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PROMISES AND PERILS:

THE POTENTIAL OF AUTOMOBILE TECHNOLOGIES

TUESDAY, MAY 18, 2021

House of Representatives,

Subcommittee on Consumer Protection and Commerce,

Committee on Energy and Commerce,

Washington, D.C.

The subcommittee met, pursuant to call, at 10:34 a.m. via Webex, Hon. Jan Schakowsky, [chairman of the subcommittee] presiding.

Present: Representatives Schakowsky, Rush, Castor, Trahan, McNerney, Cardenas, Kelly, Soto, Rice, Craig, Fletcher, Pallone (ex officio); Bilirakis, Upton, Latta, Guthrie, Bucshon, Dunn, Lesko, Pence, Armstrong, and Rodgers (ex officio).

Also present: Representatives Eshoo, Doyle; and Joyce.

Staff Present: Jeff Carroll, Staff Director; Lisa Goldman, Senior Counsel; Waverly Gordon, General Counsel; Jessica Grandberry, Staff Assistant; Daniel Greene, Professional Staff Member; Tiffany Guarascio, Deputy Staff Director; Perry Hamilton, Deputy Chief Clerk; Alex Hoehn-Saric, Chief Counsel, CPC; James Johnson, Policy Coordinator; Ed Kaczmarski, Policy Analyst; Zach Kahan, Deputy Director Outreach and Member Service; Mackenzie Kuhl, Press Assistant; Phil Murphy, Policy Coordinator; Tim Robinson, Chief Counsel; Chloe Rodriguez, Deputy Chief Clerk; Andrew Souvall, Director of Communications, Outreach, and Member Services; Sydney Terry, Policy Coordinator; Sarah Burke, Minority Deputy Staff Director; Michael Cameron, Minority Policy Analyst, CPC, Energy, Environment; William Clutterbuck, Minority Staff Assistant; Theresa Gambo, Minority Financial and Office Administrator; Nate Hodson, Minority Staff Director; Tim Kurth, Minority Chief Counsel, CPC; and Brannon Rains, Minority Policy Analyst, CPC, Energy, Environment

*Ms. Schakowsky. The Subcommittee on Consumer Protection and Commerce will now come to order. Due to -- today we will hold a hearing entitled, "Promises and Perils: The Potential of Automobile Technologies.''

Due to the COVID-19 health emergency today, the hearing -- today's hearing is going to be held remotely. All members are -- and witnesses will participate via conference.

As part of our hearing, microphones will be set on mute for the purpose of eliminating inadvertent background noise. Members are -- and witnesses will need to unmute your own microphone each time that you wish to speak.

Additionally, members will need to be visible on the screen in order to be recognized.

Documents for the record can be sent to Ed Kaczmarski at the email that we provided to the staff. All documents will be entered into the record at the end of -- the conclusion of the hearing.

So the -- we will begin with opening statements, and the chair will now recognize herself for five minutes.

So good morning, everyone. Thank you for joining us. Today this subcommittee will hear about the potentials for automobile technologies to improve lives and enhance safety.

Let me state, up front, innovation and revolutionary transportation technologies do not have to come at the expense of our workers or the domestic manufacturing.

Hundreds of thousands of Americans are gainfully employed in the automobile manufacturing sector, and more than four million Americans work as drivers. As we head into the next era of automobile technology, including autonomous vehicles, we must ensure economic security for the -- for this critical workforce and their families.

We also must ensure that these vehicles are safe and accessible to improved mobility.

Twenty-twenty was the worst year in a generation for automobile fatalities and injuries, despite the dramatic decrease in the number of cars that are -- actually have been on the road, due to -- and I think that that is likely due to the fact that drivers have been more reckless, as the roads have been more open.

Crash avoidance systems, lane departure warnings, and other advanced driver assistance systems could save tens of thousands of lives every year. However, the National Highway Traffic Safety Administration has not established safety standards for these technologies. Given the increase in deaths and a -- I think, at this point, a deregulatory approach is really unwarranted.

The Federal Government needs to create standards to ensure the safe deployment of technologies that are available now and in the future. Standards will create certainty that is needed to accelerate innovation. I am sure we will hear

this morning about the need to compete with China, but we must not do so in -- at the expense of the safety of Americans and the American workforce.

So I want to thank all of the witnesses that are here today.

[The prepared statement of Ms. Schakowsky follows:]

**********COMMITTEE INSERT**********

*Ms. Schakowsky. And my intention has been to yield to my colleague and friend, Congresswoman Dingell. Is she there?

Do we have you, Debbie?

[Pause.]

*Ms. Schakowsky. It looks like we don't. So, instead, I am going to yield back, and the chair now recognizes Mr. Bilirakis, the ranking member of the Subcommittee on Consumer Protection and Commerce, for his five minutes for an opening statement.

Mr. Bilirakis, it is yours.

*Mr. Bilirakis. Thank you, Madam Chair, I appreciate it very much. And good morning to everyone. Thank you for holding this important hearing, Madam Chair. And I want to thank today's panel for their testimonies. I am eager to hear their perspectives on this issue.

As you all know, I am from the State of Florida, and many of my colleagues would associate that with the NASA program. The goals set by our space program, and its partnership with innovative businesses, has had a transformational impact on our economy and our daily lives. It has led to many benefits, from image sensors and mobile phones to hearing aids and improved radial tires. I feel similarly about the topic of the hearing today, automobile technologies, as well as a conversation about the future of

autonomous vehicles.

It is important to say, "the future of,'' because there is an assumption among many that these vehicles are already being sold commercially today, when they certainly are not. Driverless vehicles now are still in a very early testing -- the very early testing stages, and still have a long way to go. However, by designing our own moonshot framework for AVs, we can set the industry on the path to a fully autonomous vehicle that is currently still many years away.

But the importance of achieving that goal and so many advancements will be borne along the way that will make the current generations of -- generation of cars safer, and force us to rethink how vehicle designs should evolve. The U.S. must seek that -- the highest form of autonomy, so we can reap all those benefits. Without that, many of the innovations won't be developed by us, and our economy and society will be at a loss, in my opinion. We will lose the race to other countries around the world.

Additionally, the sad context here is that nearly 40,000 people die each year in traffic accidents, and in almost every case the denominator is the same: human error. The preventable loss of life on our roads is tragic and unacceptable.

The AV ecosystem will also go beyond increasing the safety of our roads. It has the potential to transform the

lives of seniors and those living with disabilities in my district in Florida and around the nation. Every advancement will connect these communities that feel isolated and cut off from everyday routines many take for granted. That means the benefits go beyond safety. It really means opportunity and accessibility.

We have already seen real examples of how our future could be impacted. During the pandemic, AVs transported COVID-19 tests to and from the Mayo Clinic in Jacksonville, Florida. This was occurring at a crucial time, and demonstrates the real-world impact we should be embracing.

Again, I do want to be clear, fully autonomous vehicles are not currently sold on our market today, and they won't be tomorrow. But we must develop a framework path forward, so they are safely tested and deployed and, in doing so, educate the public during this transition period of what is occurring in these adaptive technologies.

For that reason, I wanted to specifically call out and thank Professor Rajkumar, from Carnegie Mellon University in Pittsburgh, who is with us today. The professor is a respected authority on the topic, and can communicate the facts and myths of this future technology. This objective of informing and educating the public on this issue also led to -- me to introduce -- and I will later this week, actually -- the Raising Objectivity standards in Advertising Driving

Systems, or the ROADS Act. If you could take a look at that bill, I would appreciate it very much, once I introduce. Or, if you have any interest, please contact my office.

This bill will look at ways to most effectively communicate about the capabilities and limitations of advanced driver assistance systems by examining how manufacturers advertise, disclose, label, and name their vehicles -- driving systems. It really is common sense. Current vehicle descriptions, such as "autopilot'' can mislead consumers into thinking their cars have self-driving capabilities, when they do not, much the same -- the same way that the public had to understand how anti-lock brakes work.

They need to understand the benefits and limitations of the current generation of technologies --

*Ms. Schakowsky. Mr. Bilirakis, you are going to need to wind up. You are way over time.

*Mr. Bilirakis. Let's say 10 more seconds?

*Ms. Schakowsky. Yes, go ahead.

*Mr. Bilirakis. Okay. Again, I am hopeful today serves as a path to move forward with several priorities that this committee has in the automotive space. It will be such a shame if we miss the opportunity to pass bipartisan legislation that can be included in broader efforts moving us -- moving forward.

[The prepared statement of Mr. Bilirakis follows:]

**********COMMITTEE INSERT**********

*Mr. Bilirakis. So, anyway, thank you very much, Madam Chair, I appreciate it. Thanks for holding this very important hearing, and I yield back.

*Ms. Schakowsky. The gentleman yields back. And now I call on the chairman of the full committee, Mr. Pallone, for his five-minute opening statement.

*The Chairman. Thank you, Madam Chair. Last year more than 42,000 people died in the U.S. as a result of auto accidents, and nearly 4.8 million were injured. And these deaths and injuries are preventable, and demand action from Congress and federal regulators. And we are prepared to meet this challenge with a bold vision for safety innovation that will save lives, boost domestic manufacturing, strengthen our industrial base, protect and create new jobs, and grow wages.

So last -- in the last session of the House we passed the Moving Forward Act. That included important auto safety reforms that mandate proven safety technologies that could save 20,000 lives per year. The legislation included the Five Stars for Smart Cars Act, which would have modernized the five-star safety rating, and provided consumers with meaningful information about the safety of vehicles. It also included provisions that would have mandated crash avoidance systems and drunk driving prevention technologies. It would have also put an end to children dying in hot cars, prevented carbon monoxide poisoning, and dangerous roll-aways of

keyless ignition vehicles, and, finally, address glaring limousine safety issues.

And so this is our vision to end the epidemic of automobile crashes, and save American lives. And by putting Americans' safety first, we are also putting American workers, the industrial base, and our economy first. And an investment in safety is an investment in domestic manufacturing.

Auto manufacturing is still the largest domestic manufacturing sector. But like many manufacturing sectors, our auto industry faces steady headwinds. Domestic auto production has decreased by 11 percent since 1994. And during that same period, nearly a fifth of all vehicle and parts manufacturing jobs were lost, and real wages decreased by 22 percent. And this hollowing out of America's industrial might threatens our economic security and harms our ability to compete internationally. If this century is to be another American century, the United States must harness innovation, strengthen the industrial base, and invest in the American worker.

So that is why I am so pleased that the Biden Administration has released a transformative proposal, the American Jobs Plan, to upgrade our nation's infrastructure, revitalize manufacturing, and shore up supply chains. Cutting-edge technologies like autonomous vehicles hold the

promise of improving safety, expanding mobility, and strengthening our economy.

And fortunately, we hold a competitive edge in developing and deploying AVs. According to KPMG, the United States ranks higher in preparedness for AVs than Japan, Germany, and China. We have to preserve and expand this advantage by making sure that the United States, not countries like China, write the rules of the road for this technology. But we must chart a course that balances deployment with our fundamental American values, and those are safety, workforce protections, and environmental stewardship.

We can't save lives if AVs does not operate safely or adhere to state and local laws. We can't create jobs and grow wages if we don't address how AVs may displace workers. And we can't meet our climate goals if AVs lead to more congestion or undermine our bedrock environmental laws. So Congress can bridge these gaps by creating a national road map for AVs that establishes robust workforce protections for those whose livelihoods may be harmed by the deployment of AVs, ensures that these technologies are developed and manufactured in the U.S., and protects the environment, Americans' rights, and safety.

So I think we have to act thoughtfully to address all these issues. That is why we are having this hearing today.

[The prepared statement of The Chairman follows:]

**********COMMITTEE INSERT**********

*The Chairman. And I wanted to yield a minute-and-a-half now to Representative Doyle.

*Mr. Doyle. Well, thank you, Chairman Pallone, for yielding to me. And thank you, Chair Schakowsky, for holding this important hearing.

I would like to welcome Professor Rajkumar from Carnegie Mellon University in my hometown of Pittsburgh. He directs Mobility 21 and the Metro 21 Smart Cities Institute at CMU. Raj is also a pioneer and leading researcher in the development of AV technologies. His work, and that of others at CMU, has led Pittsburgh to become a world leader AV research and development, and it is the reason that I care so deeply about this technology and, as the hearing title alludes to, the promise and perils that it portends.

We, as a government, need to help guide the development and adoption of this technology. Americans need to have faith in the safety and efficacy of AVs. They need to know that someone is accountable when they fail. And we need to have a plan for how this technology is going to increase, and not detract, from equity in our society for workers and for marginalized communities. It is critical that we bring folks to the table and have these important discussions because, if we can't figure out a path forward, someone else will.

[The prepared statement of Mr. Doyle follows:]

**********COMMITTEE INSERT**********

*Mr. Doyle. Thank you, Mr. Chairman, for this time. Thank you, Chair Schakowsky, for this hearing. I yield back.

*The Chairman. And I yield back, as well, Madam Chair.

*Ms. Schakowsky. The gentleman yields back, and the chair now recognizes Mrs. Rodgers, ranking member of the full committee, for her five minutes for her opening statement.

*Mrs. Rodgers. Thank you, Madam Chair. Before I speak on AVs, I would like to appeal to all the members of this committee to support full, in-person hearings. I heard the chair say at the beginning, "Due to the COVID-19 health emergency, this hearing is being held remotely.''

Madam Chair, the CDC guidance allows for in-person hearings. It is time. The Senate is holding in-person hearings. I am a proud member of this committee. We often say we all know that it is the best committee on Capitol Hill. And I speak for many of my colleagues who are eager to do the people's work again together, face to face, not through a computer screen, or muted.

Virtual hearings are taking a toll on this committee's important work, and further breaking down our effectiveness. Let's come together. Let's reopen E&C to legislate and plow the hard ground necessary to get things done on behalf of the people that we have the honor to represent in the People's House.

Now, turning back to today's hearing, this is a critical

time for us to be discussing the advancement of economist (sic) technologies that will bring more efficient movement of people and goods, further reduce carbon emissions, save lives -- currently, 37,000 people, on average, die on our roadways, most due to human error -- and improve mobility for so many.

The surface transportation bill expires this year, and discussions on its reauthorization are currently underway.

At the same time, U.S. leadership in innovation and next-generation technologies is being challenged by adversaries like the China -- Chinese Communist Party. To win the future and beat China, the Energy and Commerce Committee must again move bipartisan legislation. We must act now to ensure the U.S. continues to lead in technologies like AVs. If we fail to act, as we did last Congress, not only do we risk ceding global leadership to China, but here in Congress we risk ceding this committee's stewardship of these matters. Our fellow committees will not hesitate to legislate on next-generation technologies, and creep in on our jurisdiction.

So how should we think about these challenges before us? Ralph Waldo Emerson once wrote, "Do not follow where the path may lead. Go instead where there is no path, and leave a trail.'' Now, he was not talking about autonomous vehicles when he wrote that. Yet it is a fitting way to think about the future, and the future of these technologies, and the

opportunity that we have on this committee to lead with unique solutions.

As with any new technology, businesses of all sizes and sectors will be disrupted and forced to adjust. The workforce will need to be retrained to prepare and adapt.

At the same time, we are already seeing the benefits associated with AVs. During COVID we have witnessed how AVs can be used to deliver critical food, medical supplies, virus tests, and other needed provisions. During this time many of us have also experienced some degree of restrictions as to where we can go and what we can do.

Sadly, for many of our senior citizens and those with disabilities, these are the kinds of restrictions that they live with every single day. But AV technology has the power to tremendously improve their access and mobility. The idea that someone with a disability could one day be able to get into a car and go wherever they need to go is revolutionary. Many of these adjustments will be challenging, but they will be more challenging if the U.S. is not forging the path and leading the way. If we do not lead, we will empower our adversaries to chart the future for AVs, artificial intelligence, and other critical and emerging technologies this committee has championed.

China is moving forward with ambitious plans to lead the development and deployment of AVs. Their authoritarian

regime is already providing a roadmap. We cannot trust the CCP to set the standards for this industry, and we certainly cannot trust them to protect intellectual property and individual rights. The standards and regulatory framework must be led by the United States.

