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SHARING THE ROAD: POLICY IMPLICATIONS OF ELECTRIC AND CONVENTIONAL VEHICLES IN THE YEARS AHEAD

TUESDAY, MAY 8, 2018

House of Representatives

Subcommittee on Environment

Committee on Energy and Commerce

Washington, D.C.

The subcommittee met, pursuant to call, at 10:15 a.m., in Room 2322 Rayburn House Office Building, Hon. John Shimkus [chairman of the subcommittee] presiding.

Members present: Representatives Shimkus, Barton, Blackburn, Olson, Johnson, Hudson, Walberg, Carter, Duncan, Tonko, Ruiz, Green, McNerney, Cardenas, Dingell, Matsui, and Pallone (ex officio).

Staff present: Samantha Bopp, Staff Assistant; Daniel Butler, Staff Assistant; Kelly Collins, Staff Assistant; Jerry

Couri, Chief Environmental Advisor; Margaret Tucker Fogarty, Staff Assistant; Jordan Haverly, Policy Coordinator, Environment; Ben Lieberman, Senior Counsel, Energy; Milly Lothian, Press Assistant and Digital Coordinator; Mary Martin, Deputy Chief Counsel, Energy & Environment; Drew McDowell, Executive Assistant; Brandon Mooney, Deputy Chief Energy Advisor; Austin Stonebraker, Press Assistant; Priscilla Barbour, Minority Energy Fellow; Jeff Carroll, Minority Staff Director; Jean Fruci, Minority Energy and Environment Policy Advisor; Tiffany Guarascio, Minority Deputy Staff Director and Chief Health Advisor; Caitlin Haberman, Minority Professional Staff Member; Rick Kessler, Minority Senior Advisor and Staff Director, Energy and Environment; and Alexander Ratner, Minority Policy Analyst.

Mr. Shimkus. We will call the hearing to order and I will recognize myself 5 minutes for an opening statement.

As most of you know, this is the Environmental Subcommittee's third hearing over the last 2 months dealing with fuels and vehicles. Our first hearing provided an overview of the future of personal transportation and I believe there were two key takeaways, one that the internal combustion engine running on petroleum and plant-based liquid fuels remain the major player in the decades ahead. And two that battery electric vehicles will continue to make inroads in the marketplace.

Our next hearing expanded on that first point specifically that since the internal combustion engine and liquid fuels are going to be around for awhile we should consider new ideas for improving them, namely, a high octane fuel standard matched with vehicles whose engines are optimized to run on these fuels. Ideally, a range of higher octane fuel blends could lead to as much if not more ethanol use than under the RFS while giving vehicles significantly improved performance and fuel economy.

Today we focus on the second point, the battery electric vehicles, EVs, are gaining in market share and that the internal combustion engine has significant competition for the first time in a long time. This hearing will delve into the question of what these changes mean for everyone involved in fuels and vehicles and most importantly what they mean for consumers. I thank our diverse panel for being here today and providing a

variety of perspectives.

I should add that we are focusing on EVs and not other alternative vehicles like natural gas vehicles or fuel cells for example, mainly because projections from the Energy Information Administration see EVs as the fastest growing alternative. Of course, only time will tell which vehicle types will catch on.

When we think of larger EV fleets, one of the first questions that come to mind is where all the extra electricity is going to come from to power them. After all, EVs are not going to be a good deal for consumers if the electricity is expensive. I am certain we will hear from several witnesses on this point, but I would like to add that I believe coal-fired generation will have an important role in providing affordable electricity and making an EV future work.

Fueling infrastructure is also an issue. We currently have 150,000 liquid fuel retailers along our nation's roads and highways and you can fill up in about 5 minutes. It is hard for EVs to compete with that level of convenience, so charging infrastructure and charging times are still a challenge. As the nation's vehicle mix changes, we may need to re-think past fuel and vehicle policies. For example, the Renewable Fuel Standard was last amended back in 2007 when we assumed that gasoline demand was on a one-way trip higher. We know now that those assumptions were overstated and will be even more so if EVs continue to gain market share. This doesn't necessarily mean the RFS needs to

be amended in light of EVs, but Congress should at least look at the matter. Automobiles are the second biggest family expense after home so the stakes are high. I look forward to a thorough discussion and again I thank our witnesses.

I have some time. Would anyone else -- I will yield to the gentlelady from Tennessee.

[The prepared statement of Mr. Shimkus follows:]

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[The prepared statement of Mr. Walden follows:]

**********INSERT 2**********

Mrs. Blackburn. Thank you, Mr. Chairman, and thank you to the witnesses for being here and for this hearing. In my district in Tennessee we have Nissan which is located right in Franklin, we have GM at the Spring Hill facility working on the Ecotec engine, and we hear from automakers and auto dealers about EVs. We are interested in looking at going forward the strength of that battery, and the chairman has well laid out some of the questions that we as a committee have.

We also are looking at the acceptance by the public. Last year in my district, in 2016, 67 percent of the cars that were sold were in the truck category. They were small trucks, light trucks, SUVs, crossovers. And looking at acceptance and then looking at how the EVs will move into that market that is where I will center my questions with you today. I look forward to hearing what you all have to say about this. And as always with us in Tennessee this is an interesting topic and we welcome you. I yield back.

Mr. Shimkus. The gentlelady yields back to me. Anyone else seeking the last 30 seconds, if not, I yield back my time and I recognize the ranking member, my friend Mr. Tonko, for 5 minutes.

Mr. Tonko. Thank you, Mr. Chairman. Before we start the clock, if I might I want to acknowledge the presence of Albany County Executive Dan McCoy who just joined us. It is great to have you in town, Dan, and thank you for your work on transportation issues.

Thank you, Mr. Chair. And thank you to our witnesses for joining us this morning. Much like this subcommittee's future of transportation fuels and vehicles hearing in March, the assembled panel represents a good overview with diverse perspectives on today's issue, the current state and future of electric vehicles. In recent years, despite more options for fuels and improvements in fuel economy, transportation has become the leading source of greenhouse gas emissions in the United States.

Greenhouse gas reductions are occurring much more quickly in the power sector. It has become clear that shifting transportation emissions into electricity generation is not only an effective, but a necessary means for our country to make major strides to address climate change. EVs will continue to become cleaner as the nation's electricity supply moves towards a more low and more zero emissions energy resources. This has already been recognized by countries around the world, so it is my belief that electric vehicles are not only essential they are inevitable.

But we do not need to look as far as China or Europe to see the desire to promote EVs. Cities and towns across our country are launching smart community projects, many including EV charging sites to make their communities more connected and efficient. I expect we will hear about the benefits of EVs, chief among them the opportunities to improve air quality, reduce gas emissions, and save consumers from fuel costs.

Despite these benefits, it is important to acknowledge that the internal combustion engine is not going to disappear overnight. In the subcommittee's previous hearing we heard estimates of how long it might take for the nation's vehicle fleet to turn over. Even with a growing adoption rate of EVs, conventional vehicles will remain a staple of our vehicle fleet for decades to come.

Today we should hear about a few aspects of the future of electric vehicles. First, what is the state of EV technology development? In part due to investments by the Department of Energy in recent years, batteries' costs have declined and their effectiveness have improved dramatically. According to DOE's 2016 Revolution Now report, the cost of EV batteries produced at high volume decreased by 73 percent between 2009 and 2016. Automakers are now offering many more vehicle options with ever-increasing ranges at a variety of price points. Continued federal investments in R&D could unlock the next big breakthrough in fast-charging battery capabilities or vehicle-to-grid smart technologies.

Second, what barriers still exist to broader EV adoption? These may include increasing consumer education and acceptance, deploying new charging infrastructure, and addressing regulatory hurdles. Regulatory action often lags behind technology. This has been true of charging infrastructure which is outstanding questions about where to build it, who can own it, and how to

ensure broad public access at affordable rates. Some of these questions will be determined by state governments and PUCs such as the development of off-peak charging rate structures. But clearly there are things Congress can do to incentivize EV purchases and infrastructure build-out.

Finally, where are we heading? The trends are positive for greater EV adoption. I want to highlight a portion of Ms. McKernan's testimony, and I apologize for spoiling it, but what A-A-A, AAA, has identified is worth mentioning more than once. Between 2017 and '18 there were pretty significant shifts in an increasing number of Americans that want to buy electric for their next vehicle and a decreasing number of Americans concerned about access to charging locations which is still the biggest concern for buyers. It is clear that even in a short amount of time, consumer acceptance is growing and range anxiety is beginning to decline. My guess based on the trends is that concerns over range, charge time, and price will continue to decline especially as more infrastructure is built to support the growing EV fleet.

Perhaps the most important trend which is outside of Congress's control is that many other countries have already set ambitious EV goals. Some are even proposing to ban internal combustion engines entirely in the decades ahead. EVs will be heavily utilized around the world which is why I believe this transition is inevitable. It is my hope that our federal R&D

investment continue to support the research, design, and manufacture of EVs here in the U.S. in the face of increasing global competition and market opportunities. Mr. Chair, I believe that cleaning up our transportation sector is important regardless of our vehicle and fuel mixes. That means improving fuel economy, developing new low emissions liquid fuels such as advanced cellulosic biofuels, and deploying a much greater number of electric vehicles. If we continue to identify and address barriers, I am certain EV adoption will increase substantially.

So I look forward to hearing more about the current state of EVs as well as what federal, state, and local policymakers can do to continue to incentivize adoption to ensure that the trend of greater EV deployment continues. With that I thank you, Mr. Chair, and I yield back.

Mr. Shimkus. The gentleman yields back his time and the chair thanks the gentleman. The chair now recognizes the ranking -- let me delay for a minute -- the ranking member of the full committee, Congressman Pallone from New Jersey, for 5 minutes.

Mr. Pallone. Thank you, Mr. Chairman. I am pleased that we are finally having a hearing to discuss electric vehicles or EVs. These vehicles are transforming our transportation sector to the benefit of both consumers and our environment, and I strongly support efforts to advance electric vehicles whether they be tax credits for EV purchases, assistance for the deployment of EV charging infrastructure, and federal investment

in vehicle and battery research.

Unfortunately though, progress in transportation modernization and fuel economy is under direct attack by the Trump administration. Recent reports indicate that the administration plans to undermine the 2012 agreement made between the auto industry, the State of California, advocates, and the Obama administration to increase the efficiency of our transportation fleet.

And this is extremely shortsighted and now comes word that President Trump intends to preempt California, a move that appears driven mainly by Administrator Pruitt and right-wing ideologues to benefit their favorite special interest, the petroleum industry. At the same time, the administration is indiscriminately giving companies of all sizes waivers of the Renewable Fuel Standard undermining that program as well.

So the administration's efforts to gut enhanced fuel economy standards couldn't come at a worse time. Emissions in the transportation sector are continuing to grow. They now exceed those of the electricity sector. In 2017, the cost of weather related disasters hit a record $306 billion, and just last month we hit another grim milestone. Scientists recorded concentrations of heat-trapping carbon pollution in the atmosphere above 410 parts per million for an entire month. The last time carbon dioxide concentrations were at that level was 3 million years ago when seas were 66 feet higher and human beings

did not exist.

