



# PENNSYLVANIA

AUTOMATED VEHICLE SUMMIT 2018

## PROGRAM SUMMARY



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## Introduction



Roger J. Cohen,  
Pennsylvania Department of Transportation,  
Senior Advisor to the Secretary

When the first Pennsylvania Automated Vehicle (PAAV) Summit convened in September 2017 in State College, the discussions among the 275 attendees reflected such enthusiasm and urgency that the conveners, Pennsylvania Department of Transportation (PennDOT), and the Pennsylvania Department of Community & Economic Development (DCED) decided to convene a second summit in the spring.

The second PAAV Summit met April 9-10, 2018, in Pittsburgh—the birthplace of vehicle automation technology thanks to the pioneering research of Carnegie Mellon University and related entities. More than 400 attendees registered for the summit, whose themes were threefold: AV safety, infrastructure planning, and workforce economic development.

Pennsylvania is one of a handful of leadership states in automated vehicle development, and is consistently recognized for leadership in citizen/public engagement. The AV summits are structured with the goal of fostering interchange among the industry, policymakers, advocates of various stripes, local officials, service providers, and opinion leaders. In doing so, PennDOT and DCED aim to build a foundation of participation in these issues—both in the discussion and related decision-making—so that the outcomes will be informed by public input to ultimately optimize benefits to the Commonwealth and all its citizens. Every summit attendee is now an ongoing member of our “community of participation.” We do this as a long-term investment in public acceptance and support of vehicle automation.

Noteworthy policy news was unveiled at the summit. On day 1, Pennsylvania Secretary of Transportation Leslie Richards announced a strong and balanced interim testing safety

package, including an update to the 2016 testing safety policy recommendations of the PA Autonomous Vehicle Task Force. PennDOT will call on testing entities in Pennsylvania to pledge compliance to those policy recommendations for safe AV testing, while the Department continues to ask the General Assembly to enact legislation to grant PennDOT authority to oversee AV testing safety.

On Day 2 of the summit, PennDOT, the Pennsylvania Turnpike Commission, and Penn State University announced joint plans for a state-of-the-art advanced technology training and testing facility (PennSTART).

The full text of both announcements is included in this summary document.

Of course, the essence of the summit is the interchange among subject-matter experts and decision-makers, opinion leaders, and engaged citizens of the Commonwealth. Many important points emerged; a few notable items follow.

- There is concern regarding potential inequities in access to technology between rural and urban/suburban regions that must not be neglected;
- Local officials (county and municipal) need to be more engaged and involved in thinking how vehicle automation will affect their communities, particularly regarding land use, tax revenues, and law enforcement.
- Public transit represents one of the most promising areas for developing vehicle automation solutions that bring widespread public benefit, but transit agencies will need to address the workforce and labor-relations issues that may arise.
- Workforce impacts are a concern, but as a leading voice of organized labor said at one summit panel, vehicle automation will ultimately be a force that generates new, more, and better job opportunities.
- The public discussion needs to focus less on what safe, deployment-ready AVs will look like, and more on how to ensure testing safety so the technology can continue to improve and advance toward deployment readiness.
- There is an understandable fascination with autonomous vehicles, but just as much attention needs to be put toward connected vehicle infrastructure and the tremendous safety and mobility benefits these technologies can deliver.

PennDOT and DCED will continue listening closely to the people of the Commonwealth and be steered by their guidance as we actively participate in this next profound transformation in transportation technology.

## Thank You from Summit Co-Hosts

On behalf of our respective organizations, we thank everyone who attended and contributed to this year's AV summit. Our primary goal was to increase understanding of the many issues that surround this transformative technology. As part of this, we have prepared this summary of the summit's proceedings as a resource for you as you work within your sphere of planning for AV.

To our speakers, exhibitors, and poster session presenters... thank you for taking time to share your expertise with our summit participants. Your enthusiasm and positive spirit helped make our time in Pittsburgh both productive and worthwhile.