America values the safety of our citizens. China does not. We value our workforce and free market economies. China does not. We value civil society groups and their right to speak freely. China does not. We uphold Western values like liberty, individualism, and human rights. And we culture -- and we cultivate innovation, entrepreneurship, and competition from the ground up. China does not. To win the future, the United States of America must lead on AVs. We must chart the path, so that all of these considerations can be part of the road we design, and not determined by our adversary that does not respect our ideals and values.

[The prepared statement of Mrs. Rodgers follows:]

**********COMMITTEE INSERT**********

*Mrs. Rodgers. I look forward to this discussion today, and with that I yield back. Thank you.

*Ms. Schakowsky. The gentlewoman --

[Audio malfunction.]

*Ms. Schakowsky. I think that is me. No? Okay.

The gentlewoman yields back.

The chair would like to remind members that, pursuant to committee rules, all members' written opening statements shall be made part of the record.

And now I would like to introduce our witnesses for today's hearing.

We have -- Jason Levine is the director of -- is the executive director of the Center for Auto Safety.

Raj -- I will get this right -- Raj Rajkumin -- Raj Rajkumar is the George Westinghouse professor in the department of electric and computer engineering at Carnegie Mellon University.

And Greg Regan is the president of the transportation trade department of the AFL-CIO.

So we want to thank our witnesses for joining us today. We look forward to your testimony.

Mr. Levine, you are recognized now for five minutes.

STATEMENT OF JASON LEVINE, EXECUTIVE DIRECTOR, CENTER FOR AUTO SAFETY; RAGUNATHAN "RAJ'' RAJKUMAR, DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING, CARNEGIE MELLON UNIVERSITY; AND GREG REGAN, PRESIDENT, TRANSPORTATION TRADES DEPARTMENT, AFL-CIO

STATEMENT OF JASON LEVINE

*Mr. Levine. Thank you, and good morning. Good morning, Chairman Pallone, Chairwoman Schakowsky, Ranking Member McMorris Rodgers, and Ranking Member Bilirakis. And thank you for holding this important hearing today.

My name is Jason Levine, and I am the executive director of the Center for Auto Safety. Since 1970 the Center has been the nation's premier, member-supported, independent, nonprofit consumer advocacy organization dedicated to improving vehicle safety, quality, and fuel economy for all drivers, passengers, and pedestrians.

The topic of today's hearing is, "Promises and Perils: the Potential of Automobile Technologies.''

For 51 years the Center for Auto Safety has urged using proven vehicle safety technology to protect everyone inside and outside vehicles. The promise of such technology, in combination with smarter infrastructure and a dedication to consumer rights, is a safer world for all, starting right

now.

The perils are our continued acceptance of 115 deaths a day every year, the equivalent of everyone in a sold-out Washington Nationals Park being killed.

A lot has changed in the two years since I last had the honor of appearing before this subcommittee. Obviously, the last time we met in person, and today we are connected virtually. Sadly, however, far too much has remained the same. Since May 2019, an estimated 80,000 lives have been lost due to vehicle crashes in the United States. Last year, an estimated 42,060 lives were taken, representing an incredible 8 percent increase from the previous year, and the greatest year-over-year increase since 1924.

There are still an estimated 5,000 deaths involving heavy trucks, annually killing both truck drivers and other road users, such as 6-month-old Leo Wallace of South Bend, Indiana, who was killed last week in a rear end collision.

The fatality rate in rural communities remains twice as high as in America's urban areas. Pedestrians, bicyclists, and other vulnerable road users now number over 7,000 deaths, annually, including the death in November of Larry Willis, the president of TTD.

Greg, our condolences go out to you and everyone in the TTD family.

This ongoing public health crisis is, in large part, due

to our vehicle safety policy remaining in pit row, while the rest of the world laps us by focusing on using available safety technology. Taylor Grace Warner died at 17 months old when her parents' seatbacks collapsed in a crash. Sammy Cohen Eckstein was run over at age 12 in the street outside his home by a speeding van. Jewel Brangman died at age 26, as a passenger, when a defective recalled airbag deployed shrapnel in her face.

These victims, and many thousands like them, derive no benefit from counting the number of state-funded companies exposing Chinese citizens to the risks of automated vehicle technology. Their families took no comfort from discussions about the need to protect AV manufacturers from liability, even after Elaine Herzberg, a pedestrian, was killed by an automated test vehicle in Arizona. Conversations about limiting common-law liability make no one's funeral less awful.

But there is a better way. We recommend a four-pronged approach to seize on the potential of existing and yet-to-come vehicle technologies, Federal Government involvement, data collection, gaited certification, and requiring standards for proven advanced driver assistance systems.

However, instead of a debate about solutions to an actual crisis, crash victims and their families must suffer through another round of Chicken Little commentary decrying

that, if we do not immediately put all our eggs in the driverless vehicle basket, the U.S. will lose out in the race to be first to transportation and environmental nirvana.

Yet few AV proponents who claim to be motivated by vehicle safety mention that the 29 countries making up the European Union experienced record-low vehicle-related deaths just last year, without a single driverless vehicle on the road. The EU, despite a larger population, and an almost identical number of vehicles and land size, had fewer than 19,000 crash deaths last year, a total that is less than half of the U.S. death toll. This disparity is unacceptable.

The United States remains home to the greatest vehicle innovators in the world. The time is now to use proven safety innovations in a way that can save lives immediately. We want to thank this committee for your ongoing focus on vehicle safety, an issue that impacts every single American.

On behalf of our members, The Center for Auto Safety stands ready to assist however we can. We have provided more details in our written submission, and I look forward to your questions today.

[The prepared statement of Mr. Levine follows:]

**********COMMITTEE INSERT**********

*Ms. Schakowsky. Thank you for your testimony. And now, Professor Rajkumar -- I am sorry, say it for me. Rajkumar, is that correct?

Okay, you are recognized for five minutes.

STATEMENT OF RAGUNATHAN "RAJ'' RAJKUMAR

*Dr. Rajkumar. Thank you, Congressman Doyle, for your kind introduction. I am grateful to Chairman Schakowsky, Ranking Member Bilirakis, Chairman Pallone, Ranking Member Rodgers, and members of this committee for the opportunity to testify on a topic vital to American competitiveness and our standard of living: self-driving vehicle technology.

I am Raj Rajkumar, an academic researcher and educator of autonomous vehicle AV technology. AV innovations will be accompanied by large-scale economic opportunities, immense social benefits, and significant perils. Those perils include not advancing innovation that will ensure the safety of the technology, and falling behind the global technology race that will define competitiveness in the massive transportation industry and beyond.

Beginning in the 1980s, investments across 8 federal agencies advanced various aspects of AV technology. Scientists like me, working on AVs, share a passion for the mission to save 42,000 lives lost in the U.S. alone, per year, and to reduce the vast human and economic toll of automotive crashes.

When vehicles can drive themselves, transportation deserts can be eliminated. The elderly and differently-abled individuals will gain personal mobility and independence.

The historical milestone that demonstrated the practical feasibility of AV technology was triggered by the 2007 DARPA Urban Challenge. Subsequent investments of more than $10 billion, globally, have accelerated innovation and applications. Underlying this history of innovation are the best American traditions of partnership among government, industry, academia, and the communities that worked together to incubate this technology. As we plan ahead to address the challenges, opportunities, and deployment of AVs, the full might of the unique American innovation ecosystem must be brought to bear.

The AV market size is estimated at about $7 trillion per year. This market is not monolithic, and comprises multiple distinct segments. With the same market in mind, Chinese companies are catching up with us, and are now surging ahead, aided in part by their relatively lax regulations. China can also apply its global leadership in 5G technologies to leverage the large volumes of information for use in AVs. Unless we take quick and corrective action to out-innovate, them, China can secure a dominant position in both these important economic sectors.

How do we navigate the perils and realize the promise of AVs?

One, advance a new generation of collaborative research. Focused investments in basic research are needed to, A,

verify, validate, and demonstrate the safety of AV technologies; B, enable connectivity; and C, designing smart infrastructure.

Two, accelerate investment and deployment in the infrastructure of the future. We must deploy smart physical infrastructure, 5G networks, edge computing, and vehicle-to-everything communications.

Number three, actively engage on workforce issues. An all-of-nation commitment must include an up-front, holistic approach to meet job and workforce needs. Workforce organizations should be engaging directly in university AV research. If the technology is not developed or deployed here, it will happen elsewhere, anyway.

Four, actively manage the transition from driver-assist features to automated driving systems. Robust driver monitoring mechanisms will help prevent deaths from impaired driving. NHTSA must also educate the public about the deep chasm between advanced driver assistance systems and full autonomy, and take action against misleading claims.

Five, the regulatory framework must advance safety and accelerated innovation. Create a clear and uniform national approach to on-road testing. Recognize the distinctions between AV market segments. Keep regulations adaptive and agile. Encourage collaboration among jurisdictions, and create a national roundtable of stakeholders.

In conclusion, the emergence of AV technology is an exemplary American innovation success story. However, significant but addressable technical and policy challenges remain. We must commit to an all-of-nation initiative to ensure AV technology does not join the list of innovations which are invented here in the U.S., but end up generating jobs and wealth only far beyond our shores.

Thank you. I yield back.

[The prepared statement of Dr. Rajkumar follows:]

**********COMMITTEE INSERT**********

*Ms. Schakowsky. Thank you, Professor Rajkumar.

And now I welcome Mr. Regan for your five minutes of testimony.

STATEMENT OF GREG REGAN

*Mr. Regan. Thank you. On behalf of the Transportation Trades Department, our 33 affiliated unions, and millions of frontline workers, I want to thank Chair Schakowsky and Ranking Member Bilirakis for inviting me to testify today.

Although they are not an affiliate of TTD, we have worked closely with the Teamsters on automated vehicle policy, and I share a document, and -- I have shared a document with the committee that outlines our shared principles, and request that it be submitted for the record, along with my written testimony.

While the concept of fully automated vehicles may be new, innovation and change have always been hallmarks of the transportation industry. Transportation workers have lived through generations of new breakthroughs. Time and again, the skills frontline workers bring to their jobs, their adaptability in the face of accelerated innovation, and the benefits they receive from union representation have proven invaluable in implementing new technologies and serving the American public.

While the projections on how automation will impact jobs are not uniform, we know that -- with certainty, that millions will see their jobs altered or eliminated. In commercial driving alone, reports suggest that as many as

three million workers may be displaced or have their jobs fundamentally changed by automation. As we enter a new era of technology-enabled change in our system of mobility, policymakers must not allow the lure of that new, shiny object to obscure the facts, and substitute sound policy with hastily-developed legislation.

We must also not let fears of being outclassed in AV technology by other countries drive us towards rash public policies that grow wealth only for a handful of tech companies and their investors. Instead, we must balance a legitimate desire to lead the world in transportation innovation with safety, and the needs of American workers to care for their families, and to live and retire with economic security and dignity, something that is not possible if we do not reject the hands-off, de-regulatory approach to AVs we have seen in recent years.

Frontline transportation employees are already seeing a growing number of automated vehicle pilot projects on our roads and in our public transportation systems. They know that, without good training opportunities, they will be left without the skills they need to manage these new technologies. And that is the best case scenario. At worst, they risk having their jobs eliminated, all together.

Proponents of automation suggest that the labor market is "well-equipped to reabsorb displaced workers,'' and they

tout creation of new jobs in the AV and tech industry. Yet those proponents gloss over two key questions.

First, will mid-career workers who are displaced by automation be reabsorbed into jobs with similar incomes and workplace protections? Negative shocks to the economy can cause significant, long-term damage to the earning potential of working families. One study suggests that workers' earnings may be depressed by 10 percent or more, even more than a decade after workers are displaced.

Second, how confident are any of you that the new jobs created by automation will be realized back home in your districts, and not just in a handful of communities where the tech sector is concentrated?

We believe the antidote for significant economic harm and job impacts caused by the automation is a holistic approach by Congress that attacks the issues from multiple fronts, including mandating workforce impact statements when these new technologies are procured with federal dollars; creating career ladder and apprenticeship programs; mitigating job losses and wage degradation via the employee protections, job retention, just transition, vehicle taxation regimes, and wage supplements; and boosting the right to form and join unions and bargain collectively as a strategy to ensure workers have a voice in decisions around widespread deployment of AVs.

We also urge Congress to continue the carve-out for vehicles over 10,000 pounds. Heavy commercial motor vehicles come with unique operational challenges that will complicate the introduction of AVs into that space. Frontline commercial vehicle operators do not just drive, they have specific training to react to an array of challenges that an AV is ill-equipped to handle without a human on board.

At the same time, vehicles under 10,000 pounds being used for commercial or passenger service should have strict safeguards in place based on explicit, enforceable Federal regulations. The presence of a trained human driver to quickly assume control of the vehicle, for example, must be mandated for any such service.

Lawmakers must also make -- take clear steps to ensure that jobs created in AV manufacturing are good jobs, here in the U.S. Government assistance for the development and procurement of AV technologies must come with strong Buy America policies and procurement standards. These requirements will help ensure that the development and use of AVs also produce broad community benefits, and leads to good, middle-class domestic manufacturing and supply chain jobs.

While ensuring a safe framework for the deployment of automated vehicles is a critical task before this committee, I would remind you that your work must be part of a larger package that takes full stock of the disruptive nature of

this tech. We have seen the impacts of automation in other sectors, as well as the consequences for workers and consumers when public policy fails to protect the public interest. I urge you to give our safety and workforce proposals the full weight they deserve, and to work closely with your colleagues across other committees in the development of comprehensive policy that protects our transportation system and country from the premature and irresponsible deployment of AV technology.

Please reject the AV lobby's poorly-veiled attempts to sidestep all of the tough questions surrounding AV deployment. The broad-based set of principles and proposals developed by transportation labor that I have shared with you today takes on the toughest question, and offers a responsible path forward.

Thank you again for the opportunity to testify, and I look forward to your questions.

[The prepared statement of Mr. Regan follows:]

**********COMMITTEE INSERT**********

*Ms. Schakowsky. Thank you, Mr. Regan. So we have concluded witness opening statements. At this time we will move to member questions. Each member will have five minutes to ask a question, including getting the answer, of our witnesses. And I will start by recognizing myself for five minutes.

Before I do, I just wanted to say to Mrs. Rodgers that I look forward -- hopefully, when we come back after three weeks -- that we will be able to have in-person meetings, and I too look forward to that time.

So let me begin my questions with Mr. Regan. Okay, so as I mentioned in my short opening statement, that four million people in the United States of America make their living by driving. We are talking about 2.7 million truck drivers, nearly 600,000 school bus drivers, taxi drivers, and chauffeurs, over 150,000 bus and transit drivers.

So what I wanted to ask you, Mr. Regan, can the United States reap the economic benefit of AVs without considering the workforce protections for those who may lose their jobs?

And the question is, how can we do that?

*Mr. Regan. I don't believe we can realize the benefits, unless we look at it -- address workforce conditions, up front.

Frankly, the proposals we have adopted here are not ones that are designed to stand in the way of technology being

developed. They are designed to make sure that policy that is being developed right now will benefit the most people moving forward, will make sure that careers and jobs are able to grow along with the tech as we adapt it into our mobility systems. So I think that is the key to success.

And the key to truly leading when it comes to AV technology is making sure we are developing the right policy, and policy that, frankly, can be the leader in the world that will bring the workforce along with the tech.

*Ms. Schakowsky. Well, I certainly think that the people that you represent need to be part of the solution, and certainly can't be left on the sidelines.

There is no question that driving -- the driving profession, if you will, is a dangerous job. What existing technologies could make our roads safer and better for the workers, and for the passengers?

And how do you ensure that we deploy those technologies as soon as possible?

*Mr. Regan. Sure, and I would defer to Jason on some of these, as well.