So we can't continue down this road. To avoid further catastrophic climate impacts we must use every tool available to reduce greenhouse gases. EVs are one of our most critical tools to do this. In the face of a drastically changing climate we can't afford to move backwards on vehicle electrification. I believe the future for electric vehicles is promising and their lower operating and maintenance costs offer significant benefits to American consumers.

As technologies improve and costs continue to climb, consumers will continue to demand cars that save money and help preserve a livable planet for future generations. EVs have been sharing the road for some time now with conventional vehicles. As with any transformative technology, there are still various to widespread EV adoption, some of those are technological, other barriers are created by shortsighted entities who have a financial stake in the status quo and little stomach to push forward the electric platform that most auto companies' CEOs admit is critical for the future of their industry.

And the growth of the EV market even in the face of scant advertising and limited availability is a testament to American innovation and consumers' desire for these vehicles. Continued investment in EVs and charging infrastructure can only yield positive benefits for our environment, the transportation industry, and the American people. So we need smarter energy

infrastructure and cleaner vehicles. Many cities across the country are taking the lead, and it is time that we do that at the federal level to support these efforts. I would like to yield the remainder of my time to Congresswoman Dingell.

Mrs. Dingell. Thank you, Ranking Member Pallone. We have all been paying attention to the discussion about fuel economy standards and it is clear that electric vehicles are an important part of getting there. The fact of the matter is auto companies are building EVs, but we need to figure out how we are going to encourage more consumers to buy them and that is a challenge we all have to tackle together. We need to use this hearing to understand the barriers to EV adoption and deployment, how we combat range anxiety, and we build out an infrastructure that we need to support electric vehicles. This closely relates to fuel economy standards and I will talk about this more on my questioning, but want to close with a final comment. We must maintain one national program for fuel economy standards that keeps California at the table. We need stringent standards that improve over time but that also reflect current marketplace realities like the low cost of gas and low rate of EV adoption.

We are entering a critical phase. We can either come together on a negotiated solution that continues upward progress and sets standards through 2030, or we can have a costly legal battle where nobody will win and we cede American leadership in this area to overseas. I hope that this administration,

California, and other stakeholders will roll up their sleeves and get to work on a negotiated deal on fuel economy. Failure is simply not an option, it hurts too many people. I yield back the balance of my time.

Mr. Shimkus. And the gentleman yields back his time.

The chair wants to thank you all for joining us today. It is a diverse and a very interesting panel. And so we will start, first of all, and remember your full statements have been submitted for the record, you will have 5 minutes to kind of summarize that and we will go into a question and answer period.

So we will begin with Megan McKernan, Manager, Automotive Engineering, Automobile Club of Southern California, on behalf of AAA. Welcome, you are recognized for 5 minutes.

STATEMENTS OF MEGAN MCKERNAN, MANAGER, AUTOMOTIVE ENGINEERING, AUTOMOBILE CLUB OF SOUTHERN CALIFORNIA, ON BEHALF OF AAA; MITCH BAINWOL, PRESIDENT AND CEO, ALLIANCE OF AUTOMOBILE MANUFACTURERS; GENEVIEVE CULLEN, PRESIDENT, ELECTRIC DRIVE TRANSPORTATION ASSOCIATION; BOB DINNEEN, PRESIDENT AND CEO, RENEWABLE FUELS ASSOCIATION; GEISHA WILLIAMS, PRESIDENT AND CEO, PACIFIC GAS AND ELECTRIC COMPANY, ON BEHALF OF THE EDISON ELECTRIC INSTITUTE; FRANK MACCHIAROLA, GROUP DIRECTOR, DOWNSTREAM AND INDUSTRY OPERATIONS, AMERICAN PETROLEUM INSTITUTE; DAVID REICHMUTH, SENIOR ENGINEER, CLEAN VEHICLES PROGRAM, UNION OF CONCERNED SCIENTISTS; AND, DYLAN REMLEY, SENIOR VICE PRESIDENT, GLOBAL PARTNERS LP, ON BEHALF OF THE NATIONAL ASSOCIATION OF CONVENIENCE STORES AND SOCIETY OF INDEPENDENT GASOLINE MARKETERS OF AMERICA.

STATEMENT OF MEGAN MCKERNAN

Ms. McKernan. Chairman Shimkus, Ranking Member Tonko, and members of the subcommittee, thank you for the opportunity to testify at today's hearing. My name is Megan McKernan and I am the manager of Automotive Engineering for the Automobile Club of Southern California. In that role I lead the team of automotive engineers responsible for evaluating alternative fuel vehicles for our annual Green Car Guide. I am also a race car driver, so I am one of those lucky people that gets to apply my passion for cars with my job.

With over 100 years of experience, AAA is a trusted,

independent authority in the automotive industry. AAA experts serve on SAE committees responsible for setting automotive standards and participate in the Auto-ISAC working group responsible for vehicle cybersecurity guidelines. Most importantly, AAA serves 58 million members and is a leading traffic safety advocate. In the time I have today I would like to focus on a few key points from the more detailed testimony submitted for the record.

AAA has invested significant resources into understanding and evaluating vehicle ownership trends, fuels, automated vehicle technologies and electric vehicles, and surveying consumer trends. One of the key investments we have made in this area is the Automobile Club of Southern California's Automotive Research Center, ARC, located in Los Angeles, a premier vehicle emission test laboratory featuring state-of-the-art facilities and equipment operated by a team of highly qualified engineers and technicians.

The pace of battery EVs and plug-in hybrid vehicles being introduced into the national fleet is likely to accelerate especially as technology trends ramp up due to changing consumer preferences, lower ownership costs, and the adoption of connected and autonomous vehicles. In fact, according to a new AAA survey, 20 percent or 50 million Americans are likely to go electric for their next vehicle purchase, a jump of five percentage points from just a year ago.

Since 2010, the AAA Green Car Guide has become a trusted source of information for buyers who are looking to maximize the value of their purchase. A team of ARC engineers with more than 75 years of combined automotive experience conduct the evaluations of a variety of new alternative vehicles including hybrid or plug-in hybrid, battery electric, compressed natural gas, hydrogen, other alternative fuel vehicles, or have category leading fuel economy set by the U.S. EPA for the annual AAA Green Car Guide.

All vehicles are evaluated in thirteen different categories in real-world and test track evaluations using testing procedures developed by SAE standards and custom procedures employed by the ARC to provide useful information to members and consumers. Vehicles are rated on the criteria that matter most to car buyers including ride quality, safety, and performance. In 2018, we evaluated 74 vehicles and based on our findings awarded AAA's Top Green Vehicle awards in several categories. The complete guide has also been submitted for the official record and is available online for consumers.

To better understand what the public thinks about EVs, AAA also conducted a consumer attitude survey on EV purchasing trends. So what did we find? Two in ten Americans say they are likely to buy an electric vehicle the next time they are in the market for a new or used vehicle, an increase from 15 percent over 2017 survey results. We also learned concern for the environment is

the top reason consumers are likely to purchase an EV, followed closely by lower long-term ownership costs, access to the newest technologies, and then access to car pool lanes.

And range anxiety, previously a serious concern for consumers, is beginning to ease. More charging options is reducing consumer anxiety and making EVs an attractive vehicle purchase and viable transportation option for a variety of trips, including longer journeys that may require fueling options as convenient as filling up at the local gas station. With more consumers looking to purchase an EV, the AAA Green Car Guide is a valuable resource for consumers who are looking for the right electric vehicle or alternative fuel vehicle for their next purchase.

Over the coming years, automakers will make EVs a higher priority in their research and development efforts and the next generation of EVs will feature the most advanced technology our nation's roads have ever seen. Whether it is EV or autonomous vehicle, the importance of well-maintained roads and bridges cannot be ignored. Infrastructure improvements and system upgrades will need to incorporate electric vehicle charging, intelligent transportation, and connected vehicle technologies to ensure networks are built and maintained to support all levels of connectivity that will benefit users and improve safety.

In closing, AAA is committed to doing its part to provide accurate information to help consumers on all things automotive.

Through our continued vehicle research and consumer surveys to our work in traffic safety, we will look for opportunities to make the nation's roads, vehicles, and drivers safer. Thank you.

[The prepared statement of Ms. McKernan follows:]

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Mr. Shimkus. Thank you.

Now I would like to recognize Mr. Mitch Bainwol, President and CEO of the Alliance of Automobile Manufacturers. Sir, you are recognized for 5 minutes.

STATEMENT OF MITCH BAINWOL

Mr. Bainwol. Thank you, Chairman Shimkus and Ranking Member Tonko, members of the committee. I am Mitch Bainwol. I run the Auto Alliance which is comprised of 12 manufacturers headquartered in the U.S., in Europe, and in Japan, and we are responsible for about 80 percent of the vehicles on the road today in this country. Next slide.

[Slides.]

Mr. Bainwol. Rather than read testimony, I am going to run through a short PowerPoint deck and hopefully it will be a little lively and at least some good images here for you. The first slide shows world vehicle sales 1996, 2006, and 2016 by region, and what you see is one phenomenal growth in sales. So mobility is alive and well and we are probably, 2017, closer to a hundred million units. When you think about the next decade a billion cars will be put on the roads of the world. What you also see is that the U.S. is a very mature market. We are relatively stable in terms of sales. And you see China ramping up, so China is clearly the world leader in terms of unit sales. The question for us really, ultimately, is who will be the world leader when it comes to innovation and we want that to happen here. Next slide.

We are talking today about powertrain. I think when you reflect on the broader question of mobility there are four

different trends going on. One is powertrain, another is connectivity, another is the trend toward autonomy which this committee has addressed, thankfully, and the last is sharing, and these are all independent trends but they are interactive. And when you have a conversation about powertrain I think you have to look in the context of the broader question. Next slide.

Around the world, and this was, I think, suggested in Mr. Tonko's statement, we are seeing policy made to either phase out liquid fuel, ban liquid fuel, or set EV targets. So this is happening in a very, very dramatic way. We are global companies and we are having to respond to that global reality when it comes to policy. That is also happening in the U.S., more so in California and what are called ZEV states, states that follow the California model. But we are seeing policy induce electrification, and the question really is how you align what is happening in the marketplace with what is happening with policy. Next slide.

What you see here, very quickly, is a timeline of announcements by the companies responding to the global interest in electrification. Next slide.

You see the green bars show from 2011 through 2017 the number of models available to the public when they go into showrooms to buy a car and it has gone up by about 980 percent from 2011 to 2017. So we are offering many more models but consumers literally are not buying it just yet. EVs represent about 1.2

percent of the marketplace. If you add in hybrids you are getting closer to about 3 percent. The next slide tells you why this is in part happening and one reason is the success of the conventional engine. From 2005 to 2017, the conventional engine is up 30 percent in terms of fuel economy and so that does make the question in terms of the economic calculus a more complicated one for the consumer. Next slide.