Thank you too for your comments and suggestions on the summit's exit survey evaluations. We want to assure that each will be given thoughtful consideration so that future events will be planned and designed to be even more relevant and useful.

Again, thank you for being part of the Automated Vehicle Summit. Our organizations look forward to the prospect of continuing our work with PennDOT as it seeks to maintain Pennsylvania's leadership status nationally in AV.



Chris Prisk, President  
The Mid-Atlantic Section of the Institute of  
Transportation Engineers



Kevin Conahan, President  
Intelligent Transportation Society of Pennsylvania

## Opening Remarks



Leslie S. Richards, Secretary  
Pennsylvania Department of Transportation

Thank you for joining us here at our second Pennsylvania Automated Vehicle Summit.

Thanks to our hosts, MASITE and the Intelligent Transportation Society and our sponsors and exhibitors for their support in helping PennDOT and the Pennsylvania Department of Community and Economic Development convene this important gathering.

This gathering reflects the leading role Pennsylvania and Governor Tom Wolf's administration have played and are playing to foster the research into this technology here in Pittsburgh and Pennsylvania and to ensure that safety remains paramount.

I wanted to outline some steps we in Governor Wolf's administration believe are critical at this moment when some may be questioning the safety of this emerging technology.

We value the contributions the companies and other entities engaged in Highly Autonomous Vehicle research and deployment bring to Pennsylvania. But we can't ignore our concern that safety remains paramount.

With the recent tragedy involving a pedestrian death in Arizona caused by a collision with an HAV, the Wolf administration wants to immediately lay out an action plan to further ensure public safety in Pennsylvania.

While the Pennsylvania experience has been good so far, featuring open communication with testers, adequate safety guidelines are necessary. Until the General Assembly passes authorizing legislation giving PennDOT oversight, an interim Testing Policy is needed to address safety and transparency.

We are proposing actions reflecting the shared responsibilities of government and the industry:

- I will convene a meeting of the testers regarding the interim policies.
- We will reconvene the Autonomous Vehicle Policy Task Force to update testing policy recommendations. This task force was formed two years ago and presented policy recommendations to the General Assembly in November 2016
- Until enactment of legislation based on those recommended policies and sought by the administration, PennDOT will ask all testers to comply with the following testing policy:

Testers would submit a "Notice of Testing" to PennDOT, with:

Basic Information, including name of the company, address, phone number, e-mail; and principal point of contact for the testing;

Verification attesting that the HAVs meet all federal and state safety standards and meet the policies adopted by PennDOT;

Proof of a driver/operator training program. We recommend that HAV operators have clean driving records.

Certification that all drivers have met and passed program requirements;

Name of approved "drivers," with valid Driver License numbers;

A list of vehicles that will be involved in the testing and their VIN and/or plate numbers;

Routes or geographic location for testing;

Basic overview of Operational Design Domain (ODD) including constraints. The ODD describes the specific conditions under which a given HAV is intended to operate including where (such as what roadway types and speeds) and when (under what conditions, such as day/night and weather limits. We are not seeking any trade secrets or propriety information.

Proof of insurance.

- The immediate halt in testing of any HAV that knowingly shares hardware or software with a vehicle that is part of a National Transportation Safety Board (NTSB) investigation. Testing can resume when either:

The NTSB investigation is completed and any applicable issue have been addressed.

• The tester can show that the common hardware or software was not at fault in the incident.

Compliance with the above list of voluntary policies will qualify the tester to receive an "Authorization Letter" from PennDOT valid for a year, with annual renewals.

We also will:

- Ask the industry to establish and fund an independent technical review body to promulgate best practices and pledge adherence to its recommendations.
- Initiate a letter from multiple state DOTs and transportation agencies calling for the creation of an independent certification mechanism similar to the work Underwriters Laboratories (UL) does to reduce system failure (both software and hardware). The letter is to be sent to US DOT Secretary Elaine Chao as well as the Occupational Safety and Health Administration, which maintains the list of Nationally Recognized Testing Laboratories.
- We also will enhance the safety of automated vehicles while testing on public roadways by putting greater emphasis on developing and deploying infrastructure, such as Dedicated Short-Range Communications (DSRC).