But if you look at automated braking technology, the sensors that are in a lot of vehicles that are being deployed right now, all of these are a form of automation, or a form of technology that could be beneficial, if widely deployed, and actually provide a great number of safety benefits, and

ones that enhance the ability of an operator, of a human operator, to do their job safely and effectively, or just drive their vehicle safely and effectively. So all of these can actually enhance safety, and should be adopted widely.

*Ms. Schakowsky. Well, let me turn to Mr. Levine.

If an AV hits -- oh, let me see, hang on.

If an AV were to hit and kill a pedestrian, or runs a red light, who is responsible? Is it the manufacturer, or the AV -- of the AV, one of the vehicle suppliers, the passenger? Who is to be charged for that?

*Mr. Levine. Sure, thank you so much for the question. And, you know, I think, as others have already noted, there are currently no truly driverless vehicles on our roads. And so right now, the responsibility for those actions go to the driver of the vehicle. And so I think what is important to think about is, when we talk about AVs, that should be the same. Except now the question is, who is the driver?

*Ms. Schakowsky. Well --

*Mr. Levine. And the AV -- you know, when we are talking about a driverless vehicle, that means it was created by a manufacturer who wrote computer code, and totally and completely controls that vehicle. Now, right now, that is regulated at a state level. Right? State and localities determine exactly how that liability, and how that responsibility will be apportioned, which is why it is really

important that we maintain that ability at the local level, to make sure we have oversight over the responsibility, if a vehicle operator -- a computer, in this case -- runs a red light and kills someone, or injures someone, that entity who created that code is who needs to be held responsible.

*Ms. Schakowsky. Well, so let me follow up on that. How has -- on there -- how have Americans' access to the courts actually helped improve safety?

And do AVs pose a different challenge to consumers?

*Mr. Levine. Sure, I see there is only a little time left. Can I answer that question?

*Ms. Schakowsky. Yes.

*Mr. Levine. Okay. So, quickly, Americans' access to courts have, literally, saved thousands, if not tens of thousands, of lives. And we say that because defects that were found -- one perfect example is the General Motors ignition switch defect, which killed over 174 people, and injured many more, was only brought to light because of a civil action that someone brought after there was a death. And that is what uncovered it. That is what led to the recall. That is what led to the fix. So that is really an important history that goes backwards.

Going forwards, that same -- those same issues remain vitally important. And so, if we have a circumstance where Americans are interacting with autonomous vehicles from a

legal standpoint, where they lose their right to bring an action, should something go wrong, that not only injures that person financially, but their injury may not be able to open up what might be a problem and help everyone else, if they are denied access to the courts. And so that is something we are going to --

*Ms. Schakowsky. Thank you, Mr. Levine. I appreciate that. And now the chair will recognize Mr. Bilirakis, subcommittee ranking member, for his five minutes to ask questions.

*Mr. Bilirakis. Thank you, Madam Chair. I appreciate it very much. The first question is for Professor Rajkumar.

As I mentioned in my opening statement, I am alarmed by some manufacturers that potentially mislead consumers by advertising automated capabilities not currently on the market. My draft legislation was circulated with stakeholders on this topic. And while I am pleased that NHTSA took note of it, and announced a campaign yesterday to educate drivers, I still believe it is important we legislate on this topic, since we have seen that, every time there is a related accident, it sets back our progress and the efforts to actually test and develop AVs.

So the question. We hear about the Society of Automotive Engineers, SAE, level of autonomy. Can you tell us what SAE-level vehicles are on the road today, and how

many years away are we from level five autonomy that many opponents of AVs are most concerned about?

*Dr. Rajkumar. Thank you, Ranking Member Bilirakis.

Number one, the Society for Automotive Engineers has defined multiple levels of automation. It has become sort of an industry standard, going from level zero, with no automation at all, to level five, which is complete automation, where the passengers do not do anything at all. All the technologies out there today on the market correspond to level two, which basically means that the vehicle can, "drive itself'' under some well-defined conditions like highways with well-defined lane markers. But the operator of the driver must be paying attention at all times so, if the self-driving software misbehaves, it is the responsibility of the driver to intervene and take over.

So pretty much all technologies out there today are level two. And then, going up to level three, level four, level five, they begin incrementally much -- more and more complex. And in my estimate, level five autonomy is many years away, at least five years, if not much longer.

*Mr. Bilirakis. Okay, thank you. How does misrepresenting the autonomous capabilities of vehicles damaged consumer confidence in the safety and mobility benefits these currently present?

And how do you suggest we ensure that manufacturers

accurately reflect actual capabilities and limitations of their vehicles' automated driver assistance systems?

I think this is very important. If you could answer that, I would appreciate it.

*Dr. Rajkumar. Sure. There is at least one car company out there which seems to have mislabeled -- it is really not marketing correctly, truthfully, its vehicle capabilities. And such misrepresentations cause all sorts of problems.

One is that there are customers who actually believe that misleading information, and possibly could end up either dying or causing problems to other people on the road.

A second category of people who are allowed to benefit from this technology do not believe these misleading statements and, therefore, they are -- trust in these systems actually going to -- so that is a disservice to the rest of the industry.

In terms of making sure that information is not misleading, enforcement agencies, including NHTSA -- false advertising laws that the Federal Trade Commission can enforce, that they just basically make -- must take concrete action to prevent such misinformation being used, either in the selling of the product, or through marketing.

*Mr. Bilirakis. Thank you, sir. I am turning on another issue again, Professor Rajkumar, on the related issue of updating the new car assessment program. I am interested

in your familiarity with crash testing of anthropomorphic test vehicles -- actually, devices. So these dummies that we are talking about, commonly known as test dummies, and have -- how those can factor in. I have seen recent reports where gender is not reflected during these crash safety tests. I believe that the physiological differences between a man and a woman must be considered to rectify gaps that may exist within the safety standards.

So can you tell me if you conducted research on this matter, and, if so, what has that research shown?

And then I have a short question for Mr. Levine, if I have time. Well, let me go ahead and give it, and if I don't have time, Madam Chair, that is fine.

Can you briefly answer what you believe is a sensible balance with regard to these crash dummies? Because, again, we have been hearing these reports. It is very dangerous for female drivers, and it is just not fair.

So, Mr. Rajkumar, can you briefly answer that question?

And then also, Mr. Levine, if possible, if I am permitted, Madam Chair. I know I am already over, I apologize.

*Dr. Rajkumar. I am not an active researcher in crash test dummies. But that being said, I do know that the industry, both NHTSA and the Insurance Institute for Highway Safety, they use, "male version'' of these dummies, which are

five foot and nine inches tall, the median height of the American male. So that allows them to, basically, standardize across all tests across different cars and such.

But it turns out that American women, for example, are -- the average height is five feet, four inches. So testing on a five-foot, nine-inch dummy is not the same as the effect on a five-foot, four-inches person. It turns out that I am five foot five inches. So this really does not reflect on me, as well. So really, the study has to be conducted to understand the effects of shorter people and females, as well.

*Mr. Bilirakis. Thank you. I guess, Madam Chair, I probably need to yield back. I appreciate it very much.

*Ms. Schakowsky. Yes. And you can submit a question to -- for the record.

*Mr. Bilirakis. Yes, thank you, Madam Chair.

*Ms. Schakowsky. Is Chairman Pallone here?

It is your five minutes to ask your questions. Thank you.

*The Chairman. Thank you, Madam Chair.

The auto industry claims that AVs have the potential to eliminate virtually all human-caused crashes, but then they oppose efforts to establish safety standards that would ensure that AVs perform safely. Instead, they want a hands-off approach to self-driving cars, quick deployment with no

new safety standards. And so I wanted to ask in that regard, if I could start with Mr. Levine.

Do you believe that the auto industry can be trusted to police itself, and ensure AVs perform safely?

*Mr. Levine. No.

*The Chairman. Okay.

*Mr. Levine. I do not. That --

*The Chairman. How will -- okay, go ahead, I am sorry.

*Mr. Levine. Oh, no, I was just going to say, I mean, there is a -- unfortunately, a many-decades-long history of the industry failing to do exactly that. And you know, you can go back to before our founding in 1970 to find evidence of that. In fact, that is why we were founded.

*The Chairman. All right, thanks. Now, how will implementation and safety standards applicable to self-driving cars help us reach the potential benefits of AVs, if you would?

*Mr. Levine. Sure. There is -- in two ways, actually. You know, in -- to accelerate the success of automated technology will require an entire new set of layers of standards. And whether we are calling them voluntarily or calling them mandatory, the reality is, eventually, they are going to need to be mandatory, and they are going to need to be part and parcel of our new vehicles. And they are going to need to be built for trust. They are going to need to be

built so everyone knows how they work, whether they are working, when they are not working.

But I would also say, on the road to autonomy, we are going to need -- and we can achieve far more safety gains than we are currently getting out of existing technologies that will eventually become part of autonomous technology.

So safety standards can help us get to AVs, but can also help us protect lives now.

*The Chairman. All right. So I want to go to Mr. Regan, and talk about workforce and safety, if you will. So, Mr. Regan, what policies can Congress include in an AV bill to strengthen American jobs, enhance U.S. competitiveness -- we keep talking about China -- and also boost domestic manufacturing?

*Mr. Regan. Sure, I -- thank you for the question. I know that, frankly, one of the talking points we hear is we are going to lose to China. Well, if we don't have, you know, strong Buy American policies attached to this if we are using Federal dollars, then we are going to lose all of that manufacturing to China, regardless of how we deploy it here.

We do need to make sure that we have built-in workplace protections at the front end of all this, so that we are growing the workforce along with the technology as it is deployed. We have laid out all of these in the document that we have submitted for the record today. And frankly, if you

do it based on maintaining collective bargaining agreements, using transit worker protections, there is a lot of ways that we can ensure that working people benefit as much as those who are using the systems.

*The Chairman. All right. And I want to go to back to Mr. Levine again about advanced driver assistance.

The wide-scale deployment of advanced driver assistance systems like automatic emergency brakes, lane departure warnings, and blind spot detection are building blocks of AV, and could save 20,000 lives a year. But as we work on a framework for deployment of AVs, should we also consider policies to expand the deployment of advanced driver assistance systems?

*Mr. Levine. Thank you so much for the question. And the answer is categorically, 100 percent yes.

I mean, if you look at the main significant difference between our death rates and the European death rates I mentioned earlier, there are about 20,000 deaths. That is the number you just mentioned. Now, is it one for one? No, that is not exactly how it works. But one thing that Europe has done is -- really consistently have implemented a lot of these ADAS systems that we haven't. By next year they are going to be required on all new vehicles in Europe, and they have been rapidly adopting them, whereas here they remain luxury items, they remain completely unregulated. We are not

even sure whether they work, how they work, and manufacturers can call them whatever they want.

So we need to accelerate not only getting them into cars, but making sure that we have got standards around them, that they succeed in protecting people on our roads.

*The Chairman. All right. Thank you so much.

Oh, did anyone else want to say anything?

No, all right. Thank you.

And thank you, Madam Chair. I yield back.

*Ms. Schakowsky. I did just want to mention that we heard from Debbie Dingell. There was no way to overcome the technology problems that she faced, so she will be presenting her questions and her comments for -- and opening statement for the record.

[The prepared statement of Mrs. Dingell follows:]

**********COMMITTEE INSERT**********

*Ms. Schakowsky. And now I welcome our ranking number, Mrs. Rodgers, for five minutes of questions.

*Mrs. Rodgers. Thank you, Madam Chair. Before I begin my questions, I would like to offer for the record a letter from the National Federation for the Blind to Senators Cantwell and Wicker, in support of the autonomous vehicles legislation, in this case attaching a version to the Senate's Endless Frontiers Act, which is supposed to focus on U.S. leadership versus China.

Sadly, the amendment was withdrawn, as Senator Thune cited, "due to intense lobbying pressure from the trial lawyers and the Teamsters.''

*Ms. Schakowsky. Without objection, so ordered.

[The information follows:]

**********COMMITTEE INSERT**********

*Mrs. Rodgers. Thank you.

Professor Rajkumar, I believe, lost in this tug of war on auto issues among companies, and safety advocates, and labor unions, and trial lawyers is the greater opportunity that will be available years down the road for seniors and those with disabilities. Can you tell me about the mobility benefits autonomous vehicle technology will provide for the more vulnerable in our society?

*Dr. Rajkumar. Oh, sure. There are more than six million legally blind people in the country, more than a million physically disabled people in the country, none of whom can actually drive like you or me. So these are people, millions who, actually, are, literally, stuck at home. And to go from point A to point B, they need to depend on somebody else. With autonomy these people will gain mobility and independence, and a much better quality of living.

And the same concept applies to elderly people. Since women tend to outlive men, it applies more to women than to men. When an elderly person's faculties begin to decline, they may end up losing their driver's license. And even though they have been an independent spirit their entire life, now they do not have a license. It is an empty nest. They basically get stuck at home all by themselves, and records indicate that both mental and physical health begin to decline very rapidly. So we can -- with autonomy we can

actually give them a better quality of life.

*Mrs. Rodgers. Thank you.

Mr. Regan, while we do not have jurisdiction over labor or trucking issues, we do appreciate you being here today to speak to workforce issues. I just wanted to know, given other topics are covered in your testimony relative to autonomous vehicles, specifically in regard to the Tesla accident, do you mind just stating for the record that the AFL-CIO agrees with us that Tesla does not currently sell an autonomous vehicle?

*Mr. Regan. Well, sure. It depends on how you define "autonomous vehicle.'' It is not a fully autonomous vehicle, no.

*Mrs. Rodgers. Right, right. There is five levels. Theirs is a level two, so we have a long ways to go.

Since public transportation options and assistance can be limited, depending upon where you live, do you agree that these technologies can fill a gap in areas where organized labor is not serving those in need?

*Mr. Regan. We have always looked for opportunities to expand mobility options for people in all communities. We think that there are other ways to do that, frankly: more investing in public transit, for instance.

And frankly, what public transit offers right now for -- whether it be paratransit for people that are in need of

special assistance -- a lot of that, as we start developing technology and moving forward, needs to be replicated in the right way to make sure that that -- those people are not left behind, that we have the same access to transit that everybody else has, and --

*Mrs. Rodgers. Okay.

*Mr. Regan. -- the pathway to the middle class there, as well.

*Mrs. Rodgers. Thank you. To all the witnesses, I mentioned in my opening statement America still leads the world in the innovation of advanced technologies. However, just like the lessons we learned from ceding leadership on telecommunications networking equipment, we risk our auto and tech companies being marginalized or acquired by Chinese competitors if we fail to enact our own roadmap to develop and test AVs, getting to that place where we have full autonomous vehicles. We are not there yet.

While we will always have outliers in this discussion for their own several (sic) interests, I hope our auto and tech companies, our workforce, and our safety advocates can see the benefit of the U.S. developing this technology, setting up supply chains, and designing the rules and standards creating new jobs.

Do you all agree that China will seize our inability to lead on this technology, yes or no?

Professor Rajkumar, would you answer?

*Dr. Rajkumar. Yes.

*Mrs. Rodgers. Mr. Regan, would you answer?

*Mr. Regan. No, not necessarily. I think it depends on how you define "lead.''

*Mrs. Rodgers. Okay. And I am looking for the third, here.

Oh, Mr. Levine. Yes, please.

*Mr. Levine. No, because I don't think that they are leading. We are leading, and I believe we will continue to lead, if we choose to do so.

*Mrs. Rodgers. Okay. Well, I will just underscore we need a national framework. We need to take action to make sure that we do this right.

With that, I yield back. Thank you.

*Ms. Schakowsky. The gentlewoman yields back, and now I recognize Mr. Rush.

Are you here from --

*Mr. Rush. I am here, Madam Chair.

*Ms. Schakowsky. Go ahead.

*Mr. Rush. Madam Chair, I thank you so much for this hearing. My first question is directed to Mr. Levine.

As you know, Mr. Levine, I, along with my good friend from Indiana, Dr. Bucshon, recently introduced a bill that will require the National Highway Traffic Safety

Administration to "evaluate the performance of crash avoidance systems, and detecting and classifying pedestrians, bicyclists, and other vulnerable units, including those with different skin tones.''