Here you see the relationship between gas prices and the adoption, the purchase of alternative powertrains and it looks like an Olympic event. It looks like synchronized swimming. It is just directly correlated, and so policymakers can make policy but what happens in the marketplace has a huge impact in terms of buying behavior. The next slide shows the bottom line in terms of where we are and the red line is the share of the marketplace that is gas and diesel. The blue line is the share of the marketplace that is a combined hybrid, plug-in, and electric and the circled percentages are the delta between gas, diesel, and alternative powertrains. And from 2011 to 2017 that net has gone from 96 percent to 95 percent, so in other words it hasn't really moved. We all expect it is going to change at some point, but it has not yet changed.

I have two more slides. This next one is a bit complicated, but it reflects -- I can deconstruct it pretty quickly and easily. It reflects, and I believe you may have a copy of this and we will make sure it is available to you, this reflects the ZEV

percentages in 2013 and in 2017 by the states on the Energy and Commerce Committee. So, overall, ZEVs were 0.6 of the marketplace in 2013, in 2017 nearly doubled to 1.13. If you look at California, there you see a material change.

So, for the California members, up from 2.34 to 4.81, California is alone in this respect. Other states are not moving quite as rapidly. It is also important to point out Georgia, where the ZEV credit, the tax credit, was removed and there the number actually fell. So there is a direct relationship between the availability of tax credits and adoption.

Finally, the last slide, I just want to make a point that the job of Congress is hard and sometimes policies conflict. If you care about the environment and that is your driving passion in CO2 reduction then you are looking to promote electrification and that all makes sense, but that obviously drains the Trust Fund. If you are looking to build an infrastructure then you want a robust gas fund and that unfortunately is inhibited by electrification and by the improvements in conventional engines.

At any rate, I appreciate the opportunity to testify and this is a kind of sardine panel, but I would look forward to the questions.

[The prepared statement of Mr. Bainwol follows:]

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Mr. Shimkus. Thank you very much.

The chair now recognizes Genevieve Cullen, President, Electric Drive Transportation Association. You are recognized for 5 minutes. Thanks for being here.

STATEMENT OF GENEVIEVE CULLEN

Ms. Cullen. Thank you. Good morning Chairman Shimkus, Ranking Member Tonko, and members of the committee. I am Genevieve Cullen, president of the Electric Drive Transportation Association. Our membership includes the entire electric drive value chain including vehicle, battery, and component manufacturers as well as utilities and infrastructure developers who are advancing e-mobility. Using electricity to power a hybrid, plug-in hybrid, battery and fuel cell electric vehicles enhances our energy security with fuel diversity and ensures our competitiveness in the global race for new technology while reducing transportation costs and emissions.

A brief look at the numbers, the same numbers that Mitch uses but from a slightly different lens shows a growing market for electric drive, since the commercial scale introduction of plug-in vehicles in late 2010 the electric drive segment has grown from two to almost fifty models including three models of fuel cell vehicles. More than 800,000 electric vehicles have been sold to date and annual sales are continuously increasing. 2017 sales showed a 71 percent increase over 2015 in the face of stable and low gas prices.

The diversity of the electric drive market is also increasing. We are seeing a expanded offerings across a range of price points in vehicle categories including trucks, buses,

and mobile equipment. Looking ahead, a survey of major industry and analyst projections shows uptake increasing substantially in the next decade and beyond. For instance, the Boston Consulting Group predicts that EVs could be more than 20 percent of the U.S. new car registrations by 2030. Bloomberg New Energy Finance estimates that global electric drive sales will reach parity with internal combustion sales by 2038.

While the numbers and timelines have some variability, the direction of the market is clear. Electrification will shape the future of mobility. The global opportunity in e-mobility has not gone unnoticed by our competitors. Although not alone in its pursuit, China is making an aggressive push to dominate this market and they could succeed. The Wall Street Journal recently reported that 40 percent of global investment in electric vehicles is occurring in China. Meanwhile, electric charging and hydrogen fueling infrastructure are expanding to serve this market. DOE reports more than 20,000 charging stations in operation today. More will be needed to serve diverse driving and charging needs.

Electric transportation advances are also reinforcing growth in automation, connectivity, and shared mobility. While the continuum of autonomous technology is being built into vehicles today is not exclusive to it, electric drive is in many ways the optimal partner. The smart technologies of the future will be built on electrified platforms. In that vein, we thank

the committee for its leadership in this area through H.R. 3388, the SELF DRIVE Act. The advances we have been talking about have positive implications for consumers, businesses, and the country.

For drivers, e-mobility means wider options and reduced costs. For the country, the growth of this market is building an advanced technology value chain that is creating jobs, expanding manufacturing in the United States, and bolstering our position in the global race for electrification. An electrified transportation sector will also increase our energy security, reducing our reliance on a single transportation fuel while reducing transportation emissions.

So where do we go next? To secure these benefits and the U.S. position in the global marketplace we need to grow. I think we can all agree to that. We are still an emerging market of new technologies pushing to deliver ever-enhanced performance at reduced cost while building volume. To achieve that scale, the industry is investing in technology development, market expansion, and infrastructure at the local, regional, and national scale. Public policies can reinforce that work and speed achievement of these benefits. In conclusion, industry investment trends, technology advances, and global market imperatives all point to electrification. Accelerating that movement is a critical opportunity for continued United States leadership in a market that we build. Neglecting that opportunity is a choice to follow rather than lead in the world

market for electric transportation. Again I thank you for the opportunity to be here today and I look forward to your questions.

[The prepared statement of Ms. Cullen follows:]

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Mr. Shimkus. Thank you very much. The chair now recognizes Bob Dinneen, President and CEO of the Renewable Fuels Association. Welcome, you are recognized for 5 minutes.

STATEMENT OF BOB DINNEEN

Mr. Dinneen. Good morning Chairman Shimkus, Ranking Member Tonko, and members of the subcommittee. I greatly appreciate the opportunity to be with you again to present the views of the American fuel ethanol industry.

Liquid fuels and internal combustion engines will continue to drive America for decades to come and despite what you might hear, these are not fully mature technologies. Plenty of room remains for the improved performance of both. We need to make sure that the technologies literally and figuratively driving our economy compete in a policy environment that maximizes efficiency and carbon reduction and allows fair access to a market that has largely been closed to competition for more than a century.

As you heard at your hearing 2 weeks ago, ethanol is the lowest cost and cleanest source of octane on the planet and research has shown that a mid-level ethanol blend could deliver tremendous efficiency benefits if used in an optimized engine. However, if the move toward higher octane fuels simply encourages more hydrocarbon aromatics, a huge opportunity will be lost and consumers will be paying more for fuels that pollute more, are imported more, and increase carbon more.

This committee has already led when it comes to transformative energy policy. The RFS, for example, remains a

beacon of success that is being emulated as other countries seek to expand their production and use of renewable fuels to address the same energy, economic, and environmental imperatives that drove this committee to pass the RFS a decade ago.

Yes, there are critics of the policy, those who want to ignore the economic and environmental consequences of unfettered petroleum use, but consumers appreciate the savings at the pump resulting from the increased use of lower priced biofuels. Farmers appreciate an important value-added market that means fewer taxpayer dollars being spent on farm programs, environmentalists recognize that we have made an important first step in addressing global climate change, and national security hawks most certainly value the fact we are relying more on renewable fuels produced in the Midwest and less on fossil energy from the Middle East.

That is why EPA Administrator Pruitt's campaign to destroy RFS demand is being met with such virulent opposition. By issuing secret hardship waivers to highly profitable refineries, by ignoring a court-ordered reallocation of 500 million gallons in 2016 RFS obligations, and by forgiving more than half of the RFS obligation for an aging and noncompetitive refinery that has scapegoated the RFS, EPA has done great damage to this important program. Those actions send the wrong signals to the fuel producers and automakers who are poised to make huge investments in the next generation of fuels and vehicles.

The ethanol industry recognizes a broad array of electric vehicle technologies are on the horizon and we want them to succeed. We do not see electric vehicles as a threat, rather, we see electric vehicles as fellow travelers on our road toward energy independence and decarbonization. It will take all innovative technologies for us to succeed. Indeed, I will tell you, although I would appreciate it if you didn't tell my board of directors that my wife drives a hybrid electric car. She loves it, I don't. It is too small for me, big surprise. I much prefer my flex-fuel Chevy pickup, but that just underscores my point.

There will be consumers for whom electric vehicles work well for their taste, their lifestyle, and their wallets and there will be consumers who will continue to prefer liquid transportation fuels. Public policy needs to make room for both and ought not put the heavy finger of government on the scale in favor of any one technology. Today, for example, EVs are effectively treated as zero emission vehicles because the upstream source of the electricity is not considered. That is not only inaccurate it provides EVs with an incentive relative to other decarbonization technologies. Compliance values from all technologies should be based on full, direct, well-to-wheels lifecycle emissions that would allow for an apples-to-apples treatment of their greenhouse gas emissions.

We believe ethanol and EVs can play a complementary role in the long term. In 2016, Nissan unveiled the prototype of a

vehicle powered by solid oxide fuel cells that uses ethanol as the fuel. Last month, Toyota revealed its first prototype of a hybrid electric vehicle powered by a flexible fuel internal combustion engine that can run on any blend of ethanol and gasoline. Ford has also experimented with ethanol flex-fuel hybrid EV technology.

A global policy shift is taking place driving transportation toward low carbon technologies. Renewable fuels have a key role to play in the development of this new mobility. We believe a combination of technologies with ethanol could be the answer so long as there is a level playing field. Together we can work to increase efficiencies and reduce costs for consumers, it is not one or the other. Thank you and I look forward to our questions.

[The prepared statement of Bob Dinneen follows:]

**********INSERT 6**********

Mr. Shimkus. Thank you.

The chair now recognizes Geisha Williams, President and CEO of Pacific Gas and Electric Company, on behalf of the Edison Electric Institute. You are recognized for 5 minutes. Welcome.

STATEMENT OF GEISHA WILLIAMS

Ms. Williams. Thank you, Chairman Shimkus. Thank you, Ranking Member Tonko, for the opportunity to speak before your committee this morning. It is on, yes. I will make it up a little bit closer, all right.

I am Geisha Williams, CEO and President of PG&E Corporation, the parent company of Pacific Gas and Electric. Pacific Gas and Electric is the largest combined electric and natural gas energy company in California. PG&E is here today as a member of the Edison Electric Institute. Together, EEI's member companies provide power to 220 million Americans across all 50 states.

We are also active and committed partners in the drive to grow America's electric transportation sector. As such, we applaud your focus on the policy implications of a transportation future in which electric vehicles will represent a growing share of the vehicles on our roads. Let me say clearly, we see electric transportation as a vital opportunity. It is an opportunity to make more efficient and economic use of our nation's incredible energy grid infrastructure and to help keep costs reasonable and affordable to all Americans. But it is also an opportunity for the U.S. to cement itself as a leader in transportation innovation. It is an opportunity to spur new investment and create jobs. And it is an opportunity to make our environment more sustainable through improved air quality and through lower

greenhouse gas emissions.