We also will ask the National Robotics Engineering Center at Carnegie Mellon University (CMU/NREC) to assess and recommend best testing practices, and evaluate PennDOT HAV test policies and requirements against those best practice recommendations.

We also urge the General Assembly to adopt legislation that provides for AV testing on public roadways subject to PennDOT's safety oversight and requires compliance with PennDOT's testing safety policies.

We also urge the Automated Vehicle industry and testers to:

- Voluntarily agree to comply with PennDOT interim testing policies and complete Notice to Testing Certification.
- Attend a meeting with the PennDOT Secretary of Transportation.
- Continue and foster open lines of communication with PennDOT.
- Coordinate with PennDOT on developing best practices for operating HAVs within safety critical locations such as signalized intersections and work zones.
- Put greater emphasis on developing and deploying vehicle-to-vehicle, vehicle-to-infrastructure, and vehicle-to-device connectivity.

And we look to the federal government for these actions:

- NHTSA should revise Guidance 2.0 to make a safety checklist mandatory. It now is voluntary.
- Congress should amend current HAV legislation to strengthen state control over roadway operations with respect to HAVs.
- Third Party safety auditors should adopt independent certification similar to the work Underwriters Laboratories (UL) does. This would help reduce system failure (both software and hardware).

Highly Automated Vehicles (HAVs) hold much promise, both to improve transportation safety and mobility and to support technology and economic development. We hope our action plan will allow continued HAV research and development in Pennsylvania while offering a framework to help build confidence that this work advances with safety as our highest priority at all times.

Thank you,

Leslie S. Richards  
Secretary  
Pennsylvania Department of Transportation

Monday, April 9th

## INTRODUCTION: WELCOME AND OPENING REMARKS



### **ROGER COHEN, SENIOR ADVISOR PENNSYLVANIA DEPARTMENT OF TRANSPORTATION**

Co-chair of PA Autonomous Vehicle Policy Task Force along with PennDOT Deputy Secretary Kurt Myers.

Welcome attendees to the second PA Automated Vehicle (AV) Summit with attendees from all regions of Pennsylvania (approximately 400 attendees).

Representation from surrounding states such as New Jersey, Virginia, Rhode Island, and Washington as well as Canada.

Highly automated vehicles (HAVs) are an emerging topic in society with many points of view, areas of interest, complex questions to answer, and difficult issues to address.

The AV Summit is designed to allow attendees to voice comments and ask questions.

AASHTO recognized Pennsylvania for leadership in 2017 when the Commonwealth received a President's Transportation Award for Performance Excellence in AV.

Award is a testament to PennDOT's leadership under Secretary Richards.

Charge from Secretary Richards to PennDOT senior staff: Maintain balance between innovation and safety.

### **RICH FITZGERALD, COUNTY EXECUTIVE ALLEGHENY COUNTY**

PennDOT's Secretary Richards is providing leadership on many issues.

AV technology was developed in Pittsburgh with Carnegie Mellon University (CMU) leading in the field of robotics. Robotics technology was developed under the leadership of Red Whittaker more than 30 years ago. The original automated vehicle was larger than today's AV and tested in Schenley Park.

Pittsburgh is partnering with DCED and the AV field is producing demand for jobs such as software developers and engineers.

Pittsburgh is embracing technology with partners working together at all levels: Public-private, shipping and transportation, business, labor, universities, community groups, and government.

### **CONNOR LAMB, U.S. REPRESENTATIVE-ELECT PA 18TH CONGRESSIONAL DISTRICT**

Decisions to fund scientific research in the last generation resulted in many of today's technology advances.

Government research budgets have been reduced. Scientific engineering research should not be compromised, but expanded.

Research funding will be a focus in Washington.

## KEVIN CONAHAN, PRESIDENT INTELLIGENT TRANSPORTATION SOCIETY OF PENNSYLVANIA

- 2018 PAAV Summit has greatly eclipsed the inaugural summit in terms of attendance.
- TSPA has the organizational capacity to help facilitate the evolution of AV technology.