The genesis of this bill came out of a recent Georgia Tech study that found that crash avoidance systems currently on the market have trouble recognizing individuals with darker skin tones. And I am grateful to you and the Center for Auto Safety for your support of our bill.

Can you please discuss why this legislation and the performance evaluation it mandates are so important?

*Mr. Levine. Thank you so much for the question, Congressman. And thank you for introducing the bill.

The value of making sure that crash avoidance systems work is really inarguable. The idea, both for vehicles today -- you know, when we talk about automatic emergency braking, and forward collision warning, and all these different acronyms that people throw around, the value in them is only if they work, only if they detect other vehicles and, of course, other vulnerable road users, pedestrians, bicyclists, particularly, making sure they detect every one of every -- you know, of every possible skin color, and whether they are -- again, they are a bicyclist or a pedestrian.

And most importantly, this is something that will help save lives now, and help build AVs in the future, because

these AVs are going to be dependent upon crash avoidance technology. So this is really an important step in making sure we get the right technology on the road for everyone's safety.

*Mr. Rush. Mr. Levine, I have a second question, and I thank you for your answer to my first question.

Does the Georgia Tech study have any more information as to the safety of AVs? And if so, give us some ideas about what those implications are.

*Mr. Levine. Well, you know, I mean, AVs, if I understand the question correctly, I mean, AVs can prevent, in the long run, if they work properly, a lot of the current crash circumstances. But we have a long way to go to make sure that they are working correctly. As was discussed previously, there is some technology out there right now, particularly from Tesla, that claims it is autonomous, but is not. There is an unregulated sort of moment that we are living in, with respect to how this technology is described and deployed.

So in the long run, for us to get from where we are now to where we want to go, and eliminate, or at least mitigate, the vast majority of these 42,000 deaths a year, we are going to need careful, iterative steps to make sure the technology works --

*Mr. Rush. Mr. Levine, I have another question. As you

know, even pedestrians may lose their right to seek justice and, of course, if there is a continued proliferation of forced arbitration clauses. These clauses often -- in terms of service agreements that waive a consumer's right to sue in court, participate in a class action, or appeal the arbitrator's decision.

Does forced arbitration clauses relating to AVs pose a danger to pedestrians? And if so, why?

*Mr. Levine. They pose a real threat, and the threat is this. As we discussed earlier, the ability to make sure you are holding any manufacturer -- AV or otherwise -- responsible for something defective, for a defective vehicle, is critical to safety. It is a backstop to our entire system.

And so, if you are a pedestrian who has entered into an agreement unknowingly when you downloaded an app to order a pizza, maybe, and you get hit by a pizza delivery vehicle, and you said, "Well, I am going to do everything, from a legal standpoint, through binding arbitration,'' you have now lost your ability to go to court. That sounds outlandish, but it is not actually that far from where we are, in terms of binding arbitration, removing our ability to hold manufacturers accountable.

And so that is something that we don't want to see in an AV context.

*Mr. Rush. Thank you very much.

Madam Chair, I yield back.

*Ms. Schakowsky. Thank you. And now, Mr. Upton, it is your turn for five minutes of questioning.

*Mr. Upton. Well, thank you, Madam Chair. And I think we all agree -- I know we all agree that, if we don't lead, if America doesn't lead in AV technology, we run a lot of risks. And we saw this last week with Colonial Pipeline. We also run the risk of cybersecurity threats from abroad.

So I would just note to my colleagues that I introduced the GUARD Act last week that is going to require the Secretary of Transportation, in consultation with other appropriate Federal agencies, to conduct a study, report to us on the state of cybersecurity regarding motor vehicles.

And I wonder, Professor Rajkumar, if you could talk a little bit about what is Carnegie Mellon doing to address cyber, and what do you think the Secretary should focus on in the report, as authorized, if my legislation moves forward?

[Pause.]

*Mr. Upton. You have to unmute yourself.

*Dr. Rajkumar. Thank you, Congressman. Cybersecurity is a critical issue for AVs, in particular, and vehicles in general. If my bank account gets hacked, I may end up losing some money. But if my vehicle gets hacked, and the vehicle runs into something, I can lose my life. So it is actually a

big imbalance out there. So I really think that cybersecurity, as applied to physical destruction of life and property, should really be cyber physical security.

At Carnegie Mellon we have an institute called CyLab that I am part of, as well. "Cy'' stands for cybersecurity and privacy, in this case. We are looking at so many different functions, detecting security intrusions, how to design systems from scratch to be secure, how to take an existing system, make it more robust, from a security perspective. And when we map that to vehicles, we go across multiple hardware subsystems when computers talk to each other within the vehicle and with the environment, as well. So we are looking at that whole spectrum of technology. So it is imperative that we make this vehicle secure.

*Mr. Upton. So there has been pretty big investments made by -- you know, I am from Michigan, the auto state. The President is there, actually today, looking at the new Ford 150 electric vehicle. But GM just announced more than $2 billion investment in a company called Factory ZERO in Hamtramck, Michigan. It is going to create a couple of thousand jobs, all on the AV industry.

You know, one of the things that we are all concerned about is DoD -- DoT, rather, Department of Transportation, needs to modernize the Federal Motor Vehicle Safety Standards, FMVSS, to account for AVs. What can we do in the

interim to help with funding and development to make sure that those -- that technology, in fact, is born here, in the U.S.?

*Dr. Rajkumar. I see multiple components forming a holistic picture, Congressman.

Number one, we still have a need for basic research, so targeted research programs at the Federal level would go a long way.

Number two, the USDOT, it has a program called Automated Driving System Demonstration Grants. We need more of that to, basically, deploy these technologies in the real world, and get -- collect data, and then obtain feedback.

Number three, we need to engage workforce, and understand their concerns so that retraining programs can be put in place so that their skills can be upgraded.

So all of that needs to happen.

With respect to FMVSS, Vehicle Safety Standards, we have some very outdated regulations on the books. You cannot remove your side mirrors, for example, and replace them with small cameras with displays inside on the doors. If you remove those side mirrors, the aerodynamics of the vehicle will go up, mileage will go up, and costs will actually come down, cost ownership will come down. But meanwhile, nobody has ownership of that particular regulation and, therefore, it is on the books. Even though the technology is there, it

cannot be deployed today.

So we should be revisiting these regulations on a complete scale.

*Mr. Upton. So it would make some sense, then, to have some common-sense regulations that would be able to account for some of those things that weren't done when those regulations were promulgated through OMB.

*Dr. Rajkumar. Absolutely, yes. Many of them are outdated, and it is hard to change that. So going forward, when we put in regulations for AVs, it is important that the regulations are not set in stone. They need to be revisited every so often, at least once a year.

*Mr. Upton. Thank you. I yield back.

*Ms. Schakowsky. And next up, Congresswoman Castor, you are recognized for five minutes for questions.

*Ms. Castor. Well, thank you, Chair Schakowsky, and thank you to our witnesses for being here today.

You know, together with the Biden Administration, as we bounce back from COVID, we are pressing ahead on jobs in clean energy and cost saving energy efficiency in ways that we reduce pollution, as well, to create these win-wins. In fact, when it comes to autos, the House Select Committee on the Climate Crisis, our Big Climate Crisis Action Plan, we recommended providing incentives for the purchase of electric vehicles and incentives for EV charging infrastructure, with

very significant Buy American, Build It in America complementary policies.

And what followed on? President Biden's American Jobs Plan. He does propose to invest $174 billion in vehicle electrification, and there is an exciting announcement coming today out of Dearborn, Michigan with Ford and the United Auto Workers that we are all going to be watching.

Mr. Regan, how will such investments boost domestic manufacturing, help us expand domestic jobs, and ensure all workers in the industry earn fair wages and high-quality benefits, while we boost American competitiveness?

*Mr. Regan. Thank you, Congresswoman. Really, the way -- if you look at the American Jobs Plan, the reason why it will create so many jobs and be such an economic benefit is because of the labor standards that are attached to all of those investments. Buy America, 13C, Davis-Bacon, all of these labor protections that have been proven to provide middle-class jobs are embedded in that proposal. And we expect Congress will make sure it is written in the right way to do it, to create those jobs.

*Ms. Castor. Yes, we have got to make sure that the United States outpaces our international competitors in the global race for electric vehicles.

And the race is on. In 2018 Chinese production accounted for more than half of all lithium battery cell

manufacturing capacity, and nearly half of global EV sales. So this -- I mean, the race is on, and we better get our act together here with very substantive policies.

Mr. Regan, can we win the global race to EVs without a comprehensive Federal approach that supports electric vehicles and high-quality jobs, manufacturing, and deployment? What do you think?

*Mr. Regan. No, we can't. We need those policies. We need the investments.

And also, I would add, we need the investment in the workforce, as well. We need training requirements. We need to make sure that the people are growing, their careers are growing at the same time that the technology is growing. That is true for EVs, it is true for AVs. And we have an opportunity here to really become a leader, not only in the manufacture of these vehicles, and the deployment of vehicles, but also in the policies that will redefine how we interact, how these policies and how these vehicles are being built out, and expanding workforce opportunities.

*Ms. Castor. Exactly. And so would you recommend that any Member of Congress who wants the United States to outcompete China, support the American Jobs Plan?

*Dr. Rajkumar. A hundred percent, yes.

*Ms. Castor. We have to do it. As the economy heals and interest rates remain low, this is the perfect time to

invest in our workforce, electric vehicles. We have got to outcompete our global competitors.

And by the way, these cars are really fun to drive. So this is going to be an exciting time, and an exciting announcement today.

Also, fuel economy and tailpipe emissions standards have played a critical role in reducing pollution, but these standards are only effective if they are enforced. Thankfully, when two major German automakers installed the so-called defeat devices to cheat emissions tests, consumers who had purchased those cars under false pretenses had the right to hold the manufacturers accountable by participating in a class action lawsuit that awarded billions of dollars in compensation.

Mr. Levine, automated vehicles, as they are deployed -- a number of members have raised this today -- how do we ensure that consumers are still able to seek legal recourse if they violate the fuel economy and tailpipe pollution standards? What do you recommend?

*Mr. Levine. Sure. Thank you so much for the question. I mean, a core way of achieving the accountability is not changing the system in a way that, all of a sudden, changes how we hold manufacturers accountable. Right now, if a manufacturer of a vehicle is doing something that is cheating intentionally, or putting a defect on the marketplace, they

can be taken to court. They can be held accountable by both regulators and by individual citizens, either banding together or one on one. Let's not change that. Let's not remove that backstop that helps protect all of us, whether it be from an emissions cheating scandal or a defective ignition switch.

*Ms. Castor. Thank you very much.

Thank you, Madam Chair. I yield back.

[Pause.]

*Ms. Schakowsky. Oh, I am so sorry, Mr. Latta, I just introduced you as someone who has a little interest in this topic. But I was on mute, so now you have five minutes.

*Mr. Latta. Well, thank you. I thank my friend and -- for holding today's hearing. I really appreciate it. Thanks to our witnesses for being with us today.

It is hard to believe it has been two congresses ago that this committee and subcommittee passed out the AV legislation unanimously, and it passed the House on a voice vote. And I think that we are falling behind the rest of the world, and I am glad we are having this hearing. We need to spotlight this.

And, you know, if I could just go back to the legislation that we had, I think we had over 300 staff meetings, and meeting with everyone on the issue to make sure that we came up with a good piece of legislation, from

preemption to safety. And I remember saying it over and over and over, we wanted safety first, safety last, safety always, cybersecurity, and we wanted privacy. We wanted to make sure, of course, that the vehicles that were coming out would be as safe or safer than anything that was on the road.

And then, you know, talking about our senior citizens, give them more mobility, making sure that those with disabilities had more mobility. And so we wanted to make sure that happened.

We also looked at, you know, saving energy, and working with smart cities like Columbus, Ohio. So it is getting out there, and testing.

And then, you know, it has been brought up, unfortunately, you know, we have had 42,000 deaths in the last year on the road, 94 percent being human error. And, you know, then it was increased. It was 37,000 when we were talking about this legislation two congresses ago.

So, Mr. -- or Dr. Rajkumar, if I could start with you, first question: Are we falling behind China right now, in AV technology?

*Dr. Rajkumar. Congressman, I believe yes. Yes, we are. After the 2007 DARPA Urban Challenge, China launched a sequence of annual competitions. Initially, basically, they had vehicles that were really veering this way, that way, and then next year they improved. Now, basically, they are

pretty much catching up with us.

Baidu, the big company in China, has announced -- has reported in Bloomberg that they will have more than 2,000 autonomous vehicles across multiple Chinese cities in the next couple of years. And meanwhile, the longest video on YouTube that showcases a completely driverless vehicle without anybody inside them is for two hours, driving across a Chinese city in light traffic, Sunday morning traffic. But it is the longest driverless trip I have seen anywhere, including U.S. companies and such. And that is from a company that is operating in China.

And meanwhile, they have these advantages of a relatively lax regulatory environment, where they don't -- they can stifle -- muffle disagreements. And they tap into the resources available in China, in terms of talent and money. They also operate offices in the U.S., so they tap into American talent, as well.

So I think we should be very concerned. They already have 80 percent of electric vehicle manufacturing capability, I believe, more than the U.S. and Europe, combined. And if we end up losing the manufacturing capability, and we end up losing the IP, the intellectual innovation part with autonomous vehicle software and sensing -- they have sensor manufacturing companies there, as well -- we could end up losing the whole enchilada.

*Mr. Latta. Well, and, you know, we already know that is not only what they are doing in China, but they are testing in the United States right now.

Let me ask you. You talk about safety being paramount. Would you want to talk about -- a little bit about that?

And I would like to -- if you could, make it a shorter answer, because I got about a minute and 12 seconds left.

*Dr. Rajkumar. Sure. Without safe technologies, customers will not trust or buy these vehicles. So the companies are incentivized to basically make sure that this technology is reliable and safe.

*Mr. Latta. Well, and also, you also mentioned that, you know, that this should be adaptive and agile. Could you touch on that?

*Dr. Rajkumar. Yes, the technology is maturing rapidly, evolving across multiple different segments and multiple different geographic regions. Whatever regulations that we put in place today will end up being outdated a few months from now, a year from now. So it is important that any framework that we put in place is revisited every so often, once a year.

*Mr. Latta. And you also talk about encouraging collaboration, and that is something I -- we worked on in the last -- you know, two congresses ago, making sure we had everybody involved. Do you want to just quickly talk on

collaboration?

*Dr. Rajkumar. Yes, I find that -- the American innovation ecosystem to be very unique. It comes about because of Federal investments in basic research, industry participation, and groundbreaking creative ideas from universities working with communities and organizations. So that, I think, is the magic sauce that we have in the U.S., why we became the innovation capital of the world, and we need to push that advantage that we have.

*Mr. Latta. Well, thank you very much.

And Madam Chair, my time has expired, and thank you for today's hearing. I yield back.

*Ms. Schakowsky. Thank you. Next up is Congresswoman Trahan.

And you are recognized for five minutes for questions.

*Mrs. Trahan. Thank you, Chairwoman Schakowsky, Ranking Member Bilirakis.

I am the daughter of a union iron worker. And like several of my colleagues, I am concerned that market forces will likely lead to an uptake in self-driving cars for ride hailing, transit, and delivery. And this means that, not only are the livelihoods of displaced workers at stake, but their physical health and safety, as well, as they look to be the first major subset of the population to work in and around level three, four, and five vehicles.

This workforce will be at the front lines when these vehicles make mistakes. And AVs will make mistakes, they already have. Mistakes are part of the process for developing innovative technologies. Mr. Levine, if a worker is killed or injured by a defective AV car or truck, what recourse will they have against the manufacturer?

Can they bring an effective case if they are forced to proceed in a private arbitration, with little access to discovery, or to information from similar incidents that might have occurred?