Electric transportation technology and infrastructure are going to be one of the keys to making our cities smarter and more liveable. In our home state in California, for example, the transportation sector contributes 40 percent of the greenhouse gas emissions, 80 percent of NOx emissions and 90 percent of diesel particulate matter pollution. Because of the progress we are seeing in clean energy, and specifically in California, electrifying the transportation sector offers a chance to dramatically reduce each of these numbers. Consider in 2016, the electric industry CO2 emissions were nearly 25 percent below the 2005 levels and for the first time in over 40 years they were lower than emissions from the transportation sector.

EEI member companies including PG&E are already helping to turn these opportunities into a reality in an efficient and cost effective way that benefits everyone. And let me briefly touch on a few examples. One is access to public charging infrastructure. A study by EEI and the Institute for Electric Innovation projects that by 2025 there will be seven million electric vehicles on the road in the United States and they will require nearly five million charging stations. More than a dozen EEI companies are stepping up and helping with this challenge with plans to invest $350 million in customer programs and projects.

PG&E alone, my company, is investing $130 million over the

next 3 years to put 7,500 chargers at workplaces, at multifamily residences, and in disadvantaged communities. This will roughly double the number of public charging facilities in our service area. And we hope to soon launch an additional $230 million project of similar investments for medium and heavy duty vehicles. We are also growing EV into the grid. One key to this is managing the timing of charging. Our companies are approaching this in multiple ways including customer education, rate design, and smart charging which optimizes charging through communication between the grid, the vehicle, and the charging equipment.

For the last several years, PG&E has partnered with BMW to successfully pilot wireless smart charging through vehicle telematics systems. We also offer special rates to EV owners that incentivize them to charge at certain times of the day which allows us to take advantage of times when there is excess energy available on the grid. For the customer it means they are able to charge their vehicles at the equivalent of a $1.20 per gallon, a price we haven't seen at the pump in 20 years.

The last area I will touch on is the industry's work to accelerate EV adoption by fleet operators including our own companies. EEI companies have increased the number of EVs in their fleets by 43 percent just since 2015. We are helping others make this transition as well. At PG&E, for example, we are working with transit agencies in Stockton and San Jose to pilot advanced smart charging and energy storage technologies to more

seamlessly integrate their electric bus fleet charging with our grid.

These few examples only scratch the surface of everything we are doing as an industry. The key point I want to leave you with is this. Our industry is a critical partner in America's transportation future. From a policy standpoint it is vital that we continue to look for opportunities to engage the power sector and leverage this amazing energy grid that we have in this effort. Our companies are unique in our scale, our reach, and our expertise and we are committed to partnering and making this opportunity in this area a reality for all. Thank you again for the opportunity.

[The prepared statement of Ms. Williams follows:]

**********INSERT 7**********

Mr. Shimkus. Thank you very much.

The chair now recognizes Mr. Frank Macchiarola, Group Director, Downstream and Industry Operations for the America Petroleum Institute. Welcome.

STATEMENT OF FRANK MACCHIAROLA

Mr. Macchiarola. Good morning. Chairman Shimkus, Ranking Member Tonko, and members of the subcommittee. Thank you for the opportunity to testify today. My name is Frank Macchiarola and I am group director of Downstream and Industry Operations at the American Petroleum Institute.

The subject of this hearing is important as it raises policy questions affecting our nation's economic strength, energy security, and environmental stewardship while presenting core questions about our everyday mobility. The internal combustion engine is the backbone of our transportation system and instituting significant changes to that system presents complex issues that must be approached with substantial caution.

The fuel supply chain is highly integrated with the transportation sector therefore we encourage the development and evaluation of transportation policy through a holistic systems-based approach in which vehicles, fuels, and infrastructure are treated as an integrated system. A strong oil and gas industry is a vital component of this integrated system and it is essential for our standard of living. The oil and gas industry supports approximately 10.3 million American jobs and nearly 8 percent of the U.S. economy. The industry also provides more than 98 percent of the fuels we use to conduct commerce, to travel for work and vacation, and to stay connected to our

family and friends.

America's energy renaissance has allowed us to produce significantly more of the energy we use today and to help the United States become an exporter of gasoline and diesel. At the same time, the United States has reduced air pollution by 73 percent between 1970 and 2016, even as vehicle miles traveled nearly tripled and the economy grew during that period by 253 percent. EIA estimates that liquid fuels will continue to be the primary transportation source through the next 2 decades. The fuels we use must be reliable and affordable and fully compatible with engines, motor vehicles, and fuel distribution systems and we must enact transportation and energy policy based on free market principles providing consumer choice and greater certainty for market participants.

One policy that distorts free market, conflicts with integrated approach, and places a burden on the consumer is the Renewable Fuel Standard. It is an example of the government placing its finger on the scales to benefit one industry over another. To be clear, API believes we need all sources of commercially viable energy including renewables. However, the statutory requirements of the RFS are unworkable and unattainable. At the time of the RFS passage in 2007, EIA significantly overestimated today's gasoline consumption by 12 percent, substantially underestimating oil and gas resources by 70 percent. Furthermore, EIA assumed in 2007 that we would see

a technological breakthrough in production of advanced and cellulosic biofuels. These fuels have failed to be produced in meaningful commercial volumes.

We need to sunset the outdated RFS and we appreciate the leadership of the chairman and members of this subcommittee in analyzing potential solutions for comprehensive reform. As we look at fuels policies including those addressing electric vehicles the RFS should stand as a cautionary tale to policymakers. Electric vehicles show some promise in certain applications and many forecasters expect market-driven growth in the production and use. While API supports market-driven activity, we oppose government intervention in the markets to pick winners and losers as that creates an unlevel playing field.

In enacting transportation policy we must acknowledge that vehicles are staying on the road longer and going further on the fuels we use. New transportation policies that incentivize shifts in consumer behavior should be considered with caution as they could impose undue costs on consumers with diminishing environmental benefits. The ultimate trajectory and level of market penetration achieved by EVs should not rely on government interference but rather the free market. It should depend on consumer acceptance on the relative energy and environmental performance of existing conventional automotive technologies.

The oil and gas industry is committed to providing for our nation's essential energy needs in the years ahead and we look

forward to working with the Congress on solutions to support the American consumer. I thank the chairman, ranking members, and members of the subcommittee for the opportunity to testify today and I look forward to your questions. Thank you.

[The prepared statement of Mr. Macchiarola follows:]

**********INSERT 8**********

Mr. Shimkus. Thank you very much.

The chair now recognizes Dr. David Reichmuth, Senior Engineer, Clean Vehicles Program with the Union of Concerned Scientists. You are recognized for 5 minutes. Welcome.

STATEMENT OF DAVID REICHMUTH

Mr. Reichmuth. Thank you. Good morning, Chairman Shimkus and Ranking Member Tonko and members of the committee. My name is Dr. David Reichmuth. I am a senior engineer with the Union of Concerned Scientists, a nonprofit advocacy organization whose primary mission is to ensure that policy is crafted based on the best available science. I would like to thank you for the invitation to talk to you today about the benefits of electric vehicles, or EVs.

The promises of EVs are clear. Drivers can save money, harmful emissions are reduced, and the use of petroleum can be minimized. Reducing emissions means public health benefits, economic benefits, and avoiding the worst impacts of climate change. Transportation is now the leading source of carbon dioxide emissions in the United States. Addressing the emissions from this sector is a critical piece in moving towards a more sustainable economy and way of life not just for the United States but worldwide.

Now switching fuels from petroleum to electricity can provide significant emissions reductions. My colleagues and I have compared the climate emissions from driving on electricity versus gasoline. To do so, we considered all the global warming emissions from driving on electricity versus gasoline and we considered all the emissions from fueling power plants, getting

electricity to an EV and compared that to the emissions created extracting crude oil, refining gasoline, distribution to filling stations, and combustion in a vehicle's engine.

Our most recent analysis shows that cars driving on electricity in the U.S. have emissions equal to what a gasoline car that gets 80 miles per gallon would produce. It is true that emissions from EVs vary depending on where in the U.S. they are driven, as the emissions from electricity generation varies regionally. Overall, 75 percent of the people in the U.S. now live where driving on electricity is cleaner than a 50 mile per gallon gasoline car and these are figures for the average EV. More efficient EVs of course are even cleaner. Not only are EVs cleaner than gasoline cars, the gap is growing as electricity generation shifts away from dirtier fossil fuels to sustainable lower emission resources. EVs also have air quality benefits when paired with clean sources of power. Studies have shown the potential for EVs to reduce ground level ozone and particulate matter in both urban and rural areas across the country. But EVs are not just cleaner than gasoline vehicles, they are cheaper to refuel and maintain. In a recent UCS analysis we compared the cost to refuel with gasoline with the cost to recharge an EV. Looking at the electricity providers in the 50 biggest U.S. cities, recharging an EV is cheaper than refueling the average new gasoline vehicle in every city. The average saving is almost $800 per year on fuel costs.

In addition to lower fuel costs, EV drivers avoid unexpected shocks to their household budget from spiking gasoline prices and face significantly lower maintenance costs. Battery electric vehicles have no engine so no oil changes, spark plugs, or engine air filter to change. Instead, electric motors and batteries require little to no attention. This means less time and less money spent on routine car maintenance.

Now EVs are an important tool to improve public health and economic vitality, but the EV market, the infrastructure, and the technology are still relatively new. It has been less than 8 years since the start of mainstream EVs in the United States and the ability of longer range, lower cost, battery electric vehicles really only started last year. So, while there is strong growth in EVs both in the number of models available and sales volume, it is far too early to end public sector investments in EVs and in needed infrastructure. Removing support prematurely will delay the adoption of EVs at a time we need to be doing exactly the opposite which is accelerating the transition to cleaner transportation.

Other countries around the world are moving to incentivize and require electric vehicles and manufacturers will need to respond in order to compete. Last year, four of the five top-selling EV models in the U.S. came off of American assembly lines. Making policy choices in the U.S. that inhibit the growth of EVs will place domestic car makers at risk of falling behind,

hurt American drivers, and harm U.S. manufacturing. Now EVs are an important solution to improve air quality and reduce climate changing emissions. They allow U.S. drivers to use a cheaper fuel with lower variability in price. The EV market it is young but it is growing and the investment that U.S. Government, the states, automakers, and utilities have made in EVs will pay dividends if we continue to have smart EV policies.

I would like to thank you for the invitation to share UCS's perspective on electric vehicles and I am happy to speak to those issues or anything else which is of interest to the committee. Thank you.

[The prepared statement of Mr. Reichmuth follows:]

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Mr. Shimkus. Thank you very much.

And finally, last but not least, Mr. Dylan Remley, Senior Vice President, Global Partners, on behalf of the National Association of Convenience Stores and Society of Independent Gasoline Marketers of America. Sir, you are recognized for 5 minutes. Welcome.