## CATHIE CURTIS, DIRECTOR OF VEHICLE PROGRAMS AMERICAN ASSOCIATION OF MOTOR VEHICLE ADMINISTRATORS (AAMVA)

• Pennsylvania holds a leadership position in the country and world in AV due to the work accomplished over many years at Carnegie Mellon University (CMU). Acknowledged PennDOT Deputy Secretary Kurt Myers as chair of AAMVA Board of Directors and PennDOT's work on AVs.

• The Autonomous Vehicle Best Practices Working Group was established in 2014 and includes 16 members, two from Pennsylvania. Guiding principles include:

- Facilitating a consistent and balanced oversight approach by motor vehicle administrators to avoid inconsistent regulatory practices
- Supporting the research and development of technology that has the potential to improve traffic safety while providing mobility options for underserved populations
- Supporting the safe testing and deployment of HAVs
- Confirming the roles and responsibilities of jurisdictions and the federal government

• The Working Group provided input to NHTSA Automated Vehicles Policy; Section 2 – Model State Policy (09-20-16). Input carried forward in NHTSA publication, "A Vision for Safety 2.0" (2017).

• The Working Group is completing Guidelines for the Regulation of Highly Automated Vehicles entitled, "Jurisdictional Guidelines for the Safe Testing and Deployment of Highly Automated Vehicles" (May 2018 – anticipated).

• Provides voluntary recommended guidelines regarding motor vehicle administration and law enforcement for the safe testing and deployment of HAVs.

- Chapter 1: Introduction
- Chapter 2: Automated Vehicles Classifications, Terms, and Technologies
- Chapter 3: Administrative Considerations
- Chapter 4: Vehicle Credentialing Considerations
- Chapter 5: Driver Licensing Considerations
- Chapter 6: Law Enforcement Considerations
- Chapter 7: Next Steps

• Next Steps for the Working Group:

- Attend conferences, seminars, etc., to advance and share expertise
- Provide technical assistance to jurisdictions
- Support for updating driver licensing testing standards and training
- Work closely with stakeholders: industry, research, government officials, and national associations supporting transportation agencies

• Report will be updated to include additional topics:

- Commercial motor vehicles
- Cybersecurity
- Motor vehicle association staff training
- Enabling infrastructure

oJurisdictional safety inspection programs and criteria

oEconomic considerations

oData privacy and security (to include personal identifiable information (PII))

oEnvironmental impacts

Successful path for safe testing and deployment of HAVs must include government oversight in coordination with strong stakeholder engagement.



## Featured Speaker



### PHILIP KOOPMAN, ASSOCIATE PROFESSOR CARNEGIE MELLON UNIVERSITY

Remarks focused on safe testing to mitigate future risk.

Some activities do not improve testing: blame, arguing, finding out why, LiDAR.

Make progress with a safe AV testing platform, AV driver safety, and support technology.

It is important to increase awareness that a testing platform is not true AV.

How do you know safe is enough? Use rigorous engineering and simulation.

Safety Case: structured, written argument, evidence that technology is acceptably safe.

Technology is not going to be perfect when deployed, just like the first test flights for aviation were not perfect.

Essential safety observations:

- Care about safety of test vehicle

- Safe does not mean perfect

- Have a target level of safety

- No more dangerous than human behind the wheel

- No increase in impact to road users

Focus on Safety Driver

- Safety Driver is attentive; must pay attention

- ❖ Safety Driver needs to learn how a vehicle behaves.

- ❖ Decide when the vehicle is misbehaving and then react and recover.

- ❖ Safety Driver should be: trained, alert/awake, have situational awareness, monitor on-the-road performance.

- ❖ "Driver Dropout" is frequently an issue. There should be a plan to make sure drivers are alert, plus data to show technology is working.

- Safety Driver has time to react; a human needs time to detect and then react.

- ❖ Account for a longer reaction time than in a conventional vehicle.
- ❖ Make sure the human driver has time to interact, i.e. “Don't paint the human into a corner”.