*Mr. Levine. Well, as a general -- thank you so much for the question. As a general matter, no. I mean, to the extent that an employee, or a contract worker, or, really, any individual has been bound from -- prevented from using all of the access to all the different tools that the American court system provides, then no, they are unlikely to be able to seek justice. They are unlikely to be able to hold the manufacturer accountable. And, perhaps most importantly, whatever they do determine will be done in secret, so the rest of the public won't learn what happened, and if there is a real widespread problem.

*Mrs. Trahan. Understood. And I am wondering if you could just expound a little bit on how these forced non-public arbitrations would affect public safety.

*Mr. Levine. Well, again, as a general matter, there is

only one party that seeks binding arbitration in a consumer-manufacturer context. That is going to be the manufacturer. Consumers are never out there looking for binding arbitration agreements that they want to be able to sign. They are generally forced upon them.

And when we enter into them on our phone for an app, we don't think very much about it often. But when we are talking about a vehicle, whether you are in the vehicle, or you are hit by the vehicle, or you are -- have to use it for work, it dramatically changes your opportunity, again, if something goes wrong, to hold that manufacturer responsible, and perhaps, again, even more importantly -- remember, binding arbitration disputes are almost always settled in private, in secret, and do not get made public. And this is a major problem, historically, that has little to do with AVs, but there is no reason to expand this problem to the autonomous vehicle environment, which we all want to get to.

*Mrs. Trahan. Yes, no. Thank you.

Similarly, this same frontline workforce will be highly surveilled. Working alongside AVs means being constantly surrounded by cameras, and having your every move tracked. Mr. Regan, heavy-duty truck driving is already a highly surveilled occupation. Can you speak to the impact this has on workers, and ways Congress can create policies that balance a worker's right to privacy with the fact that AV

technology needs large quantities of image data to work effectively?

[Pause.]

*Mrs. Trahan. Did we lose Mr. Regan?

*Mr. Regan. I am sorry, my Webex just suddenly froze out on me. But can you repeat the question?

*Mrs. Trahan. You bet. You bet. I am -- given just the high level of surveillance, I am wondering -- you know, heavy-duty trucking is already highly surveilled, and I am wondering if you could just tell us a little bit about the impact this has on workers, and ways that, you know, Congress can create policies that balance a worker's right to privacy with the fact that, you know, AV technology needs large quantities of image data to work effectively.

*Mr. Regan. Sure. I think you can look to, frankly, look to the aviation sector for guidance on how to balance worker privacy with the necessary safety constraints that are inherent in some of the monitoring equipment in an aircraft. We have struck that balance before. We can certainly do it here.

*Mrs. Trahan. Great. Well, certainly I join so many of my colleagues in my excitement about the potential of a world with self-driving cars, and I believe in the ingenuity of our engineers and our computer scientists. I believe our brightest minds can develop world-changing technology, while

remaining committed to the safety of those working on our front lines of this grand experiment.

Thank you, Madam Chair. I yield back.

*Ms. Schakowsky. Thank you.

Mr. Guthrie, you are now recognized for five minutes for questions.

*Mr. Guthrie. Thank you, Madam Chair. And first I need to point out that Mr. Levine appears to have Willie the Wildcat behind him, which is a really good move, since Willie is a constituent of our chair. So that was a good move this morning.

I have questions for Dr. Raj Rajkumar.

In your testimony you discuss the regulatory challenges that are preventing us from deploying autonomous vehicles. While these deserve our attention, I would like to shift focus to some of the technical challenges that remain ahead. As you know, we are also in a global race to 5G. How important of a role do you see 5g playing in the deployment of autonomous vehicles?

*Dr. Rajkumar. Thank you, Congressman. Autonomous vehicles collect a massive amount of information from different sensors, multiple cameras, radars, and lidars. We are talking a massive information.

With the 5G connectivity, a good portion of that information can be transmitted to the cloud, to a central

computer somewhere, which can collect all this information from multiple AVs, and then extract very useful information -- what the weather conditions are, different roads, what the road conditions are like, wet, icy, slippery, and so on. It can get the traffic snags like accidents, debris on the road, the presence of potholes and such, and it can feed back that information back to the AVs. And now the AVs can basically react to that information that cannot be sensed by their sensors. Now they basically navigate those obstacles by taking detours and such, and therefore, they are more safe -- they are safer and more reliable.

*Mr. Guthrie. Okay, thank you, and --

*Dr. Rajkumar. So --

*Mr. Guthrie. Now, next, during today's hearing we have heard a lot about potential safety benefits that autonomous vehicles can bring to our nation's highways. And Dr. Rajkumar, what are the safety implications of allowing a country like China to beat the U.S. to automotive innovation and AV deployment?

And how can we assure Americans that this technology will provide improved mobility and quality of life, ultimately ensuring more widespread adoption?

*Dr. Rajkumar. Sure. In terms of deaths, the World Health Organization reported that there may be about 250,000 automotive deaths in China. So they are motivated to save

lives, number one.

In my testimony I say that the market size is estimated about $7 trillion a year -- with a T. They understand that, as well. So while they are investing intensely into the space, they are encouraging their companies to forge ahead. And when they get the manufacturing base in-house, and they basically get the intellectual meat, the cream of the crop in terms of the core innovations, so that can become an unbeatable combination, particularly when combined with 5G.

So it is important that we invest -- we out-innovate them. That is the only way that we can actually get ahead. And therefore, we maintain our national security, as well as economic competitiveness, retain our jobs in terms of maintaining control of domestic supply chain and such.

*Mr. Guthrie. Okay, thanks. And how can we ensure that that rural America is going to benefit from AV technology?

*Dr. Rajkumar. If there is a crash, an automotive crash in the rural areas, it is likely that emergency vehicles will not reach you necessarily on time. So the fatality rate in rural accidents is much higher than in urban areas. And if you are disabled, or legally blind, or living alone by yourself and you are old, you get stuck at home. So autonomous vehicles can give you both mobility, independence, a better quality of life, access to opportunities and employment. So all of that will be enabled in rural areas.

Luckily, rural areas also have open skies and such, and therefore, autonomous vehicles likely will drive better, also.

*Mr. Guthrie. All right, thanks. And then to also Dr. Rajkumar, during the 115th Congress I introduced the SHARES Act, which eventually became part of the SELF DRIVE Act. The SHARES Act set up an advisory council to bring industry experts together to develop an information-sharing framework to advance the safety of AV. How important is it for us to be sure we are bringing experts and relevant stakeholders together to tackle emerging issues?

*Dr. Rajkumar. I believe that should be advisory boards that advise the USDOT, in particular, that brings together participants from industry, participants from academia, from stakeholder organizations, bike organizations, pedestrian organizations, people with disabilities and such. So it is important that all of us together communicate with each other our concerns, and come up with a solution that works for everybody, including the regulatory framework.

*Mr. Guthrie. Thank you very much, and my time has expired, and I yield back. Thank you.

*Ms. Schakowsky. I thank the gentleman. And now, Mr. McNerney, you are recognized for five minutes.

*Mr. McNerney. Well, I thank the chair, and I thank the witnesses. Your testimony has been very informative.

The ransomware attacks at the Colonial Pipeline and the massive hack detected by SolarWinds are wake-up calls about the increasing cyber threats we now face. AVs are, effectively, computers on wheels, and can be hacked.

Mr. Levine, in your testimony you noted that AV legislation must include cybersecurity standards. Following up on Mr. Upton's question, why is it necessary that this legislation include such standards?

*Mr. Levine. Thank you so much for the question. And as Congressman Upton noted, you know, I mean, the Colonial Pipeline is a perfect example of how important cybersecurity is in our transportation sector. But we don't have to go outside of vehicles themselves. I mean, there have been reports, since we have made computers part and parcel of our vehicles, of vehicles being hacked. There was a news report last week of a Tesla being hacked via a drone.

Now, we are not yet at the point where they are always able to take over operational control, but we are probably not that far away. So the immediate importance of setting up cybersecurity standards that allow for us to know what is happening, and allow for a sharing of information that shares threats amongst both government and the manufacturers, will allow us to be more protected in these vehicles, going forward. It is a critical part of the conversation. Thank you for raising it.

*Mr. McNerney. Thank you. Well, AVs are likely to communicate with smart infrastructure like tolls and traffic lights. Are you concerned that the potential cyber vulnerabilities of AVs could pose cybersecurity risks to a city's smart infrastructure?

*Mr. Levine. It is certainly a concern. I mean, any time anything is online, there is a risk associated with it, from a cybersecurity perspective. That said, this is the way we are going to achieve the tremendous benefits that AV proponents are discussing.

And so it is probably not a question of if there is going to be a connection between infrastructure and vehicles. It is a question of how can we be sure to protect it as well as possible, and make sure that, if there is a hack, if there is a vulnerability, it can be closed as quickly as possible, and mitigated.

*Mr. McNerney. Thank you. It is my understanding that NHTSA can currently use recall authority to remove vehicles with cybersecurity vulnerabilities. Is NHTSA's recall authority sufficient?

*Mr. Levine. Well, the authority is probably sufficient, but remember, a recall is only happening after the problem has been discovered. The reason standards are useful is they try and prevent the problem from happening in the first place, and create a more effective mechanism,

ideally, for limiting the scope of the problem.

But yes, I mean, NHTSA can certainly recall something that has an issue, but there is a larger question of can we prevent or limit that issue before it gets to a recall.

*Mr. McNerney. Well, thank you. Well, in your written testimony you noted the importance that an AV law does not preempt protections provided by state and local rules of the road regarding operations of vehicles on the street. Why is that something you believe is important?

*Mr. Levine. Well, right now, remember, the way we think about who is in charge of our local roads, our local communities. They determine the rules of the road, who gets on the road, who gets driver's licenses, speed limits, that sort of idea. And that is not just important for local control; that is important for oversight and accountability.

And so, if we decide that that should all be preempted at a Federal level, we are removing not only the opportunity for local communities to have oversight into what is going on on their roads, but we are also taking away a legal oversight mechanism that holds manufacturers -- and anyone, quite frankly, any operator of a vehicle, a person or a computer -- responsible.

And so, again, that -- the importance of the oversight can't be overstated.

*Mr. McNerney. Thank you. That makes that clear.

Mr. Regan, I serve as the co-chair of the Artificial Intelligence Caucus. One of the issues that I am most concerned about is the impact of AI and automation on the workforce. And thank you for the set of recommendations you gave in your oral testimony for how to avoid large-scale job displacements due to AI and automation.

What challenges are workers whose jobs are displaced as a result of AI likely to face in finding -- transitioning to new jobs?

*Mr. Regan. Thank you for the question. I mean, especially if you have people that are in the -- you know, mid-career, and all of a sudden have their jobs -- they lose their jobs, I mean, the challenges of finding something and adapting to a new economy is going to be very difficult, especially if they don't have the built-in workforce training opportunities that we are calling for here to make sure that they can smoothly transition, along with the technology, to adapt to a -- to the new economy.

*Mr. McNerney. So this is going to require investment from the government and from the beneficiaries of the technology, is what I would guess.

*Mr. Regan. Absolutely. I think this needs to be a comprehensive effort to make sure that the workforce is brought along, as well -- along with the technology.

*Mr. McNerney. Thank you. I yield back.

[Pause.]

*Voice. Madam Chair?

*Ms. Schakowsky. Yes, I got it.

So, Mr. Dunn, you have a very sparkling -- behind you, and you are welcome now to take your five minutes for questioning.

*Mr. Dunn. Thank you, Madam Chair. I will try to address this background in between meetings.

Some critics of autonomous vehicles legislation claim that exempted vehicles are not as safe as others currently on the road. And that is why I recently introduced the H.R. 1334, Safe Alternative Vehicle Endorsement, or SAVE, Act. This legislation would reclassify a vehicle's exemption -- note the word "exemption'' -- as an alternate safety endorsement. My intent is simply to better reflect that any endorsement granted by NHTSA meets or exceeds Federal vehicle safety standards.

So my first question is to the entire panel, and a simple yes or no will suffice, I think you would agree. Under current law, would you agree that, in order for a vehicle to receive such an exemption, the vehicle must have an overall safety level equal to that of the overall safety level of non-exempt vehicles?

Let's start -- Mr. Regan?

*Mr. Regan. Yes.

*Mr. Dunn. Great. Mr. Levine?

*Mr. Levine. That is the current standard. But remember, the Ford Pinto met all the Federal standards.

[Laughter.]

*Mr. Dunn. Yes, I was around for the Ford Pinto.

Dr. Rajkumar?

*Dr. Rajkumar. Yes.

*Mr. Dunn. Yes, okay, great.

So, Professor Rajkumar, can you briefly explain why the exemption process is critical for the development of autonomous vehicles now, right now?

And what exemptions are necessary to allow manufacturers the flexibility to develop safer vehicles?

*Dr. Rajkumar. AV technology is very complex, and needs to be tested extensively to demonstrate safety. I can take a couple of approaches. You can simulate, but simulation only goes so far. You can test for certain conditions, but the real world is much more complex than what simulations can produce. So these vehicles have to be tested in the real world. So having a mechanism that enables testing under well-defined conditions so that it does not hurt the public, but enables the technology to mature, is hypercritical.

*Mr. Dunn. Well, thank you very much for that. Would you say, Professor, that an auto manufacturer must meet the same level of safety in order to receive what would today be

called an exemption?

*Dr. Rajkumar. Well, absolutely. They could go through a very detailed process to, basically, get their exemption application granted.

*Mr. Dunn. So in that -- because you said that, now is it not more appropriate to describe and title what we are now calling an exemption what it truly is, which is an alternate type of safety endorsement?

*Dr. Rajkumar. Very much so, because the car maker, in this case, has to demonstrate to an enforcement agency like NHTSA that their technology is safe, because of the following reasons, and they should identify where they are going to be testing the vehicles, they need to be identifying who is involved, who is in the vehicle, who can be around, who is not, and such. It is definitely a process.

And meanwhile, NHTSA will very likely require them to share a lot more information. They will retain the right to maintain tight oversight of that vehicle, and then impose an expiry duration, after which -- car makers to come back and say, "This is what happened, and, therefore, please continue my exemption.''

*Mr. Dunn. Very good. Thank you.

Mr. Levine, would you be in favor of changing the title "exemption'' to "alternate safety endorsement''?

*Mr. Levine. Well, thank you for the question. I am

not sure that what we title it is as important as what the outcome is. And --

*Mr. Dunn. So I think you are right, the outcome, but we are talking -- the outcome is the same. So -- but the title is intended to get away from the term "exemption,'' which causes fear. That was my intention right there.

*Mr. Levine. So -- and I think that that is fair. I mean, the concern would, of course, be, you know, there is this current process, which we call the "exemption process,'' but the current process exists. There has been, I believe, two or three manufacturers who have submitted applications, one of which was approved, one of which was withdrawn. And so there is an existing process that is supposed to look at this information.

I think the most important piece is, is enough data being acquired and submitted to allow NHTSA to make a reasonable determination as to the safety of the vehicle that may not meet the traditional standards? And that is the most important question before us. And that is the one I think we are all hoping to find a way to solve.

*Mr. Dunn. And I would -- I think we would all agree with you on that. I mean, it is a new and evolving area. Thank you very much for your answers and your time, gentlemen.

I yield back, Madam Chair.

*Ms. Schakowsky. Okay, next we have my colleague and friend from Illinois, Congresswoman Kelly, for five minutes.

*Ms. Kelly. Thank you, Chair Schakowsky and the witnesses, for testifying today.

One thing we can all agree on is the desire to protect and create good-paying jobs that provide families with financial security. For decades, automobile manufacturing has supplied just that kind of employment. While that sector has faced its fair share of challenges due to automation and globalization, I am hopeful that the design, engineering, and manufacturing of autonomous vehicles will occur in the United States.

Mr. Regan, over 32,000 of my constituents are employed in the manufacturing industry, many in the automobile manufacturing sector. How can we ensure that federal support for AVs also supports American workers and domestic manufacturing?

*Mr. Regan. Thank you for the question. You know, this -- it is not going to happen by accident. It is not just going to magically develop here. We are going to need strong Buy America procurements. We are going to need community benefits agreements, U.S. employment plan restrictions, all these things that we have outlined here that are really important.