STATEMENT OF DYLAN REMLEY

Mr. Remley. Chairman Shimkus, Ranking Member Tonko, members of the subcommittee, thank you for the opportunity to testify today --

Mr. Shimkus. Just pull that mike just --

Mr. Remley. -- on the future policy implications of electric and conventional vehicles. My name is Dylan Remley. I am Senior Vice President of Terminal Operations for Global Partners. Global has one of the largest terminal networks in the Northeast and we are also one of the largest independent owners, suppliers, and operators of gasoline stations in the Northeast with approximately 1,450 locations, 260 of which we directly operate. I am testifying today on behalf of the National Association of Convenience Stores and the Society of Independent Gasoline Marketers of America.

Members of NACS and SIGMA, collectively, account for approximately 80 percent of retail motor fuel sales in the United States. Fuel retailers are consumer-facing entities that must adapt to changing consumer demands and to do so we must change the products and services we offer to the general public. We have chosen our retail locations with care. We constantly strive to provide the best possible refueling services to consumers. For example, Global itself has recently partnered with Electrify America to install EV charging stations in some of our stores

and we are also exploring a number of other options with EV providers to meet the ever-changing needs of our customer base.

However, as more electric vehicles continue to share the road with conventional vehicles in the years ahead, we urge policymakers to consider several factors including the environmental and energy independence implications of this shift, the impact on marketplace competition, and then the impact on the nation's infrastructure. Lawmakers must examine the well-to-wheels cost and impact of EVs from power plant energy distribution to battery disposal. How will batteries be ultimately recycled and then disposed if it cannot be recycled? Moving forward now and figuring out not only this issue but a host of others at a later date does not work.

It is also important for lawmakers to consider energy security and independence questions. Our nation has made significant strides to achieve energy independence and security. We should question the implications of a transition to a electricity-powered vehicles that will come at a significant cost in the form of new infrastructure and will rely on the importation of certain raw materials from countries that may not be considered politically or economically stable. However, today what we would most like to emphasize is that policymakers must consider the current skewed incentives that exist for EVs that may lead to an anticompetitive refueling marketplace.

Many states effectively grant utility companies a monopoly

over the provision of electricity in a particular marketplace and utility companies are guaranteed a rate of return from their ratepayers. Recently, utility companies have sought approval to enter the EV recharging business and treat their capital investments in that business as part of the utility rate base that all of their customers must pay. The private sector will have significant difficulty competing with zero market entry costs. It is inappropriate for utility companies and states to be regressively funding electric recharging infrastructure on the backs of ratepayers, the vast majority of whom do not even drive EVs. I want to be very clear. Fuel retailers do not have a problem with a public utility entry in the electric fuel recharging business provided it is competing for that business on equal footing with the private sector. A public utility company should not be able to invest in electric or alternative fuel recharging infrastructure by using ratepayer funds which the private sector simply cannot compete with.

Infrastructure concerns including updating the power grid and the cost of maintaining the nation's roads and bridges must also be evaluated. Unlike conventional vehicles which support infrastructure investments because their owners pay the gas tax, current EV owners use the country's roads essentially for free. Lawmakers should ensure the EV recharging and infrastructure investment is done through the private sector on a level playing field so that tax and other incentives are not provided to certain

stakeholders to the omission of others.

Finally, given the prime location of retail fueling stores, the highly competitive nature of our industry, and a wealth of experience in refueling, we believe that the fuel retailing industry is well-positioned to meet consumer needs as EVs continue to enter the marketplace. We encourage Congress and the states to work with industry and other stakeholders to find ways to deploy electric charging infrastructure via the existing privately developed motor fuel marketplace. Thank you for the opportunity to testify and I am happy to answer any questions.

[The prepared statement of Dylan Remley follows:]

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Mr. Shimkus. Thank you very much. What a great panel. I appreciate all your time. It shows you the challenges that we have in front of us.

So with that I will recognize myself 5 minutes to start the round of questioning. And this is really for anyone. You all have been following what we have been doing. Our last hearing on April 13th talked about the opportunity of high octane fuels and vehicles optimized to use them. Do you see that as a benefit to meeting CAFÉ and environmental emission issues if we moved to a high octane standard? And this is open to any of the panelists who may want to answer that question.

Bob, first?

Mr. Dinneen. Sure. Absolutely, Congressman, as I mentioned in my testimony, we believe that high octane fuels with optimized engines represent a tremendous opportunity to generate efficiency gains and carbon reductions. It is the way of the future and can be one of those future technologies that is providing consumer choice and savings at the pump.

Mr. Shimkus. Mitch?

Mr. Bainwol. We would agree that octane offers an opportunity for fuel efficiency gains and we are agnostic about the source of the octane, but ethanol is a low-cost option.

Mr. Shimkus. Well, Mr. Bainwol, before I go to then -- since you represent -- so in our debate we have talked to, in essence, our big three, but obviously you represent a broader spectrum

of manufacturers who haven't been in discussions with us yet. Do you think they would eventually see this as an opportunity for meeting the CAFÉ and some of the environmental issues?

Mr. Bainwol. So I think everybody does agree that there is, most folks agree that there is a value to octane and its conversation, I think, is taking place and will accelerate. Just last week a number of our members met with Bob and others from the ethanol community, so I think it is timely, ripe, and we are happy to engage.

Mr. Shimkus. Great.

Mr. Macchiarola?

Mr. Macchiarola. Sure. Mr. Chairman, we believe the idea of a 95 RON technology-neutral national performance standard is an intriguing one. Certainly it would have to be coupled in a conversation about broader RFS reform that we believe must include a sunset of the program, but again we also think on the question of 95 RON there are outstanding questions, questions about timing, the phase-in period of which it would be phased in, questions about potential costs at retail, potential mislabeling issues, are all questions that need to be analyzed and assessed. But again we appreciate your efforts on comprehensive RFS reform.

Mr. Shimkus. Let me go to Mr. Remley.

Mr. Remley. Chairman, if I can just comment briefly, I think we would agree with a lot of the comments that the rest of the witnesses had. You know, it is a promising opportunity. I think

the concern just raised by Mr. Macchiarola would also be echoed at the retail level which is labeling. There is still questions from OEMs with regards to higher ethanol blends, but the concept of the 95 RON and higher octane is certainly a promising development.

Mr. Shimkus. Great, thanks.

I want to move to my next question so I want to go to AAA, Ms. McKernan. The price of EVs are still high and the long charging stations makes it difficult to take long trips. I am from rural Illinois and I represent 33 counties. Over the last week I spent almost 6 hours on the road every day I was home. So can EVs ever work for lower income households especially ones that can only afford a single car?

Ms. McKernan. Well, definitely range anxiety is beginning to ease and the number of charging stations has increased in the United States, reached a level of 16,000 in 2017. You know, AAA's main concern is giving consumers a choice. And so we are not advocating one way or another that people should drive EVs or not, we want to provide the most information that we can for consumers so they have the choice.

Mr. Shimkus. So let me cut you off, I am getting short on time. But I wanted to ask because you mentioned roads and bridges, so how do we help -- and this is not a Ways and Means Committee, in fact, my roommate Mr. Brady would be mad if I asked this question. But how do we then incorporate the electric

vehicles into the funding of our roads and bridges systems? What is the secret sauce that allows us to help maintain those in a Highway Trust Fund?

Ms. McKernan. I don't have that specific information. This particular study didn't cover anything like that. But I would be happy to have AAA's staff follow up with a response.

Mr. Shimkus. Well, I think that is going to be, it is an important debate if you talk to folks in the Transportation Committee and also the Ways and Means, is why haven't we done anything on roads and bridges is this Highway Trust Fund fight. So this is going to be, whether it is now or the future it is going to be part of the debate.

Let me go back to Bob for my final question. In your testimony you suggest that environmental benefits of EVs are overstated while the environmental benefits of biofuels are not fully accounted for. How would you suggest fixing that?

Mr. Dinneen. Well, I think they need to look at a full lifecycle analysis for all fuels and technologies. For ethanol, Congressman, they count the angels on the head of a pin. They look at the energy it takes to produce the fuel. They take the energy that is used in the production of the fertilizer on the farm and the energy it takes to produce the John Deere hat the farmer wears. Heck, they even count emissions from overseas from indirect land use. And for electricity they only are looking at the carbon not the tailpipe and the source of the electricity

is not considered and that just gives a disparate view.

Mr. Shimkus. Thank you. My time has expired. I am going to move to the ranking member of the subcommittee, Mr. Tonko, for 5 minutes.

Mr. Tonko. Thank you, Mr. Chair.

Ms. McKernan, earlier I mentioned some of the trends that AAA has identified on potentially changing consumer attitudes on EVs. Do you have any thoughts on whether there might be a growing consumer acceptance of EVs?

Ms. McKernan. Yes, there definitely is a growing consumer acceptance. The more consumers can learn about the technology, what the capabilities are, and seeing whether or not it can fit into their lifestyle, I think, is what is helping to change their attitudes.

Mr. Tonko. Thank you.

And Dr. Reichmuth and Ms. Cullen, some have suggested that low penetration of EVs is because consumers do not want them. Is that a fair assessment?

Mr. Reichmuth. If I may, that is not a fair assessment because, you know, the consumers in the marketplace for a new car are not seeing the same variety of models that they are seeing in gasoline vehicles. So there are cars that are not available in every state, the Fiat 500E is only available in two states, for example. There is no plug-in pickup truck yet so if you are in the market for a pickup. There is also brands that don't offer

an EV, so you can't get a Jeep or a Lexus plug-in yet. So, when you just look at the penetration rate, the number, the amount of sales, it doesn't reflect necessarily the consumer desire to buy an EV if they can't get that EV on their dealers' lots.

Ms. Cullen. I would also point out that you are talking about penetration in an extremely large market so while the percentage might be small in penetration the growth of the market has been substantial. As I noted, we went from two vehicles on the market in late 2010 to almost 50 varieties at different price points today and those offerings are only increasing. Every major auto manufacturer has announced plans to diversify their fleets, their price points, the sizes, to offer the additional segments and performance profiles that consumers are looking for.

So I think it is also important to note again the market has grown every year since introduction and that 2017 represents a 71 percent increase in sales over 2015. So this market is growing, but we are pretty new and we are a small part of the enormous car park.

Mr. Tonko. And again, Ms. Cullen, one of the biggest barriers to greater EV adoption has been a lack of charging infrastructure. You cite a Navigant study that estimates sales of fast chargers are expected to increase from 20,000 to over 70,000 annually within a decade. What role will this deployment of fast charging infrastructure have in further EV adoption?

Ms. Cullen. The expansion of DC fast charging will

absolutely facilitate expanded use of electric transportation and it might be worth just taking a second for those people that don't live and breathe this that so there are levels of charging. Level 1 is the outlet in your home. Level 2 at 240 volts is what your dryer or your refrigerator would run after and that reduces the charging time of an EV by half. A DC fast charger reduces that charging time again to a point that enables essentially long distance traveling in a pure battery electric vehicle.