When the Safety Driver reacts, the vehicle needs to respond

- ❖ Does the “big red button” work? Make sure disengagement works after driver reacts.
- ❖ Video from Handan, China, January 20, 2016 (AV crashes into back of public works vehicle) suggests maybe AVs need to be less aggressive to give drivers extra time.
- ❖ Potential solution – heads-up display; better coding to recognize hazards.
- ❖ If the driver cannot override the vehicle’s automated controls, modifications need to be made.

AV Implementation concerns:

Minimal regulatory intervention:

- ❖ Need flexibility.
- ❖ Aim for adequate testing and safety; not perfection.

Have testers provide the argument for the technology:

- ❖ It is not prescribed like a building code
- ❖ Measure testers against their criteria.

Who decides sufficiency? Third-party organizations spend time conducting safety review using national standards.

Make safety data public:

- ❖ The safety data has nothing to do with proprietary technology.
- ❖ Proprietary autonomy not revealed; this is strictly about safety.

## AUDIENCE QUESTIONS/COMMENTS

### QUESTION

Peter Swan, Penn State Harrisburg – How do the public and legislators know a vehicle is able to go to the next stage?

### ANSWER

Panel session afterwards to discuss this.

### QUESTION

Anthony Grescavage, Stahl Sheaffer Engineering – Any consideration about bringing other parties into the picture? Improve LiDAR, include recognition of driver response. What would have been useful is an alert mechanism. What types of mechanisms are available to recognize AV?

### ANSWER

Maybe flashing light like the military, a Whoopee light. We have the data to address safety. Make it transparent and open.

### QUESTION

Helen Loeb, Children's Hospital of Philadelphia – It could be difficult for a human to regain control of AV. Are people trained to take control and to stay alert, and should they be trained?

### ANSWER

Driver training is important and effective. Test vehicles and drivers with training are required. Greater difficulty than ordinary civilian driving. Safety issues are much more of a concern. There is an Uber article which discusses driver safety.

## PLENARY SESSION: ENSURING AUTOMATED VEHICLE SAFETY



Photo: Pittsburgh Business Times

### JACKIE ERICKSON, PRINCIPAL, THE JACKIE GROUP, MODERATOR

- The PAAV Summit is taking place at very important time. The incident in Arizona was a critical moment in the AV industry. It was important because it was the first incident of its kind. Where were you when you heard? What were you doing when you heard?
- Member of the AV Policy Task Force working with a fantastic group at DCED and PennDOT.
- Pennsylvania is being proactive, not reactive—proactive in balancing safety and innovation.
- Pittsburgh or “Roboburgh” is the birthplace of self-driving vehicles.
- Challenges: technical, pedestrian, and public safety.
- When developing the panel, the intent was to hear different perspectives from:
  - Software/technical
  - What does pedestrian need to be aware of?
  - What does it mean for first responders?
- John Bares of Carnegie Robotics, formerly Uber, gave a quote to a local reporter. In summary: The company and the vision is of a mode of transport that is safer and more efficient. The dream is still there and we are going to get there.
- Panelists will provide a brief introduction of their area of focus relative to AV safety, followed by a series of questions/answers, and then audience questions/answers.

### MIKE WAGNER, CEO EDGE CASE RESEARCH

- Autonomy and software safety community need to come together—currently they are not on the same page.
- Edge Case Research (a testing and safety company) has assembled a team with a strong combination of how algorithms work and the background to look at safety standards—where they need and should be applied.
- Edge Case Research is fundamentally trying to maximize the value of every bit of data.
- Allow manufacturers to bring capabilities in-house and develop standards. For example, have an ISO committee establish a protocol for triggering events that can lead to failures.

- Make changes to make technology systems safe and bring to market in responsible manner.
- Phil Koopman’s talk was about being careful—software is very good at this—even better than a “system-wide” human investigation.
- Many trends we see in aerospace and other industries are coming up in AVs and we want to be prepared for the same issues they’ve faced.