And I would add -- earlier the Ranking Member Rodgers

made a point about the Thune amendment being withdrawn because of Teamsters and trial lawyers. I would say it was withdrawn because it did absolutely nothing to address manufacturing, domestically. It laid out findings that we need to be able to produce these here in the United States, but had zero policy that would actually accomplish that goal.

*Ms. Kelly. Is there a danger, Mr. Regan, if we permit the wide-scale development of AVs without any assurances that the vehicles are designed, engineered, and manufactured in the United States?

*Mr. Regan. Yes, I think the danger of falling behind China, as I know that -- has been raised many times here, would exactly be realized at that point. If we aren't making sure that it is going to be developed and built here, it is going to go overseas, and we are not going to realize the benefits, economically, of these in the United States.

*Ms. Kelly. And how do you suggest we prevent a regulatory environment in which companies designing, engineering, and manufacturing AVs overseas reap the economic benefits? How do we prevent?

*Mr. Regan. Well, I think what we have laid out here -- it is the responsibility right now of policymakers to build a framework that is going to ensure that we reap the benefits. I think a failure to address the manufacturing, safety, workforce issues that are very complicated and, frankly, are

all going to be impacted by AVs, any policy that doesn't address all of those is, frankly, a failure of legislating, and any regulation that is adopted because of it would be a failure of regulation, if it doesn't address all these issues.

*Ms. Kelly. Thank you.

Professor, in your testimony you mention that there is more research needed into cybersecurity and cyber physical security around AVs. What role can the Federal Government play, and how mature are the current industry standards actually -- how mature are they in auto cybersecurity?

*Dr. Rajkumar. Thank you, Congresswoman. We still need some fundamental breakthroughs, because cyber physical security spans all layers of the system, all the way from you playing your music on your Bluetooth device, all the way down to the wire that basically carries information back and forth between computers.

The industry is very sensitive to potential attacks, which will make them extremely liable for things that go wrong. But they do have the need, the necessity to make money now. So they are taking, basically, near-term solutions to address this problem.

But really, to come up with a fundamental framework that addresses the issue or the longer term, that calls for investments in basic research at the Federal level, and it

really needs to be coordinated across multiple agencies, including the DoT, as well as basic research agencies like the National Science Foundation.

*Ms. Kelly. Thank you.

Mr. Levine, are industry standards sufficient to protect vehicles from cybersecurity threats?

*Mr. Levine. That is highly unlikely. Thank you so much for the question. It is highly unlikely that industry standards, all by themselves, are going to be sufficient. And we know that because they are not sufficient in almost any other category, either.

There is certainly a role to be played by industry standards. There is certainly a role to be played by public-private partnerships, when we talk about cybersecurity, whether you are talking about ISACs or other collaborations, but there needs to be a significant involvement from the Federal Government, and DoT should look to how it deals with cyber in the aviation space as a model.

*Ms. Kelly. Thank you so much.

And lastly, Mr. Regan, what safety lessons can we learn from the aviation and transit sectors, which have long adopted automation to improve safety?

*Mr. Regan. Thank you. Aviation is a really good example, because the FAA has often been referred to as the tombstone agency, where regulations are written in blood.

Every time there is a major accident, you know, most of the good safety policy that has come out, good safety regulations, are because of a catastrophic crash. We have an opportunity right now to prevent that from happening, when it comes to AVs, if we are addressing this at the early part, instead of waiting until there is a catastrophe.

*Ms. Kelly. Thank you so much, and I yield back.

Thank you, Madam Chair.

*Ms. Schakowsky. Thank you. And now five minutes go to Congresswoman Lesko.

*Mrs. Lesko. Thank you, Madam Chairman, and thank you to the witnesses today.

I really do believe that the future of vehicle safety and autonomous vehicles is something we can work together on, as Republicans and Democrats. I am happy to cosponsor a bill with Congressman McNerney on -- Impaired Driving Safety Act. And I think autonomous vehicles may be part of the solution.

In the past five years, the State of Arizona has become the world leader in autonomous vehicle technology. Arizona welcomes testing and pilot programs in our state. In fact, I rode in an autonomous shuttle launched in my hometown of Peoria, Arizona, just last spring, and it drove us around a shopping area in Peoria called P83.

Autonomous, long-haul trucking companies have also found a welcome home in Arizona. And in March, Arizona Governor

Doug Ducey signed into law legislation that updates our state's safety framework for autonomous vehicles. We know that approximately 94 percent of vehicle accidents are caused by human error, including impaired driving. My district is home to thousands of senior citizens who can no longer drive, and need to get to their doctors and stores. I think autonomous vehicles can be part of the future to solve that problem for senior citizens, those that are disabled, and, of course, will definitely cut down on impaired driving accidents.

Mr. Rajkumar, my first question is for you. In your opinion, what are the hurdles remaining for the automobile vehicle industry to overcome, to continue the development of this technology, as we shift from driver assist functions to fully autonomous systems?

*Dr. Rajkumar. Congresswoman, thank you for the question. The basic technology for doing that is available, or can be made available fairly quickly. There are so-called driver monitoring systems, where a camera can be mounted above the steering wheel, say, looking at the driver's face, and then monitor whether the driver's eyes are closed or not, that the head is drooping or not.

And therefore, the technology is there to detect whether the driver is opiated, drowsy, or drunk. And whether the vehicle is driving itself or not, even with the level two

systems and beyond, as well, you can monitor. And if things are not looking good, the vehicle can take action, generate alerts. And if they are not being responded to, slow down, turn the flashers on, pull over, and stop.

*Mrs. Lesko. Yes, that is very interesting that -- you know, of course, with the introduction -- there is drunk driving, and then, of course, with the introduction of more legalization of marijuana, that is causing a problem, as well. So I could see how that would be very beneficial.

I have another question for you, sir. You mentioned in your written testimony that China's ability to catch up with our advances in autonomous vehicles has been aided in part by their regulatory environment. What actions should Congress take to both address consumer safety and maintain American leadership and innovation in autonomous vehicles?

*Dr. Rajkumar. Oh, sure. China, being an aristocratic regime, they can turn many different ways, or just completely shut them down at will. We, being a democratic republic nation, we cannot do that. We will not do that. Our value systems are fundamentally different.

So the way we basically beat them, I believe, is by out-innovating with the most talented, innovative workforce in the entire world. So that is how we need to make it happen. We have done that through public-private partnerships with the gems of the nation in higher education contributing with

the creativity -- and startups. So that is the way to make it happen.

*Mrs. Lesko. Thank you and members.

And Madam Chair, I do think this is part of our future. Of course, we need to proceed cautiously, and make sure that the vehicles are safe. But as I am growing older, I look forward to the use of autonomous vehicles, so that I don't have to rely on other ways to get to the doctor, or, you know, to the shopping center, because I know this is a huge problem in my district. I have been working for years on how we transport around senior citizens that don't have access to vehicles.

And so, with that, I yield back.

*Ms. Schakowsky. I thank the gentlewoman, and I look forward to working with you on this.

And now, Mr. Soto, the floor is yours for questions for five minutes.

*Mr. Soto. Thank you, Madam Chair, and I appreciate this great hearing today on autonomous vehicles. We can boost innovation, protect safety, and retrain American workers for our 21st century transportation system.

You know, autonomous vehicles have an incredible effect across the nation, but we are doing research already in what would otherwise seem like an unlikely place. In Auburndale, Florida, right next to the new Florida Polytechnic

University, we have a 475-acre facility built amid both pasturelands and orange groves. The project, SunTrax, in conjunction with the Florida Department of Transportation and Florida Turnpike, has already completed phase one, a two-and-a-quarter-mile oval testing track.

We are also developing phase two, in-field testing elements to create obstacles and barriers for testing autonomous vehicles. And soon phase three, to be able to simulate rain, smoke, fog, and other environmental challenges. Plans call for several testing environments.

We are seeing, right in central Florida, testing for the vehicles of future. But we know those can be 5 to 10 to 20 years off. We also know that, if we aren't careful, we could see a disruption of many jobs in our current economy, which is why our Artificial Intelligence Jobs Act, our AI Jobs Act, is a blueprint to make sure that we are retraining those for the future.

But advanced driver assistance systems are already here: autonomous emergency brakes, blind spot detection, and lane delay. These technologies can save more lives at a time when we desperately need them. Unfortunately, in central Florida, we still have the highest pedestrian death rate in the nation: 740 pedestrian deaths from 2010 to 2019.

Florida also, sadly, still tops the list of dangerous -- most dangerous places for pedestrians, according to the 2021

Dangerous by Design, by Smart Growth America and National Complete Streets Coalition.

These new autonomous systems are available now. What is the solution? The National Highway Traffic Safety Administration must develop performance and safety standards for both -- for the advanced driver assistance systems in the near term, and autonomous vehicles in the long term, as well as protecting drivers with access to the courts for legal remedies arising from product liability, negligence, or other liability.

Then we need to pass the American Jobs Act, upgrade our crumbling highways, roads, and bridges, add new sidewalks, pedestrian bridges, and trails at commuter rail, high-speed rail, and add electric vehicles and charging stations to combat climate change.

In fact, today President Biden is in Dearborn, Michigan, visiting the Ford Rouge Electric Vehicle Center, where they are working on an F-150 with zero emissions and built by union workers.

Mr. Regan, we know that, as we prepare for these 21st century jobs, advanced electric, semi-autonomous, and, eventually, autonomous vehicles are key for competitive manufacturing. What workforce training should we invest in to help these workers who may face economic disruption?

*Mr. Regan. Thank you. Yes, workforce training, I

think, is a key part of this. It is going to have to come so they can transition to the new jobs that are created in agencies, transit agencies, that are deploying this technology, making sure that people have a career or a ladder of opportunity to advance their careers.

And I think it is going to have to take -- frankly, be flexible about how people are able to take advantage of it, and pursue the career opportunities that they desire.

*Mr. Soto. And Mr. Regan, how will the American Jobs Plan help with workers displaced by new technology like autonomous vehicles, and a decline in oil jobs due to electric vehicles?

*Mr. Regan. The American Jobs Plan is -- has built into it labor protections that are key to making sure that workers are brought along, and that the investments we make as a country are going to build our economy from the bottom up, and make sure that working people have their fair share in all of this.

So whether it be Buy America policies, 13C, Davis-Bacon, any number of labor protections to make sure that the investments are done in a way that advance middle-class jobs, and encourage the ability of people to form and join unions.

*Mr. Soto. Well, thank you so much. We know in this committee we need to be forward-looking, and having a Federal regulatory regime for both advanced driver assistance

systems, which are coming online and helping save lives now, as well as autonomous vehicles.

And my time is expired.

*Ms. Schakowsky. And so I thank the gentleman. And now I recognize for five minutes Mr. Pence.

*Mr. Pence. Thank you, Chairwoman Schakowsky and Ranking Member Bilirakis, for holding this hearing. And thank you to the witnesses for appearing before us today.

As the crossroads of America, Indiana is uniquely positioned to play a central role in the development, deployment, and manufacturing of autonomous vehicles. Congressional action, or its inaction, will set the stage for our position globally, and opportunities locally for advanced transportation technologies.

Just last summer the Indiana department of transportation announced a test bed initiative for partially autonomous trucks along Interstate 70, which runs through Greenfield across to Richmond in my district. Real-world opportunities like this are crucial to inform the continuing policy discussion for AV standards across the country. Whether it is the workers at the Honda manufacturing plant in Greensburg, or researchers and engineers at Cummins Technical Center in Columbus, autonomous vehicles have the potential to expand opportunities for Hoosiers --

[Audio malfunction.]

*Ms. Schakowsky. Oops, we seem to have lost Mr. Pence. Shall we proceed? Let's wait a second and see if he can get back.

We will come back to him if he gets back, and right now I will recognize Congresswoman Fletcher for five minutes.

*Mrs. Fletcher. Thank you so much, Chairwoman Schakowsky, and thanks to you and Ranking Member Bilirakis for convening today's hearing on this important topic. These issues matter to the people I represent in the Houston area.

From 2001 to 2016, our region had more than 3,000 fatal crashes from drunk and drugged driving, alone. Automobile technologies like advanced driver assistance systems and autonomous vehicles have great power to make our roads safer, and I appreciate the time our witnesses have taken today in detailing how we can best do that.

But, as we also know, this technology brings with it new concerns and new complications. Just last month we saw a fiery crash of a vehicle that killed two people that investigators believe no person was driving. And there is a major and ongoing investigation, and a lot of questions about exactly what happened. And that is a huge concern, going forward.

So I have heard a few negative comments in this hearing from some of my colleagues about trial lawyers. And, as a former practicing courtroom lawyer, I really think that these

comments are misplaced. There simply isn't time now to go into all of the reasons and ways that our legal system and our courtroom system protects consumers and all Americans through the courts. But access to the courtroom is important, and even a cursory review of the history of consumer and worker protection in this country will show that.

Now, that said, some of my colleagues have already raised the potential for mandatory arbitration of disputes relating to autonomous vehicles. And that is -- I think that is really an important thing to circle back to. While I certainly believe there are certain circumstances where arbitration of disputes can be useful for the parties, where they agree to do so once a dispute has arisen in this context, as with, generally, you know, most consumer matters, arbitration moves disputes out of the public view. It is often confidential. It provides no meaningful opportunity to appeal the result, all of which are hugely problematic in contexts like these, and especially with these emerging technologies.

So my first question is directed to you, Mr. Levine. Are you concerned that there will be less information available publicly about safety issues, if AV companies are allowed to force claims to arbitration?

What kind of impact will that have on safety and

creating a legal record for these new technologies?

*Mr. Levine. Sure. Thank you so much for the question. And the idea that we are going to have this transformational new technology, which is going to replace the 280 million currently human-driven vehicles on our roads, and -- but it is all going to be done behind closed doors, should really scare everyone.

And we see that already, in AV manufacturers disclosing very little information to the Federal Government right now, as they are currently testing on our roads. Very little useful information is being disclosed now, and that is before there is widespread deployment and, hopefully, long before we get to widespread problems and defects that may result in injuries, in crashes, or deaths.

So if there is a circumstance where the people who are using vehicles, or who are injured by them, or just financially injured by them cannot make that made public, cannot hold people accountable -- manufacturers accountable, I should say -- that is going to really blunt the opportunity to fix those problems, not just for the injured party, but for everyone else. We have got to get this stuff out into the light.

*Mrs. Fletcher. Thank you. And as a follow up to that, you know, in 2017 the Texas legislature passed a bill in our Senate that places the liability of vehicle operation on the

owner of the vehicle, not the manufacturer, even when the owner has no control over how the system operates, no insight into where and when it might fail, and no ability to update the system, or keep up with the latest rules of the road.

So, you know, in thinking about this and looking into the future, do you think it is fair to hold owners of cars liable for a crash that may be caused by the company that built the vehicle and the technology that drives it?

I mean, how do we address that concern?

*Mr. Levine. You know, it just -- it is fundamentally unfair to posit a circumstance where you have no control over the vehicle, what it does, how it operates, whether it operates safely, but you are responsible for it. This is not a circumstance where you chose to loan the vehicle to an irresponsible driver. You purchased it on the -- in this theoretical context, on the idea that it is a perfect driver, it is a perfect robot that will never cause a problem, and that, if it does have a problem, you are responsible for it.

Manufacturers need to be held responsible, not just for their claims, but for what they actually put on the road.

*Mrs. Fletcher. Well, thanks so much. And I have a few more questions, but I am running out of time, so I will submit them for the record. And thank you so much for your testimony today.

And Madam Chairwoman, I yield back.

*Ms. Schakowsky. Is -- did I see Mr. Pence back?

*Mr. Pence. I am back, Madam Chair. Do you hear me?

*Ms. Schakowsky. Okay, yes, I can hear you. You just disappeared on us.

*Mr. Pence. Yes.

*Ms. Schakowsky. So --

*Mr. Pence. Thank you very much for your patience here. I am just going to go straight to my question to Professor Rajkumar.