I would also add that the question -- you can also build range confidence by building in extra battery capacity in the vehicle. And that is what is happening. We are seeing longer ranges in battery vehicles and the fact that there are plug-in hybrids where you have the addition of an internal combustion engine that can service all your longer distance needs and perhaps do all of your daily commuting on electricity.

Mr. Tonko. Thank you.

And Dr. Reichmuth, a majority of EV charging occurs at home. Unfortunately, this is not an option for everyone especially in cities which may have high potential for EV adoption due to shorter commuting but also have many people living in apartment buildings, multifamily houses, or in neighborhoods without dedicated parking spots. So do you have any suggestions of how to enable this population to access EV charging infrastructure?

Mr. Reichmuth. Yes. That is an important consideration.

So there is a number of things that are going on. One is the increase in putting charging into multifamily dwellings, so apartment buildings, condominiums, and a number of the utilities are working hard at that right now. We can also take a look at building codes. Putting at least conduit and the space for EV charging in parking garages and new facilities, you don't have to put the wiring, you don't have to put in the charging equipment itself. You can just put the conduit so you don't have to rip up concrete or rip up a parking lot to put in charging later.

And then the last thing is DC fast charging in urban environments not just for people that don't have a place to park at home and to charge at home, but also to enable taxi, ride sharing, and other uses of electric vehicles in the urban environment, so having that fast charging within the urban environment.

Mr. Tonko. Thank you very much. I yield back.

Mr. Shimkus. The gentleman yields back his time. The chair now recognizes the gentleman from Ohio, Mr. Johnson, for 5 minutes.

Mr. Johnson. Thank you, Mr. Chairman, and thanks to all of our panel members for being here this morning. I appreciate this discussion.

Ms. Williams, the electricity grid is becoming increasingly complex with electric vehicles being just a part of that increasing complexity. This presents us both with opportunities

and challenges for the grid. Along those lines, can you identify any potential cyber threats associated with increased usage of EVs and what is the industry doing to tackle these challenges?

Ms. Williams. Thank you very much for that question. So as you know, the electric utility industry, the energy companies of America, we take cyber threats extremely seriously. We work very closely with the government looking at standards, looking at our controls, looking at specific things we need to do to make our grid the safest and the most cyber secure that it can be. Of course when you look at electrification overall, more points, electrification whether they be electric vehicles or other things do in fact present additional opportunities for a hacker to get in and that is why we have got to be so vigilant, again working closely with government to make sure that our system is up to code, that we have good monitoring in place, early detection, and fast response.

We view charging networks or chargers very much like an appliance and as our homes become smarter, as really the grid becomes smarter we have to increase the level of vigilance and make sure that it is up to code in everything that we have in place. There are NERC standards, there are any number of standards that we comply with to make sure that they are cyber secure.

Mr. Johnson. Sure. Well, you know, my background is information technology and I have said it many, many times,

cybersecurity is not a goal that has a finish line because as soon as you solve one problem there is a dozen more right on the backside of it. It is just something we are going to have to remain vigilant on and I appreciate that.

Mr. Macchiarola, the oil and gas industry has undergone significant changes due to breakthroughs and technological advancements. Eastern and Southeastern Ohio, for example, has benefited greatly from the Utica and Marcellus shale gas plays and I think the ability to access this cheap oil and gas took many people by surprise. And I think this example plainly shows we can't always predict future technological breakthroughs nor the impact that these breakthroughs will have on the different sectors of our economy such as the automobile industry.

So as Congress looks at current and future transportation policies, how can we be sure that we are not jeopardizing the private sector's ability to innovate and bring about new technological advancements?

Mr. Macchiarola. That is a great question, Congressman, and you know firsthand the experience of the shale gas revolution and in Ohio and your leadership on LNG exports helped bring that to markets around the world. From our perspective, I think the point you make is a strong one about the fact that tipping the scale, of keeping your finger on the scale for government through mandates or through incentives can have a real dampening effect on, you know, bringing affordable energy to the consumer,

strengthening our energy security.

The example that I highlighted in my testimony, the Renewable Fuel Standard, is a perfect case of that. The estimates that we had both on the demand side and on the supply side totally missed the mark over the past decade and the result is we have a mandate that can't be met and needs to be reformed.

Mr. Johnson. Okay, thank you.

Ms. Williams, back to you, I mentioned that I represent rural Appalachia. It is not uncommon for my constituents to have to travel 35, 40 miles up hills, down hills, around curves to go to work, to go check on Mom and Dad, to go to the grocery store or the hospital. The terrain is hilly and dependability is a must in automobiles, with light trucks and SUVs and pickups largely making up the vehicles of choice. While I see EVs making inroads in the cities, they face a different set of challenges in my neck of the woods. Do you believe that EVs will become viable in rural parts of the country that have weather and terrain and distance challenges like that?

Ms. Williams. I do believe they will become viable in all parts of our society. Within in our own service area we have hills and lots of varied terrain. We have a lot of agricultural parts of our service area in our Central Valley and our North Valley. Some of these areas also end up being some of our most disadvantaged.

So one of the things that we are doing as we are doing these

pilots to put in more charging networks is going to learn a great deal about as you put these charging stations in different parts of our service area, some of which are disadvantaged communities, some of which are rural, how does it impact the adoption of electric vehicles, does it make a difference? We think it will, but it is going to be an interesting pilot for us to learn from so that we can take those learnings and then deploy them. As we have heard from some of the other folks this morning that are testifying, battery life is increasing and technology is really evolving and so what we have today may not be exactly what we have 10 or 20 years from now, so I do believe that it will be viable across the country.

Mr. Johnson. Okay. Well, thank you, ma'am. And Mr. Chairman, I yield back.

Mr. Shimkus. The gentleman yields back his time. The chair now recognizes the gentleman -- we have a lot of Californians on this subcommittee -- so he recognizes the gentleman from California, Mr. McNerney, for 3 minutes -- no 5 minutes.

Mr. McNerney. I thank the chairman and I thank the panelists, a great set of viewpoints this morning.

Ms. Williams, I appreciate you giving us a shout-out to Stockton and the work with the RTD out there to electric our bus systems. What sort of integration challenges do the electric utilities face and are there grid related benefits to EV penetration?

Ms. Williams. I do believe there are grid related benefits. One of the things that we find in California as we know, Congressman, is we have plentiful solar renewable resource available to us, often more than we need in the middle of the day. And I believe that electric vehicles provide us an opportunity through smart charging, through incentives to really, our customers to charge at the right time to take advantage of that plentiful resource that is there to really better utilize this incredible energy grid that we have. At the same time we are seeing second use batteries being grouped and deployed to become almost like a battery to grid resource. So in the middle of the night when we don't have the sunshine, the battery, the second life batteries provide us needed resources to really smooth out the resource requirements for our system.

Mr. McNerney. So when you refer to wireless smart charging you are referring to the communication being wireless not the charging?

Ms. Williams. Correct, the communication, the telematics.

Mr. McNerney. Right. Do you have any rebuttal to Mr. Remley's comments that the utilities are being guaranteed a rate of return and building EV infrastructure on the backs of ratepayers?

Ms. Williams. I do. Energy companies like PG&E Corporation or PG&E are not guaranteed a rate of return. That is a rate of return that is set and if you operate your system

efficiently and effectively and deploy your capital and run your business efficiently you could achieve that but you don't often achieve that necessarily. As far as sort of the whole approach of the utilities somehow being, expanding their monopoly, we believe in competition and EEI nor PG&E believes that there is one point of view in terms of what that business model looks like. We look forward to partnering with third parties in terms of the actual ownership of the charging network. We view ourselves as an enabler. We view ourselves as, because of our scale, because of our capital as spurring this important resource into happening, but we certainly don't believe that we are the only game in town. We want to help electric vehicles actually become more of a reality. Again we see ourselves as an enabler, not as a monopolistic owner of those charging networks.

Mr. McNerney. Thank you.

Mr. Reichmuth, how do EVs lifecycle global warming emissions compare to that of gasoline vehicles?

Mr. Reichmuth. That is an important question. So with the research that we have done at UCS we found that, in general, driving on electricity is much cleaner than driving on gasoline from a global warming perspective. You know, in our analysis we did an apples-to-apples comparison, looked at all the emissions from generating electricity and bringing it to the EV and compared that to getting crude oil out of the ground, refining it into gasoline, distributing it to service stations, and then of course

burning it in the car. If you look at cars today on the road, the EVs on the road they average emissions equal to an 80 mile per gallon gasoline car and that is higher in places with cleaner electricity, so over a hundred miles a gallon equivalent in California.

Mr. McNerney. Thank you.

Mr. Bainwol, have the CAFÉ standards introduced an explosion of innovation in auto engineering? That is kind of a leading question, but go ahead and answer it.

Mr. Bainwol. Yes, there has been massive investment in innovation both on a powertrain side and elsewhere, and certainly standards certainly bias some of those decisions.

Mr. McNerney. Will the elimination as proposed by Mr. Pruitt impact that drive to innovation?

Mr. Bainwol. There has not been a final NPRM so we don't know whether they are going to eliminated or not. We are hopeful that this slope continues to rise. We are in favor of year over year fuel efficiency.

Mr. McNerney. Thank you.

Ms. Cullen, do you know if the electric vehicle industry working to create appliances -- let me read this as it is written. I am trying to innovate here. Do you know if the electric vehicle industry working to create small motors for industries such as agriculture is the industry working to create applications for agriculture?

Ms. Cullen. It absolutely is. There is enormous growth in mobile equipment in the electric drive field. We are seeing them in tractors, in forklifts, and you are seeing applications at ports and other, and airports that the flexibility of electric drive is that it is very scalable and so that it can be used in small and light applications as well as larger and heavy duty ones because we are also seeing an enormous growth in the medium and heavy duty and the transit bus segment.

Mr. Shimkus. The gentleman's time is expiring.

Mr. McNerney. Well, I will yield back then.

Mr. Shimkus. The gentleman yields back his time. The chair now recognizes the Chairman Emeritus of the Energy and Commerce Committee, Joe Barton, for 5 minutes.

Mr. Barton. Thank you. I am happy to go, but Mr. Duncan was here before me if you --

Mr. Shimkus. I would like for you to allow Mr. Duncan to go first.

Mr. Barton. I think Mr. Duncan is fully entitled. He showed up at his first baseball practice today and that gives him real priority.

Mr. Shimkus. The chair recognizes the gentleman from South Carolina, Mr. Duncan, for 5 minutes.

Mr. Duncan. Thank you.

And Mr. Bainwol, in your testimony you alluded to the obvious that when gas prices fall the desire to pay more for a vehicle

with higher fuel economy diminishes. The statements reflect over the ebbs and flows of the demand in the market. Despite all the incentives to purchase EVs, they still only represent only 1 percent of all vehicles purchased last year. Despite the reality of the market, it is clear that government is trying to push consumers toward purchasing electric vehicles.