### **ANN SHIKANY, INDEPENDENT CONSULTANT AND MANAGER AUTONOMOUS VEHICLE COALITION FOR NATIONAL SAFETY COUNCIL**

- Started out in innovation, not necessarily transportation. Worked in infrastructure with DOE and DOT.
- In Portland, OR, they developed the Smart AV Initiative (SAVI) – How to introduce the technology to a community that was excited but apprehensive.
- Want to teach people how to safely interact and how to feel comfortable around the vehicles. Moving forward we need to do even more of this as a community or else risk challenges with adoption.
- Change communities' perception to focus on benefits—mobility, safety, efficiency.

### **LIEUTENANT BRIAN IANUZZI, PENNSYLVANIA STATE POLICE, PUBLIC SAFETY PROGRAM DIVISION**

- Law enforcement is a core duty to ensure highway safety.
- Absence of legislation in Pennsylvania creates an enforcement void and uncertainty with public, law enforcement, and manufacturers.
- PennDOT developed the AV Taskforce, which formulated regulations and policies collaboratively with many stakeholders. While dynamic and including multiple stakeholders, the group never lost sight of the fact that public safety must be number one. This has led to informing the pending legislation—and in this vein the PSP is happy to hear the policy announcements from Secretary Richards this morning.
- Law enforcement involvement could be key to developing the technology—we have a familiarity with traffic and are on the road every day.
- AVs will pose challenges and PSP stands by to address them as they arise.

## **MODERATOR QUESTIONS**

### **QUESTION**

Perceptions on self-driving vehicles have been changing. A poll conducted between January 11 - 16, 2018: When asked, “Are self-driving vehicles “More Safe” or “Less Safe?”” 36% of respondents said, “Less Safe.” The same poll was conducted in March 2018 and 50% of respondents said self-driving vehicles are less safe. PennDOT’s Secretary is focused on building confidence and trust. How in your specific roles can you bring confidence to the industry?

### **ANSWERS**

Mike Wagner – We need to make a clear and explainable safety case for why AV will behave properly in various scenarios. We need the same level of clarity in making the safety case for a testing platform as well. We must determine how and when the system breaks and how it can be fixed. This is an ongoing process and can take a lot of time, so we need to do it responsibly. The fact that these systems are autonomous means some lessons will be learned faster than others. One last thought is that air flight 80 years ago would have probably polled poorly as well, even though it is something we take for granted now.

Ann Shikany – All unknowns are scary to the average consumer. The average consumer doesn’t know much about AVs—they are somewhat of a black box for many. But we have a lot of examples of technology in cars today that consumers don’t know about or use properly. If they did we’d have a much safer system—see seatbelt use for example. We need to reach out to the community to continually develop the understanding and reduce the unknown factor.

Lt. Ianuzzi – We need to stay engaged—we can’t just stay in Pennsylvania State Police circles. We must work across sectors. Every part of the job could be impacted by AV. While I am considered by many to be “just a cop,” working across areas of expertise

with engineers and others has helped keep me engaged and it is the right direction to keep going to get community involvement and buy-in.

Jackie Erickson – Engagement, engagement, engagement.

#### **QUESTION**

When is the right time to start outreach to consumers and communities?

#### **ANSWER**

Ann Shikany – Some might think AV technology is immature and we are not ready yet. But I disagree—especially due to recent events in Tempe, AZ, it is more important than ever. We need to be up-front about the limitations of the technology and allow the OEMs to make the safety case for themselves. Many who interacted with the technology are much more comfortable after an in-person experience, and even find using it boring after a short period of time, so education is key in this area. We should move to try to get people to interact experientially with the AVs and it will be productive. How does your car work today? How can this change your car in the future? How can we make sure people are comfortable with the technology before it gets shoved into their world?

Jackie Erickson – Comfortability is important so people can feel a part of what is happening.

#### **QUESTION**

What would you say to companies like GM or Argo to help them build your confidence? What do you need?