Let me ask you this, Professor. Your testimony highlights the many benefits that would come from continued U.S. leadership in the autonomous vehicle industry. Workers in my district representing different parts of the autonomous vehicles value chain stand to benefit from American leadership.

I introduced a bipartisan H.R. 2907, the Global Investment in American Jobs Act, which would ensure the United States remains the premiere global destination for investment, innovation, jobs, and manufacturing in emerging technologies like self-driving vehicles, which, in this world of driver shortages, is very important.

My question is, can you expand on what long-term job creation would look like across the "stack'' of technologies, particularly how it would affect my manufacturing district?

[Pause.]

*Ms. Schakowsky. Professor, you are muted. We are not hearing you.

*Dr. Rajkumar. Oh, sorry about that. Thanks, Congressman.

I see the AV market being comprised of multiple segments: robo-taxis, individually-owned consumer vehicles, delivery vehicles. You have semi trucks and transit buses.

In terms of human involvement, I think transit vehicle drivers and semi-truck drivers, basically, do a lot more than driving. So I think it will be a long time before they can be completely replaced. It would be a very long time. And meanwhile, I think robo-taxis, to make money to sustain the business, they will have to become completely autonomous, level four-plus, and that may take some time to happen. So it is not clear what the business viability looks in the near term. It is not clear.

Meanwhile, for individually-owned personal vehicles, technologies like ADAS level three and beyond, can start taking off the burden of driving very long distances, being stuck in traffic jams, and the like. So I think that sector ends up being the biggest winner in the near term. And over the long term, as the technology matures and becomes more reliable and safe, basically, that can disseminate across the other market segments.

For -- I guess we sell about 17 million cars in the U.S.

every year. Imagine more and more technology going in, sensors, computers, communications equipment into these cars. So all of that ought to be -- really be manufactured and assembled in the U.S. in your district and beyond.

*Mr. Pence. All right, thank you.

Thank you, Madam Chair, I yield back.

*Ms. Schakowsky. Yes, thank you. So we are going to go to Congresswoman Rice, and then come back to Mr. Armstrong. Okay?

*Miss Rice. Thank you, Madam Chair --

*Ms. Schakowsky. You are recognized --

*Miss Rice. Thank you, Madam Chair. I would like to -- I haven't spoken to Representative Dingell, but I would like to think that I would, in my remarks, be echoing what Debbie Dingell, Representative Debbie Dingell from Michigan, would be speaking about in terms of her bill, the HALT Drunk Driving Act. I am proud to be a co-lead on this bipartisan bill with her and Representative McKinley, and I hope to see it signed into law, because drunk driving accidents continue to plague our nation.

It is estimated that drunk driving accidents cause over 10,000 deaths a year, 29 fatalities a day, and societal losses exceeding $44 billion every year. Most importantly, you know, before coming to Congress I spent my whole life as a prosecutor, and I have seen the havoc that is wreaked in

communities and among broken families. And it is just a terrible, preventable crime.

We do have -- the technologies that can passively detect whether a driver is intoxicated, and trigger the vehicle to automatically mitigate the risks, are on the horizon. And the HALT Act would require all passenger vehicles to be equipped with this technology.

Mr. Levine, are you optimistic about the promises of drunk driving prevention technology?

*Mr. Levine. Yes. Thank you so much for the question, and thank you so much for pushing this issue forward. There is tremendous potential right now, not 10, 20, 30 years from now, right now to help prevent not only drunk driving, but drunk, drugged, distracted, and drowsy driving with technology that exists right now. And we need to get it into vehicles as quickly as possible to limit, mitigate, and eventually, eliminate these tragedies.

*Miss Rice. So I am -- thank you for saying that, because we are hearing a lot today about the promise of autonomous vehicles, and how AVs on the road could lower drunk driving crashes, obviously. But you know, still, that is still a ways away. And I don't want us to kind of be thinking, okay, that is where we have to focus on, is what -- how the deployment of AVs can lessen the occurrence of drunk driving fatalities and crashes, when we have that technology

now.

But now also, Mr. Levine, with you, you know, I am concerned, you know, with the proliferation of marijuana legalization. It is a lot more tricky to detect an impaired driver from drugs versus an intoxicated driver from alcohol. So what are your thoughts about that, in terms of what is the latest technology, and what -- with the AV -- deployment of AV, how would that affect the impaired drugged driver?

*Mr. Levine. Sure, and there is -- obviously, there are different chemical characteristics of a -- of someone with alcohol in their system, or someone with other substances in their system. That is the idea of technology like driver monitoring systems, is to try and get after the behavior that leads to crashes and injuries and deaths. And so maybe that is a drowsy driver. Maybe it is a driver who has had too much -- you know, who has had too much to drink, or who is on drugs. There is a lot of different possibilities that lead to behavior that is dangerous. It could be a completely sober driver who is texting while driving. Many of these behaviors, in terms of how we actually operate behind the wheel, are similar.

And so the idea of driver monitoring systems is to try and attack the behavior that leads to the crash. And eventually, hopefully, we get to a place where we can detect what we need to detect. But until we get there, attacking

the behavior that can stop the crash is our best opportunity, and we can, again, do it with technology that exists right now. We don't need to wait.

*Miss Rice. Thank you.

Very quickly, Mr. Regan, many of your members have fallen victim to drunk drivers. How do you feel about the deployment of the, you know, drunk driving prevention technology to protect our nation's -- not only our nation's truck drivers, but our transit workers, as well.

*Mr. Regan. Well, thank you. I think that it is important. I think it would be -- provide great benefit. Anything to increase safety is, in my view, a benefit. And I think that is an example of new technology that can assist human operators, and that can be deployed throughout our system to make sure that we are augmenting the safety of the human operated crafts, and making sure that we are not just jumping headlong into an automated future without any real safeguards.

*Miss Rice. I want to thank all the witnesses for coming today, and I yield back the balance of my time, Madam Chair. Thank you.

*Ms. Schakowsky. The gentlelady yields back. And Mr. Armstrong, you are recognized for five minutes.

*Mr. Armstrong. Thank you, Madam Chair. And I want to just say I am going to go off of what Congressman Fletcher

had said earlier about trial lawyers and all of that.

I think the one thing that we forget in this dichotomy, whether it is autonomous or not, is every state in the country requires liability insurance. And how we deal with these things moving forward, and how insurance companies deal with these things moving forward, as we deploy whatever vehicles, including the last testimony, I -- is going to be very, very important, which will be, I think, a little different than some of the other forced arbitration and different conversations we have. Because I have a very distinct idea that both insurance companies and insurance defense lawyers are going to have something to say about how this moves forward.

And as somebody who has spent my practicing legal career dealing with the DoT, and spending a lot of time with NHTSA, I think one of our conversations we have to have on our end is Congress has never been really good at adapting to quick responses in technology. The Music Modernization Act, right before I got to Congress, comes to mind. We still haven't figured out how to deal with privacy in the digital age. The Federal regulatory agencies aren't a lot better. We have no -- we still aren't anywhere on AI, facial recognition, geofence, and those things.

So, Dr. Rajkumar, your testimony suggests an AV regulatory environment that continually adapts to real-world

testing and deployment, which I think sounds fantastic. I am skeptical that we are capable of that at the Federal level. So what policies would you suggest that would allow our government to adapt to these rapid developments in the field?

*Dr. Rajkumar. Thank you, Congressman. I believe we are going back about five years. The Secretary of the USDOT did propose to have an annual revisit of AV-related guidance on a regulatory perspective. So I do agree that it is an aggressive schedule for a Federal agency, but it has been talked about before. I believe it is feasible. I think it is necessary to, not just ensure the safety of the public, which is why the regulations are in place, but to adapt to the changing -- the maturation of the technology, so -- which is why that agility is required.

I would also add two more elements in here, which are in the written testimony, too. The NHTSA budget needs to be reinforced, increased, because our responsibilities are becoming larger with the same amount of resources, number one.

Number two, the technology in the AV space is complicated. We need to figure out ways and means to get appropriate expertise into agencies like NHTSA and the USDOT.

*Mr. Armstrong. Yes, and I guess my concern is we are really good at regulating what is -- what already exists. We are very bad at crafting regulation for what might exist in 6

months, 8 months, 15 months. So which -- and part of your testimony called for tailored regulatory framework in AV markets. Like, you state that a vehicle with a license operator would be regulated differently. Can you define the market segments, and how you would approach regulations like that, and in the segments?

*Dr. Rajkumar. Sure. For example, if you take robo-taxis from a strictly business financial perspective, if there is a human operator on board, you would very likely be better off just buying a normal vehicle, hiring a human driver to operate the vehicle, and you are done, right?

If -- instead, if you basically have to put an assistant on board, the vehicle drives itself most of the time, but the equipment is very expensive sensing and computers, you only added to your overhead, and the revenue still remains the same.

But if you take an individually-owned consumer vehicle, that is a person in the car who is going from point A to point B. The vehicle belongs to that person. And if the vehicle has enough capabilities, it drives itself most of the time, and when it -- assistance, it calls upon the licensed operator in the car to basically help out the vehicle, take it out of its current fix, and then move to the destination, so that basically -- it really does not cost anybody anything, but adds convenience and, hopefully, safety to the

vehicle owner.

So I think there are distinct segments. The same regulatory parameters should not apply.

*Mr. Armstrong. Thank you.

And with that I would just add that one -- as we start going down this road, we also have to recognize that how we deal with local and state DoTs and enforcements -- there was just talk about marijuana versus impaired versus alcohol-related. Those are all really interesting conversations. I am just telling you being an impaired driver and being a tired driver are treated very differently in every court system across the state. And there is probably nothing litigated both in the civil and criminal matter more than driving crime. So, with that, I yield back.

*Ms. Schakowsky. The gentleman yields back. And I believe -- Mr. Cardenas, are you here -- is next.

No? So we have -- yes. I am going to call now on Mr. Bucshon. Then that would be the last of the members of the subcommittee, and we can go to the people who have waived on.

Mr. Cardenas, you have five minutes.

No, I am sorry, I meant to say Mr. Bucshon, sorry.

*Mr. Bucshon. Thank you, Madam --

*Ms. Schakowsky. You have five, sorry.

*Mr. Bucshon. Thank you, Madam Chairwoman, I appreciate that. No, you are fine. Thank you.

Professor Rajkumar, I am a cosponsor of H.R. 2997, the Crash Avoidance System Evaluation Act, a bill that I am proud to work with, with my friend, Bobby Rush. The bill would require the Department of Transportation to conduct a study on the performance of crash avoidance systems to detect and classify vulnerable road users, pedestrians, and the like, including those with darker skin tones. This has apparently been an issue.

In your testimony you state that stacking safety systems is paramount in achieving good outcomes for road users. Are there any emerging technologies that you have encountered in your research that you would think would be useful in addressing the concern of crash avoidance systems not detecting individuals of various skin tones, in addition to the things we know: cameras, radar, and lidar?

[Pause.]

*Mr. Bucshon. I think you might be muted.

*Dr. Rajkumar. Yes, sorry about that.

*Ms. Schakowsky. Oh, yes, okay, go ahead.

*Dr. Rajkumar. It depends upon the sensing mode within the vehicle. If only cameras are used to look at pedestrians, and the AI data being used to train that pedestrian detection system has only people of a certain skin color, and does not represent the entire distribution of people in the population, you run into these biases. When

you feed in biased input data, bias outcomes result. The algorithm itself is completely agnostic to this, it is really about getting the data sets right, if you will. So that is a key point that many companies in the domain are being very sensitive to these days.

Number two, when you use lidars or radar, they really do not care about skin color or, the detectors -- there is an obstacle there. And this could be a human, so they would be completely independent of the skin color, if you will. So the safety, therefore, depends upon the combination of sensors being used.

*Mr. Bucshon. Okay, great. So what you are saying, the sensors that are being used are probably acceptable, but that it is very important to make sure that the data that is -- that they are -- that is downloaded to them, or that they are adjusted for, is the critical piece here.

*Dr. Rajkumar. Absolutely, yes.

*Mr. Bucshon. Great. And how can Congress ensure that these concerns are properly investigated, while not stifling innovation of this emerging technology?

I mean, how can we avoid stepping in the way? Is there anything that we are doing that could prevent this type of development?

*Dr. Rajkumar. Sure. Many states across the country have a permit process through which AV testing companies can

get a permit to test AVs in those respective states.

Imagine a driver's test that all of us went through. So that test could actually involve injecting appropriate inputs of this kind, and seeing how the vehicle reacts.

*Mr. Bucshon. Okay, great. And that is why Congressman Rush and myself are proposing this legislation, to make sure that the DoT, you know, investigates this performance to detect and classify vulnerable road users, and making sure that people are testing and are putting this information properly in their systems.

Also to you, the Chinese Communist Party has now developed a pathway for the development of autonomous vehicles. And according to a recent Bloomberg article, the China tech giant, Baidu, is -- has set a goal to deploy 3,000 robo-taxis in 30 Chinese cities by the end of 2023. If Congress continues to delay in passing AV legislation, and we cede our leadership in this space, how perilous do you think these consequences could be for the U.S.?

*Dr. Rajkumar. I think this is the biggest peril that we currently face in the domain. We need to absolutely make sure that AVs on American streets are safe. At the same time, if China ends up taking the leadership in this massive market, they could locally transform their transportation industry, locally. They would also start exporting. They have incredible manufacturing power, lots of factories and

such, so they could end up taking a big slice of that $7 trillion market here.

It would be a huge loss, would be an unfortunate outcome for the U.S., where -- the technology was, literally, invented here. The mission was carried out to fruition here. But the wealth and the jobs go to a country like China.

*Mr. Bucshon. Yes, I think the -- I mean, the moral of that story is the United States Congress and the United States Government needs to get past our differences, and get this process moving along.

With that, Madam Chairwoman, I yield back. Thank you.

*Ms. Schakowsky. The gentleman yields back. And now I note that Mr. Cardenas, from the subcommittee, has returned.

And I recognize you for five minutes.

*Mr. Cardenas. Thank you, Madam Chairwoman. And thank you to you and the ranking member for having this important hearing in full view of the public. And I appreciate all of the witnesses bringing your perspectives and expertise on this matter.

The first thing I want to point out is that we, obviously, are looking at a shift in what kind of jobs will be out there, especially with autonomous vehicles. If we get to the point where we can actually have 100 percent autonomous, where we don't necessarily need a human being at the wheel, so to speak, that means that jobs shift, and what

the future jobs look like is going to be incredibly different than what it looks today.

Mr. Regan, when and if that takes place, especially when it hits momentum and moves en masse, would we see a shifting of skill sets in the people -- for example, bus drivers and truck drivers and delivery truck drivers, et cetera -- would we see a shift in the need within our society for those kinds of jobs shifting away to other kinds of jobs?

*Mr. Regan. That is certainly possible, yes. And, you know, whether they are able to shift their skill set is depending on the policies that are going to be written by Congress, making sure that they have the resources to transition along with the technology in our systems.

*Mr. Cardenas. Is there any place on the planet where we have seen shifts like this, where the government and the private sector got together, for example, when it comes to training programs to retool, so to speak, so that people can continue to have that ability to put in an honest day's work, and yet get compensated when they are trying to shift from maybe a job that they had for 2 or 20 years, and now they need to shift and have a different skill set? Is there examples on the planet where government and private industry have come together to do that?

*Mr. Regan. We have seen -- well, here in the U.S., TAA, Trade Adjustment Assistance, is an example of that. And

frankly, there are some flaws in that program. I know a lot of people rely on it, but that was an example of us trying to address a problem after the fact.

And what I am trying to impose (sic) during our -- during this hearing today is that we have an opportunity now, you all have an opportunity to address this problem on the front end, and make sure that we are building up the capacity to advance our workforce early, rather than trying to deal with the problem down the line, when it is a crisis right in our face.