Now I believe that the market determines what people buy and people buy what suits their needs whether it is safety as a concern, whether it is size, horsepower, or whatever, and many people like to drive SUVs. For example, in my district light trucks, SUVs, pickups, and vans accounted for 63.92 percent of vehicle sales. Electric vehicles only accounted for 0.05 of the sales in 2016. Now my office did the math and that equates to literally 13 electric vehicles in my district, 13 -- 770,000 people and 11 counties in South Carolina, in 2016 that equated to 13 vehicles.

It is clear my constituents don't really gravitate toward these vehicles. I am not going to say they don't like them. They don't gravitate toward them for a lot of reasons, probably price point being a big part of that, probably the need to carry things in a pickup or SUV. So the way I see it, when consumers are determining what vehicle to purchase they look to see if it fits their needs. I do recognize that the price of EVs are decreasing and I understand the Tesla Model 3 costs about $35,000. Let me ask you this. If electric vehicles can be brought down

to a price comparable to that of an average conventional new car, should the government be providing massive tax credit to purchase them? Mr. Bainwol?

Mr. Bainwol. So when we get to a point where the costs have equalized I think that is a good policy question. We face a reality today where globally and in this country we have requirements to meet both CAFÉ standards as well as the ZEV mandate in California and a bunch of other states that represent probably a third of the country. So we have a compliance reality where electrification really does help. And so the question here is when this inflection point occurs and that is a function of range and battery cost, and I think Bloomberg has estimated that by 2025 the price delta will equalize and at that point certainly with additional range then you can see the calculus for a consumer evolving.

Mr. Duncan. I agree. So let me ask you this. If we get rid of the tax credits and incentives do you truly believe consumer demand is there for electric vehicles?

Mr. Bainwol. I think consumer demand is coming and we need for it to come. We do have a compliance reality that is just a matter of law and so we have got to comply and electrification is definitely a piece of that compliance. And as the battery costs come down and range improves then that becomes a viable compliance approach.

Mr. Duncan. I actually like electric vehicles. I like the

thought process of it. I understand horsepower issues. I mean an electric motor pushes an aircraft carrier. So I also understand the simplicity. If you blow an electric motor you unplug it, put another one in, plug it back in, and the car goes. It is not like an internal combustion engine. I think the car manufacturers are recognizing the future as well. I think we are going to see that. The problem I have is when government picks winners and losers, when government is forcing consumers into a certain area like this because of some political beliefs and philosophical beliefs.

So, Mr. Chairman, I don't have any other questions, but thanks for holding the hearing. It has been informative. I yield back.

Mr. Shimkus. The gentleman yields back his time. The chair recognizes the gentlelady from Michigan, Mrs. Dingell, for 5 minutes.

Mrs. Dingell. Thank you, Mr. Chairman. I thank you again to all of the witnesses for being here, a subject I deeply care about.

I am going to do my first questions to Mr. Bainwol and to Ms. Cullen. Can you elaborate on how the global shift to the electrification of mobility is affecting the U.S. manufacturing base and what kind of opportunity does this represent for the auto industry and its workers?

Mr. Bainwol. I would just note that first slide I showed

reflected a growth in unit sales from roughly 50 million units in 1996 to something approaching 100 million units. And as other countries right or wrongly determine that electrification is going to be a big piece of that for us to compete we have got to have an ability to innovate and to respond to that growing market.

Mrs. Dingell. Ms. Cullen, any comment?

Ms. Cullen. I agree completely what Mitch just said there and I think as a matter of manufacturing and employment this global market is an enormous generational opportunity. The last time DOE looked at employment numbers they were looking at in 2015, just looking at the electric drive manufacturing segment they counted some 215,000 jobs. So that is fully 3 years ago. In that time that segment has grown as has the entire ecosystem associated with vehicles and infrastructure. So it is an enormous opportunity for our employment base and for our global competitiveness.

Mrs. Dingell. As mentioned in your testimony, and to this committee and the House, the House unanimously passed legislation that we worked, I worked on, to facilitate the testing and deployment of autonomous vehicles. Can you both talk a bit more about the role EV technology plays in supporting AV's future?

Ms. Cullen. First of all, thank you for your leadership on that issue. We are, I think everyone in the industry and everyone who actually uses roads is interested in the future of

automation and how that changes transportation. I think what everyone who is looking at automation sees is that electrification is an optimal partner, because as a congressman pointed it is a simpler technology so there are fewer pieces to electrify. It is also more suited to the connectivity that is essential for automated transportation.

Again and finally, I think because of its drive cycles EVs are perfect partners for what is seen as the first market for automated vehicles which is urban shared mobility, sort of your Lyft vehicle, and that those short drive cycles are perfect for an urban EV.

Mrs. Dingell. Thank you. I am going to be running out of time and I have a lot of questions. So let me ask you, switch to another subject, I want to talk about the important role that Congress can play to incentivize EV adoption and deployment. The EV tax credit has played an important role in this, but should we be looking at tweaking it if necessary to make it even more effective? We know that today's electric vehicles cost more than the conventional gasoline powered cars. Do you believe that the EV tax incentive has helped consumers afford an EV that they otherwise would not?

Ms. Cullen. Absolutely. The credit has been effective and it is working as designed by Congress. It is making a new technology, which has the standard price premiums associated with new technologies, more affordable to consumers which in turn is

helping the industry build to scale and that is the global opportunity we are trying to capture.

Mrs. Dingell. So I hear from manufacturers that the tax credit has been critical to EV sales. Do you think that when some manufacturers hit the cap and they may need to reduce the price and potentially lose even more money could this disincentivize EV protection and could this cap potentially take us backwards? In your opinion, will auto companies reach production scale at 200,000 units or do we need a larger more robust EV market so that all manufacturers can take advantage of this scale?

Ms. Cullen. I think it is important that Congress take a look and update that credit to reflect where the scale of the market is now. I think it can, I think there is an important role for it to play going forward and having as many diverse entrants into the industry is critical.

Mrs. Dingell. We know that about ten states currently offer EV incentives. Why isn't this doing enough? Why is it so important for the federal government to have a role here to the EV tax credit and can you even answer why when states who have these EV mandates said that they were going to put these vehicles into their fleets they haven't?

Ms. Cullen. I cannot answer that question. I would leave that to the states. But the federal policy does speak to the importance of certainty and that is what consumers want, what

manufacturers want, and what industry wants is they need some certainty to make their decisions and make their investments.

Mrs. Dingell. I am out of time.

Mr. Shimkus. The gentlelady's time has expired. The chair now recognizes the gentleman from Texas, Mr. Barton, for 5 minutes.

Mr. Barton. Well, thank you, Mr. Chairman. And since I allowed Mr. Duncan to go first since he showed up at baseball practice this morning, I should commend you, the audience that know this, but in addition to being such a great subcommittee chairman you are one of the all-time all-stars of the Republican baseball team and just announced your retirement. Your son is graduating, I think, the day of the game or the next day.

Mr. Shimkus is the only, I think this is true, the only current member of either team that has hit an over-the-fence home run, blue socks -- blue socks, he was my MVP pitcher a number of years, pitched the year after he had a heart attack. And you will be missed. In fact you were missed at the practice today, you not being there for the first time in 20 years. So in addition to being a great subcommittee chairman, you are just one of the best athletes to ever play in the baseball game and we will miss you.

Mr. Shimkus. How very kind of you. I was able to work on my nuclear waste bill though this morning so.

Mr. Barton. I don't know if that is a good tradeoff, quite

frankly. Anyway, we aren't here, we are basically here to talk about electric vehicles.

I have got, really, just two basic questions and I don't know who to ask them to, there is so many people at the witness table. My first question is what is the cost of a home electric vehicle charge station if there is such a thing in existence? Who can answer that?

Mr. Remley?

Mr. Remley. The costs vary widely. If you are talking about a Level 1 charger it can be a few hundred to a few thousand dollars and it ranges --

Mr. Barton. I am talking about at somebody's house.

Mr. Remley. That is correct. It is going to be a few hundred to a few thousand dollars depending on the vehicle and a host of other factors. And a DCFC fast charger can be hundreds of thousands of dollars.

Mr. Barton. Hundreds of thousands.

Ms. Cullen. Congressman, may I?

Mr. Barton. Sure.

Ms. Cullen. Actually a Level 1 charger is the outlet in your house. You don't pay extra for that. You can just plug in your car. It will take longer to charge but you can do that for free. A Level 2 charger to install it with any sort of smart technology so that you could set a timer, you could spend a few hundred dollars to a couple thousand dollars depending on how

smart you want it to be.

Mr. Barton. But they are available?

Ms. Cullen. They are.

Mr. Barton. Okay. Now what about a commercial charger at a, I call it a gasoline station. I guess you would call it an electric station. What would a commercial charger that you could just drive up and instead of fill up your tank charge your battery in some reasonable amount of time?

Ms. Cullen. Right. So at the next level, in commercial facilities whether they are at coffee shops or at gas stations or anyplace where there is an electricity line you can install a commercial charging spot. And most people would use either a Level 2 if it is a place where people are going to be sitting for awhile like an airport where you are going to leave your car while you are on a trip. You could plug it in and charge it at a slower rate.

If you are, say, at Starbucks and you just have 10 minutes they would be interested in installing a DC fast charge, which is 480 volts, so that folks who went in to get a cup of coffee could get several or ten or twelve miles of charge in 10 minutes. And that costs, depending on how, you know, the conduit and how complicated it is to lay down the line, $50,000 would be --

Mr. Barton. But those both in your home and commercially there is equipment available today?

Ms. Cullen. Yes, in all price points and capacities.

Mr. Barton. Okay.

Mr. Remley. Congressman, if I may, just our personal experience we are installing them at our convenience stores. A brand-new convenience store having separate chargers requires a separate, essentially, sub-mini station.

Mr. Barton. It is a what?

Mr. Remley. It is a separate sub-mini station.

Mr. Barton. Sub-mini station.

Mr. Remley. Yes. It requires 500 additional square feet and the total cost of bringing that in is several hundred thousand dollars.

Mr. Barton. All right, but not going to be a lot of several hundred thousand dollar stations installed. This next question is much trickier. We fund a big chunk of new highway construction and maintenance through the Highway Trust Fund which is funded by a cents per gallon federal highway gasoline tax and in most states have the same thing, they tack on a state tax. Well, if your electric vehicle, you can't charge them per gallon so how do you, as we get more electric vehicles how do we set up a system where they pay into the Highway Trust Fund? Who wants to tackle that one?

Ms. Cullen. I will have a go at it.

Mr. Barton. Okay. You are the lady with the answer today.

Ms. Cullen. Well, first, pure battery electric vehicles don't use gasoline but plug-in highway vehicles do and they do

pay a gas tax.

Mr. Barton. Well, focus on all-electric.

Ms. Cullen. So for that segment of the fleet we absolutely want to be part of a comprehensive solution that funds the infrastructure, the conventional and the infrastructure of the future that we need, and there are states looking at innovative ways to do that. And we certainly, you know, recognize that the gas tax system as it is not broken. We didn't break it, but --

Mr. Barton. And nobody has claimed you broke it.

Ms. Cullen. -- the fact is it doesn't serve the current transportation sector. So I think we need to look at how everyone contributes and we want to be part of it.