#### **ANSWER**

Lt. Ianuzzi – We need a better understanding of the technology generally, and for law enforcement specifically as well. We don't have a black box on the software, even though we have a black box for the car. We hear "that's proprietary" but access to that data and understanding how that is going to affect us is important as law enforcement. How do we interact with that vehicle during a stop? In a work zone, etc.? How do we bridge the gap between the two?

Mike Wagner – Which bits of data are important? What are safety critical components and features? Which are extraneous? Knowing this information will improve accident reconstruction. Get law enforcement and OEMs together to help solve problems.

#### **QUESTION**

Can you envision a driver's test for AVs? What is different from a test for humans?

#### **ANSWER**

Mike Wagner – We need to ask if the behavior of the system is suitable for the area where the vehicle would be operating. Currently we ask humans taking the test to respond to situations—and we assume they are mature—for the same reason we don't give driving tests to 10-year-olds. We need to know that the system was built with acceptable practices—underlying systems are ISO-certified and it can reliably reach a minimal risk condition. Can it respond reliably to all the things it will encounter in the real world? We can expect that the AV is going to be subjected to thousands of variations and scenarios, and we need to understand how it will respond to them.

#### **QUESTION**

What came to mind first when you heard of the incident in Tempe, Arizona, and how has this changed your perspective?

#### **ANSWER**

Ann Shikany - My first response was feeling bad for the family. I saw the video and started wondering "what happened" as many others did as well—but it is important that we be patient and let NTSB do their job, not be armchair assessors. We're in a lightly regulated industry right now. It will be interesting to see what Uber puts forward after the crash—will they be releasing lessons learned? If there had been more training and awareness for both the safety driver and the pedestrian, is there a way this could have been avoided? Others have mentioned external warning systems for interacting with others. As we move forward, communicating that with the public is important.

Lt. Ianuzzi - My first reaction was thoughts for the family of the victim and the driver. It was bound to happen—and it will happen again. How will my crash scene help understand AVs going forward? How can we learn from the tragedy that occurred in

Arizona? Sending some of the PSP staff to Arizona might be a good place to start. Interacting with neighboring states and cities can really help us support each other.

Mike Wagner – I was saddened by the accident, and coincidentally, I was at a safety standards committee meeting working with others trying to reduce the likelihood of these events. Many there agree that there is a need to move toward zero incidents. We need to get into the weeds of the data and work on a safety culture among manufacturers.

Jackie Erickson – Need to improve safety culture on the pedestrian side as well. For example, texting and walking. Pedestrians need to be aware in public sector space. Put your phone down.

Ann Shikany – Are there pieces of technology that can provide alerts? Technology that can promote safe interaction? A promotional plan such as 'Click It or Ticket' is effective. Need similar promotional plan for AV Safety.

#### **QUESTION**

What do you recommend? What is the one thing the AV Policy Task force can do for you?

#### **ANSWER**

Lt. Ianuzzi – Check the ego at the door. Everyone has something to suggest. Don't downplay an idea. Think of different perspectives. Come with an open mind and work together and think of different perspectives that may be at play when you're developing a policy.

Ann Shikany –

Federal and state funding of consumer education and community outreach for AVs is a must—this will help avoid the NIMBY issue. We need to make sure people operate this technology safely, that they can share the road safely, and that they understand what to expect when they encounter these cars in their communities.

I'd like to see more collaborative efforts (P3s) among industry, government, and safety organizations during the testing and pilot phase.

Regarding Federal Motor Vehicle Safety Standards (FMVSS), we should not rush to remove safety requirements. There needs to be no decrease in occupant protections, survivability, or a decrease in other standards if changes are made at the federal level.

Mike Wagner – When discussing operational design domains, we need to have people on the task force who understand the more complex cases, not just simple ones. Some of these things must be looked at by deeper technical analysts. Especially the complex cases.

#### **QUESTION**

What is the next action to improve automated vehicle safety?

#### **ANSWER**

Mike Wagner – At Edge Case Research where I work we want to scale things up. There is a big gap between the pace at which OEMs are developing technology and the speed at which they are being brought to market. There is a way to do that safely and that is one of the major challenges that we look to address.