*Mr. Cardenas. So, Mr. Regan, the Federal Government could and perhaps should have a role in that. And not that the Federal Government should be, for example, practicing those kinds of on-the-ground efforts, but maybe with local governments, with private industry to look into the future, to see what private industry says, the kinds of jobs that they need and are ready to pay people to do, yet at the same time, for example, community colleges or trade associations, et cetera, could -- is that the kind of effort that maybe we should get in front of?

*Mr. Regan. Yes, of course. And, you know, apprenticeship programs, you know, ladders of opportunity within agencies, whether it be public or private companies, all of those should be addressed, and we need to make sure that we are encouraging that from a Federal perspective.

*Mr. Cardenas. Well, I had an issue getting on this -- I almost called it Zoom -- this Cisco Webex event earlier today, and I had a tech staff that was very capable, much more capable than me, even though I am an electrical engineer. Go figure. I -- it took me close to, you know, 12, 15 minutes to finally get back on track.

When somebody is driving a vehicle, especially if you have vehicles coming in the opposite direction at 60 and 70 miles an hour, you don't get 12 minutes. You don't even get 1.2 seconds if that goes "off the rails.'' So are we there yet, in having autonomous vehicles on the streets of America, where we can actually trust that mistakes are not going to be made, and lives will not be lost, based on a technical glitch?

[Pause.]

*Mr. Cardenas. Who would like to answer that?

*Mr. Regan. I would say no.

*Mr. Levine. Yes, I would agree with Greg. No, we are not currently there. And in fact, when we have got manufacturers suggesting that we are, we have seen what has happened with a number of crashes involving vehicles that are, you know, supposedly autonomous, and they are not.

So we want to get there, certainly, but we are a long way from there. And let's get a lot of this better technology in sooner.

*Mr. Cardenas. Yes. And the fact of the matter is we are in the United States of America, where, thank God, people have incredible rights, civil rights, et cetera, where in other countries, perhaps, they don't have the checks and balances to make sure that, oops, we kind of let the cat out of the bag, and a few people got killed, and so what, let's just, in the name of progress, let's just continue to allow those kinds of catastrophes to happen.

So I believe that we can do it carefully in the United States. I believe in our institutions and our research to be able to do it right, respecting the individuals on the streets of America. So I look forward to the United States continuing to put a lot of energy and effort into making sure that we do not fall behind, but we do it responsibly.

And with that, my time has expired. Thank you, Madam Chairwoman, I yield back.

*Ms. Schakowsky. Thank you.

And now it is such an honor for me to recognize Congresswoman Eshoo, the chairman of the wonderful Health Subcommittee that I regularly waive onto, and to welcome you to waive on here today. So you have five minutes for questions.

*Ms. Eshoo. Well, thank you, Madam Chairwoman, for your warm welcome. I certainly appreciate the -- you extending your legislative courtesy to me for me to participate at your

subcommittee today. And thank you to the witnesses.

My congressional district covers most of Silicon Valley, and I have seen the rapid growth of the AV industry firsthand. In fact, I rode in a self-driving car in my district before this subcommittee ever had its first hearing on AV legislation, nearly four years ago. This technology is likely to disrupt industries such as ride-sharing, delivery, long-haul trucking, and public transit. Because the vast majority of crashes are caused by humans, by human error, it may also save lives. And I think that we are all focused on that, as well.

Of course, there are risks, as well. Federal standards are necessary to establish minimum safety baselines to ensure consumer confidence. And testing data will be needed to evaluate whether AVs live up to their promise of reducing crashes. This is going to require legislation, and I look forward to working with my colleagues to develop that legislation.

To Professor Rajkumar, in your testimony you note that the AV market has six distinct segments, and that regulation should recognize these distinctions. Aside from exemption caps, what distinctions should the regulatory framework make between different kinds of AVs?

And then I have a question for Mr. Levine.

*Dr. Rajkumar. Thank you for the question,

Congresswoman.

In terms of the segments, for example, for individually-owned -- the consumer vehicles, since that is a licensed driver in the car, the contours of operation can be broader than a ride-sharing taxi where there is no human operator on board. So that would be one distinction.

And meanwhile, if you go to the trucking industry, of course, lots of Silicon Valley companies working in that space, you could mandate that autonomous operations for semi trucks could only happen on highways, where there are no pedestrians, and only on good weather days, where the lighting conditions, road conditions, weather conditions are good. So it is really not about the exemption count, it is about the operating design domain, if you will.

*Ms. Eshoo. I see. Thank you very much.

To Mr. Levine -- I hope I am pronouncing that correctly. Is it Levine or Levine?

*Mr. Levine. It is Levine, but --

*Ms. Eshoo. Okay. We certainly agree that safety has to be at the forefront of AV policy. But no vehicle, whether it is traditional or self-driving, can prevent every crash. We go into this understanding it.

As the technology develops, the question will not be whether AVs are safe, but how safe they are. At least in my view, that will be the case. How safe do AVs need to be

before they are safe enough to allow on public roads?

*Mr. Levine. Wow, that is a great question. And it, I think, is one that the entire community, when we talk about vehicles, struggles with. But if we make it just a little bit broader, I think the larger question is, how do we think about our entire auto vehicle infrastructure?

How do we reduce the risk of the crashes, of the millions of crashes and injuries and 42,000 deaths every year?

And so, when we are going to measure autonomous vehicle safety, obviously, we are going to want them to be safer than our current drivers, which are -- the average driver, you know, only has -- experiences a death just over 1 time for every 100 million vehicle miles traveled. That means most drivers don't ever experience a crash death. So we are going to need to see, I think, for public to trust AVs, far significantly safer vehicle travel, with all of our infrastructure combined --

*Ms. Eshoo. How close would you estimate we are to making that determination right now?

*Mr. Levine. Well, you know, I mean, based on what we see, the statements coming from the companies themselves, we are pretty far away from a circumstance where you could be comfortable putting your six-year-old in the back of a vehicle and sending them on their way to school. We are

really far away from that.

*Ms. Eshoo. Okay, thank you very much, Madam Chairwoman. It is a pleasure to join your wonderful subcommittee, and I yield back.

*Ms. Schakowsky. Well, thank you for coming. Now I want to yield to Mr. Joyce, who has waived on, as well.

And you have been very patient, and the floor is yours for five minutes.

*Mr. Joyce. Thank you, Madam Chair and Ranking Member. Thank you for allowing me to waive on to this important hearing today.

Dr. Rajkumar, while there are clear safety benefits from highly automated passenger cars, we also expect to see safety benefits in a variety of other applications. Many of these solutions are years down the road, and will require a stable regulatory framework.

Dr. Rajkumar, how important is it that the Federal Government creates such a framework?

*Dr. Rajkumar. I think it is extremely important, if 50 states in the U.S. -- basically, each has its own regulatory framework. Now the developers of the technology, be it a big company or a startup company, cannot deal with that heterogeneity.

What should happen instead is that there is a national framework that is enforced by the NHTSA/the USDOT, and

therefore, the technology developers need to develop towards that one single standard, and then test against that standard. I think that is at the core of what needs to be done.

The USDOT has taken a similar position earlier, where the individual states had jurisdiction over licensing, insurance, and the like. But in this particular case, the driver is really not a human, but computer software, and therefore, the right to regulate that particular aspect of vehicles lies at the Federal level.

That being said, the USDOT has been taking the following position, where it lets individual states experiment with different processes to help incubate and make sure local companies and technologies try out different processes. But the Federal Government has retained the right to preempt all those regulations at a future point in time, when the processes are well understood, the technology has been proven itself to be safe.

So that, I think, is the right framework to go forward with, a single national framework.

*Mr. Joyce. If the Federal AV framework currently lacks clear testing requirements and guidelines, do you think drafting these for autonomous vehicle framework -- that the principles needed to be included should be outlined in advance?

*Dr. Rajkumar. The --

*Mr. Joyce. This is, again, for Dr. Rajkumar.

*Dr. Rajkumar. Yes, the guidelines need to be stated, but I think they need to be drafted with input from the vehicle makers, with the researchers who understand the pitfalls of the technology, with community organizations, with the workforce, and such.

And the more -- and then the other important aspect is that any regulations that we put in place today, if they are set in concrete, they will become outdated a year from now, 18 months from now. So it is important that the regulatory framework gets revisited every so often, like, every once a year.

*Mr. Joyce. We hear about concerns with driverless cars on the roadways, that some manufacturers have made claims about the current existence already of self-driving cars. To me, this sounds like level five automated technology, which, according to NHTSA, is an automated driving system.

On these vehicles, can they do all of the driving in all of the circumstances on the road?

*Dr. Rajkumar. Currently, there are no fully autonomous vehicles on the entire planet, period. The only vehicles that consumers can ride today corresponds to level two, which is far below level five. In level two features, the operator in the vehicle must be paying attention to the vehicle at all

times. You all know, if the vehicle is "driving itself,'' it could do something really crazy, something dangerous at any point in time, and it becomes the responsibility of the operator to step in when the vehicle does something bad.

So there is a huge chasm between level two functionality and level five. We are many years away from level five.

*Mr. Joyce. Earlier in this hearing, Ranking Member Bilirakis mentioned that it is important, worth repeating this.

Dr. Rajkumar, should the NHTSA hold automakers responsible for misleading claims that create fear among the public about this technology?

Clearly, you have stated to us there is a significant difference between level five and level two. Should there be accountability for misleading claims?

*Dr. Rajkumar. I think that NHTSA must take on two roles.

Number one, educate the public about what -- the capabilities and the limitations of driving technology, self-driving technology, today.

Number two, it needs to take a very strong and compelling action against any company out there which misrepresents the capabilities of their level two functions.

And meanwhile, I think, arguing on the side of NHTSA, we need to give them the appropriate resources and human

expertise, so they can actually manage this process, as well.

*Mr. Joyce. Thank you for your answer. My time has expired.

Again, thank you, Madam Chair, for allowing me to participate.

*Ms. Schakowsky. Well, I am happy to have you. Thank you very much.

And now, last, but not least, I am going to call on a man who I know just loves to wait for things, because he is such a patient individual.

And so, Mr. Doyle, you are recognized for five minutes.

*Mr. Doyle. Thank you very much, Madam Chair. I appreciate your courtesy.

You know, it is critical that, as we work to advance development and adoption of technologies that can change the way we live and work, like autonomous vehicles, that we bring folks to the table to discuss the impact that these new technologies will have, so that we can affirmatively guide the development of this technology in a way that enhances our values, our communities, our workers, and our economy.

Professor Rajkumar, a few years ago we heard from luminaries -- or charlatans -- in Silicon Valley talking about innovations in AVs, and how we were right around the corner from a revolution that would make drivers obsolete. Well, that doesn't seem to have happened. Instead, it seems

that we have seen a range of new safety technologies be deployed that can increase road safety. And I think those folks back then scared a lot of people.

So tell me, how do you see this technology evolving?

And do you see it as a sudden shift to driverless cars, or a more gradual transition, one that we have the opportunity to help guide, to ensure that these innovations enhance our values of inclusion and equity, as opposed to detracting from them?

*Dr. Rajkumar. Thank you, Congressman Doyle. Autonomous -- driving, as an activity, is the most complex activity that we adults engage in on a regular basis. But if you close your eyes for a couple of seconds on the highway, one could actually end up getting killed. And meanwhile, autonomous vehicles are deemed to be one of the grandest engineering challenges of this century. So when you, basically, juxtapose those two things together, it is very natural that it is going to take quite some time for the technology to evolve and mature that we can trust our lives with it at any time.

But meanwhile, as you pointed out, there are multiple intermediate milestones, like level two and level three, which will actually help mitigate, compensate for human error and, therefore, reduce the number of fatalities and injuries. But the process is long. We have gone through this cycle of

hype, as you pointed out, and then we went through this trough of disillusionment about a year or so back.

So we need to go past that disillusionment, understand that China is investing significantly in the space, enabling and facilitating their companies to grow more, take a bigger -- a big share of this huge market space, and therefore, we need to wear the reality goggles, invest in basic research, enable private-public partnerships, and then help out deployments and testing, from a regulatory perspective. And that is how we continue to sustain and extend the edge that we created in this space.

*Mr. Doyle. Thank you. Professor, do you believe that strong Federal safety standards are critical for the development and adoption of autonomous vehicles, that -- you know, for Americans to adopt this technology, they need to feel confident that the technology works?

*Dr. Rajkumar. Absolutely. So, if anything, any accident, crash, or fatality related to autonomous features get covered significantly, the media. It becomes top news, if you will. So we hold computers and software to a very high standard. So therefore, they could be significantly better than human performance in driving. We humans cause fatalities once every 80 million miles or so. So computers need to be better.

So importing a high bar is necessary to earn the trust

of the consumers, safeguard the reputation of the technology, and that is an incremental, evolving process that the Federal Government needs to support on ongoing basis.

*Mr. Doyle. And finally, let me ask you, do you believe the companies that deploy autonomous vehicles need to be accountable for the systems they create, if they fail and result in harm?

It seems like, all too often, folks describe machine learning systems as black boxes that aren't accountable, and that aren't sort of verifiable in what they do and how they do it. Do you think that we need to hold AV systems to a higher standard?

*Dr. Rajkumar. Yes, of course. Three words of caution to consumers: number one, understand the limitations of the system that they are buying, they are not fully autonomous; number two, be careful about what you agree to, the agreement that the car maker presents to you, it very likely says that you are responsible, even if their software does something wrong, right; number three, delve deeper, watch videos, look at the literature, read testimonies from my colleagues like Greg and Mr. Levine, and get yourself educated. We currently do not have fully autonomous cars, and will not for some more time.

*Mr. Doyle. Thank you very much, Professor.

Madam Chair, thank you so much for your courtesy, and I

yield back.

*Ms. Schakowsky. I thank the gentleman for yielding back, and I thank him for sticking around and participating in this hearing today.

So we have reached the end of the questioners. And I would like to really thank our witnesses, Mr. Levine, Mr. Regan, and Professor Rajkumar for being here today.

I want to let you know -- and I also want to say a special thank you to Representative Lesko for staying throughout the entire hearing.

We -- Mr. Bilirakis should be happy that we had almost perfect attendance today at our hearing, plus three individuals who wanted just to come and sign on. And the witnesses should know that, as well, because I think this is -- shows the interest in your areas of expertise, and the help that we are going to need from you, going forward.

Before we adjourn, I do want to have -- request unanimous consent to enter the following documents into the record.

Without objection, so ordered.

[The information follows:]

**********COMMITTEE INSERT**********

*Ms. Schakowsky. And I want to just remind -- even though they are not here -- remind all members that, pursuant to the committee rules, they have 10 business days to submit additional questions for the record to be answered by our witnesses who have appeared here today. And I ask the witnesses to respond as promptly as possible to any questions that you may receive.

[The information follows:]

**********COMMITTEE INSERT**********

*Ms. Schakowsky. At this time I will read the list. But if the witnesses are -- want to go, then I would excuse you, and thank you once again. But here is the list. If you want to stay and hear it, you have got it.

So letters for the record: a letter from a AAVOR; a letter from the Center for Justice and Democracy; a letter from the Motor and Equipment Manufacturers Association; a letter from Advocates for Highway and Auto Safety; a letter from the Institute of Electric and Electron Engineers Standards (sic) -- okay -- Association; a letter from Consumer Reports; a letter from National Association of Mutual Insurance Companies; a letter from the Transportation Trade Department of the AFL-CIO; a report from the Federal Trade Commission; an article from Auto Innovations; one paper from Alliance for Automotive Innovation; one paper from SELF-DRIVE Coalition entitled, "America Loses Too Many Lives on Our Roads''; an article from Bloomberg; an article entitled, "The Automatic Future: What is at Stake?''; auto innovation plan to add -- I am sorry -- advance safety at the speed of innovation; a letter from the Chamber of Commerce Technology Engagement Center; one paper from Self Driving Coalition entitled, "U.S. Must Maintain Global Leadership in AVs''; and finally, a letter from the National Federation for the Blind.

So I -- you can leave now. At this time the subcommittee is adjourned.

[Whereupon, at 1:30 p.m., the subcommittee was adjourned.]