Mr. Barton. Oh, you don't have an answer. Does everybody who supports electric vehicles at the witness table agree that electric vehicles in some way should pay proportionately into the Highway Trust Fund? Is there anybody that disagrees with that? I think if --

Mr. Bainwol. I would add just not a discordant note, but a point of complication and that is we have aggressive fuel standards in force that we have to comply with. I am not making a value judgment, I am describing what is. And in order to comply we need some level of electrification over the years to come as well as with the California ZEV program, and to the extent we put impediments in the way of adoption of electrification that makes that challenge a little bit deeper. So the point is that

these policies can be contradictory and it is a tough thing to manage and our particular challenge is we need adoption of electrification in order to comply and that is just a fact of life and anything that makes that more challenging is a bit of a problem.

Mr. Shimkus. The gentleman's time, he was so nice to me so I gave him a little bit of extra time. So the gentleman's time has expired. The chair now recognizes the gentlelady from California, Ms. Matsui, for 5 minutes.

Ms. Matsui. Thank you, Mr. Chairman. First of all, I would like to start by thanking Geisha Williams from PG&E. PG&E services part of my district in California and it is always nice to have a fellow Californian here, although we do have plenty, I guess, here. We have come -- we have seen the way that our changing climate has intensified natural disasters across the country and recent scientific studies have even been able to attribute the extent to which climate change has affected specific extreme events.

Ms. Williams, I know that your utility has felt the impacts of climate change on your operation. Those impacts include more intense wildfires and they are difficult for both rate payers and utilities and I appreciate that the State of California is taking a look at these issues. I am also pleased that you are taking tangible climate action that reduces emissions from the transportation sector to the benefit of both the utility and the

environment. Tell me more about PG&E's work to facilitate EV deployment, because in our state it really is somewhat of a mandate.

Ms. Williams. Thank you for that question, Congresswoman. It is great to see you again. So we absolutely are facing climate change issues in the state of California and we certainly believe that the horrible, devastating wildfires that we had last year are very greatly attributable to the severe climate that we are seeing. So we have been on a journey in California for over a decade now in terms of really looking at emissions and reducing emissions. My own company has been very successful. Today, 80 percent of the power that we deliver to our customers is greenhouse gas-free and that is a great start. The next big area of focus for the state of California as we look at how do we continue to drive emissions down is absolutely the transportation sector.

Forty percent of the greenhouse gas emissions in the state of California come from transportation. I mentioned NOx, I mentioned also particulate matter. There are such significant air quality issues in the state of California. Eight of the worst climate air quality, sort of, counties in the country are in California, so we are all-in on dealing with the air quality issues, the greenhouse gas issues, and we truly believe that transportation provides us an opportunity to go through it.

Ms. Matsui. Could I ask, Ms. Cullen, we talked about California and the nation about the adoption of the EVs and I

think somebody said one percent across the nation. And you are saying, I think you said in California it is 3 to 4 percent; is that right? Are you the one who said that?

Ms. Cullen. That was Mitch's number.

Ms. Matsui. Okay, good. I was wondering, what is a driver of the adoption in California? Is it policy, is it really a climate change, what is it? Would you like to comment on that?

Ms. Cullen. It is a combination of factors. Certainly policy helps to drive adoption. It also, it is one of the largest car markets. There is a great deal of consumer education also in California and I think which is an important point that has been brought up by a lot of folks on this panel and a lot of the questioners that educated consumers are an important part of the deployment mix. And I think California has provided the important nonfinancial and financial incentives, the tax policy, as well as HOV lane access have also helped to speed adoption in the state.

Ms. Matsui. Okay. As you know I have been supportive of California's authority under the Clean Air Act to set its own light duty vehicle emission standards. And I am obviously concerned by the administration's effort to weaken the current national standards and the result will be more uncertainty, which is really bad for the consumers and the automakers and the environment, and last week the State of California and 17 other states sued the Trump EPA for its decision to revise the light

duty vehicle standards.

I will go back to Ms. Williams. I understand that PG&E is supportive of the existing standards. Can you explain why you are supportive and how these standards affect your utility, broadly speaking?

Ms. Williams. Well, as I mentioned earlier, we truly believe that we have unique air quality issues in the state of California with eight of the ten worst air quality counties in the country, so we truly believe that it is a public health issue. We also believe that as we look at climate change, as we look at what we need to do to continue to reduce emissions transportation is key to that. And we believe that electric transportation in particular is going to provide us a great means of reducing the GHG in the air and improve the air quality and that is why we are supportive of the California waiver.

Ms. Matsui. Okay, thank you.

And I don't want to leave you out, Mr. Bainwol. The automakers are really very important in this and we understand that. And I really believe that the EVs, I mean I am looking at how we might do this. Listening to Mr. Duncan, we need to really expand, kind of, you know, we need to have more research and development on how we expand types of vehicles that can be EVs. And I think we need to expand that aspect of it and if we give too much preference or to SUVs and light duty vehicles with lower standards, I think we will have difficulty actually

incentivizing people to buy the EVs. That is a comment on my part, if you want to respond.

Mr. Bainwol. I just note that there is a challenge when the market and policy don't align and at some level the consumer is always right. So we need to, I think, to some extent when we have compliance issues we have got to educate the consumer and try to drive adoption, but at the end of the day we have got to satisfy the consumer.

Ms. Matsui. But I think when you drive adoption, you know, you really have to give more of a sense of the inventory has to be greater too, I mean, that is, we are not there yet.

Mr. Bainwol. Well, the inventory one is coming, but you can't -- this is the alignment. You can't produce if people don't want to buy it and we want them to buy it. I mean we want to produce them and we want to sell them, but if you produce them and they sit in showrooms that does no one any good.

Ms. Matsui. But if you make more of the other vehicles then there would be less incentive to get the EVs.

Mr. Bainwol. Well, I think the big incentive challenges is that the success of the internal combustion engine has gotten stronger and stronger. It is up 30 percent in 12 years. So when you turn in your 12-year-old car and you go to buy a new car and you are asked to pay a delta for an electrified product, then you are looking at what you are getting in terms of the replacement and it is a pretty good --

Mr. Shimkus. The gentlelady's time has expired.

Ms. Matsui. Thank you, Mr. Chairman.

Mr. Shimkus. The chair now recognizes the gentleman from Georgia, Mr. Carter, for 5 minutes.

Mr. Carter. Thank you, Mr. Chairman, and thank all of you for being here, very interesting subject.

Mr. Bainwol, I will start with you. We were just talking about California and their initiatives with the zero emission vehicles and what they are trying to do with that program. It has got to have an impact on your marketing and on your manufacturers and exactly what they are trying to put out there for consumers. What are the challenges that you see there?

Mr. Bainwol. So California does have a zero emission vehicle mandate that is rising to as much as 15 percent by 2025, and a bunch of other states follow that mandate and it is a challenge. When there is asymmetry between the market and policy it produces cost and so we are working very hard to drive down costs and to build range and to make it more attractive so compliance is facilitated, but it is a challenge.

Mr. Carter. What about the hybrids? Is that something that has helped kind of ease the transition, if you will?

Mr. Bainwol. Hybrids help ease the transition certainly for the CAFÉ and GHG programs, but at this point not for the ZEV programs.

Mr. Carter. Okay. Mr. Remley, I wanted to ask you, through

the advent of all this all of a sudden now we have a new anxiety, range anxiety. People are instead of being concerned about running out of gas they are concerned about running out of electricity. Now this is a concern particularly in a rural area like South Georgia that I represent. We don't, you know, I don't see a whole lot of charging stations in the areas that I represent. What kind of challenge is this going to present for your industry and how do you plan to respond to this?

Mr. Remley. So, Congressman, thank you for the question. We are looking for the opportunity to participate in the EV rollout. What we are looking for is a free competitive marketplace to do that. As I said, my company and I know plenty others are looking to install EV charging at the various different levels, whether it is Level 1, Level 2 or DCFC fast charging. It certainly is that rollout and the infrastructure needs that are going to be required is a significant investment that is going to need to be made in the country over the years.

I would also like to point out that, you know, the current structure which is both tax incentives and energy charges through the entire rate base to subsidize a very small selection of consumers for purchasing these vehicles seems regressive. And so as I said, from the SIGMA NACS standpoint we are looking for a level playing field so that we can deploy free market capital into this exciting new area.

Mr. Carter. You know, I see this as somewhat comparable,

if you will, to what we are trying to do with telecommunications. I mean I suspect in the rural areas we are going to be the last ones to see this type of technology and that is going to penalize us in a sense. What is it going to take? Are we going to be looking at subsidies or incentives for you to be able to supply those areas with that?

Mr. Remley. I think that is an important policy consideration about how rural areas of America will be allowed to participate in this. As I said, we are looking if there are subsidies or if there is going to be government support that that is given to every stakeholder that is currently involved in fueling the motoring public. We firmly believe over decades of experience that our industry has the best corners and the best locations to fuel the motoring public and we are merely just looking to participate in that fueling and that change on a level playing field.

Mr. Carter. Okay. Ms. McKernan, let me ask you. You are consumers. You are the people who belong to your organization, what are their concerns? Is it price? Is it range anxiety? I mean what are the people out there mainly concerned about? Is it just that it is something new that they aren't familiar with or?

Ms. McKernan. Well, I think actually it is probably a combination of everything that you just mentioned. Range anxiety definitely plays a role, but for some people EVs may fit into

their lifestyle if they don't have as far to drive. It could be that they have a multiple car household. Most households do have more than one vehicle. Learning about the technology, and that is why it is so important for us to provide the information for consumers and our members is because we think the more that they learn about the technology and that they have a wide range of choices when buying these vehicles that the adoption of this will --

Mr. Carter. I am not trying to be funny, I am serious. Are you all going to have, you know, electric rescue vehicles? I mean when somebody runs out of electricity are you going to send them -- they call AAA and they come and they can plug into your little vehicle there and recharge and then take off again?

Ms. McKernan. We actually have piloted a little bit with some vehicles that go out and can charge electric vehicles. But yes, I mean AAA will move as the technology continues to grow so that we can continue to serve our members.

Mr. Carter. Wow, this is fascinating. Thank all of you for being here, I appreciate it. Thank you, Mr. Chairman, I yield back.

Mr. Shimkus. The gentleman yields back his time. And again the chair does thank you all for being here. And seeing that there are no further members wishing to ask questions for this panel, I would like to thank all of you. Before we conclude I would like to ask for unanimous consent to submit the following

documents for the record: An op-ed article by a guy named Mitch Bainwol and a letter from Growth Energy. Without objection, so ordered.

[The information follows:]

**********COMMITTEE INSERT 11**********

Mr. Shimkus. In pursuant to committee rules, I remind members that they have 10 business days to submit additional questions for the record and I ask that witnesses submit their response within 10 business days upon receipt of the questions. And I think I have one I want to send, so please do that. Without objection, this subcommittee is adjourned.

[Whereupon, at 12:04 p.m., the subcommittee was adjourned.]