second use. One thing that I did want to mention -- and this is a different type of market, not for the utilities. But right now is the right time for actually used cars. I think somebody brought it up earlier, but used cars -- used EV cars isn't the way to get into the disadvantage communities.
Now, look at the EV itself, and its battery, it's not longer viable for the transportation. Argile (phonetic) is also looking at recycling. We need to know that it's necessary for our energy independence as well. So those are the -- they're all fairly new pieces. Utilities have been using them. There is some uses in Europe and also for second use battery storage based on current and storage technologies.

COMMISSION MODERATOR: I just want to thank are panelists. Thank you Elizabeth, Christie, Tim, and Mike. I will turn it over to Chair Zalewski, and then we'll be done.

COMMISSIONER BOCANEGRA: I'll go ahead and do some closing remarks really quickly. Again, thank you Chair Zalewski. Thank you to all of the Commissioners. All of the advisors, all of the ICC Staff for all of your support. I especially want to thank all of our audience members. I know that there are folks here that flew in for this section, so we are really proud. We hope that we have shared with you guys some insight as to what's happening across the national landscape.

I do want to take the time to do a couple of reminders. First, I'm not sure if you got the e-mail, but AE if you want to wave your hand. Advanced Energy Group sent out
an e-mail. There's going to be an informal non-sponsored networking session if you guys want to continue the discussion at a Randolph Taverns just down the street. So if you guys want to continue to have that discussion, I encourage you guys to attend.

As a final reminder our Office of Retail Market Development is also hosting its policy session on January 22nd, at 1:00 p.m. We're going to have panelists from the retail supplier community as well as consumer advocates. There will be presentations on consumer education, marketing practices, and lessons learned during the implementation of the Part 412 rules.

And, lastly, Speakers, if you guys can just hang back for some photos, that would be great.

Chair?

CHAIRMAN ZALEWSKI: I just wanted to echo that everyone did a great job. I'm very appreciative of the panelist. I learned a lot. I hope everyone enjoyed the presentations as much as I do. And thank you to Commission Bocanegra. I agree with Mitch. You had every intention to stay up on time, which is very difficult to do. And with that the meet is adjourned. Thank you.
(Applause.)

(Whereupon, the above entitled matter was adjourned.)