Ann Shikany – At the National Safety Council we developed a campaign called "My Car Does What?" It was a national safety campaign focused on existing lifesaving technology in vehicles. Need the campaign to take one step further and have those conversations about HAVs. <https://mycardoeswhat.org/>

Lt. Ianuzzi – Interaction with the public is the key to how we do our job. How are we going to change the way things go when traffic stops could disappear—how do we enforce the vehicle code? We need to keep engagement with the public as a high priority.

## AUDIENCE QUESTIONS

### QUESTION

Concerned about systems being hacked. How is this being addressed? There is the public perception that the IT industry does not have a great record about caring about data security.

### ANSWER

Mike Wagner – Many of the software solutions look at both safety and security—one thing we worry about is inadvertent control by other entities. Many of the core principles with which software is built accommodate both safety and security. The interesting point is when these cars interact with the established world—there are even some studies that look at adversarial imagery, like how to change a few pixels to make a stop sign look like a 45-mph sign to an AV.

Lt. Ianuzzi – It could be a terrorist or criminal, but Americans also love to modify vehicles. How can we make sure the software is intact—someone will eventually sell a “chip that makes the car do XYZ”—it’s just a matter of how we can craft policy to handle these modifications as law enforcement.

### QUESTION

What happens when a car gets upgrades?

### ANSWER

Mike Wagner – Need updates on vehicles by companies. What does it look like? Updates are made rapidly. Make updates from one city to another. This is a fundamental issue. Verification and validation must be done in a very quick way and that’s the big barrier.

### QUESTION

People fear what they don't understand. It is hard to ask people to “sit in vehicle and trust it.” We are starting to get autonomous components into regular vehicles, e.g., a sensor that alerts drivers to a deer coming out of the woods. People can start to realize that maybe the computer can make some decisions. This provides a gradual process and softer landing into HAV. Using assisted technologies gives people a technology introduction. It can assist them while they are still driving a vehicle. Isn't transparency good?

### ANSWER

Ann Shikany – Every company has its own ideas about safety—let’s create a platform on which people are comfortable. We can’t assume all people need to see into the system to develop trust—some will take your word for it. For others, we’ll need a platform to build trust upon.

### QUESTION

How do you develop trust with technology? This would elevate trust in the system.

### ANSWER

Ann Shikany – Based on the “My Car Does What?” campaign, not everyone can interact properly with their vehicle. Making sure the average consumer can interact with their vehicle is important.

### COMMENT

Michael DeKort – Cybersecurity and critical best practices are concerns. Companies giving away AV code is a problem. Pay attention to Waymo’s paradigm shift. Much more simulation is still needed. Hand-over in Level 3 is dangerous. Progress to dangerous scenarios through simulation and conduct 1,000 times each which is similar to Aerospace and DOD simulation—you have to run many scenarios. Waymo admonished Tesla...the industry should self-police.

Lt. Ianuzzi - Americans love to drive vehicles. There is still a lot of time to address the interaction between humans and automated vehicles.

Ann Shikany – The higher the levels of automation, the better. Educate consumers on interaction with HAVs.

**QUESTION**

Eric Boerer, Bike Pittsburgh – There is no representation from biking and walking on the taskforce.

**ANSWER**

Jackie Erickson – Please reach out to Roger Cohen.

**QUESTION**

Laura Wiens, Pittsburghers for Public Transit – With concerns over impacts to jobs, privacy, equity issues, congestion, 0 driver cars, and not just NIMBY-ism, do we need to have regulatory frameworks to make sure they don't go in a dystopian direction?

**ANSWER**

Ann Shikany – Agreed, there are a host of issues. By educating people we will empower people and even more issues will bubble up as we move forward, as you could expect with any disruptive technology. We must continue to work together, and this summit is a good example, to develop appropriate policies to address them.

**QUESTION**

Chandra Parasa, Lehigh Valley Regional Planning Commission – Applaud overcoming software challenges. How can AVs communicate with infrastructure as well?

**ANSWERS**

Mike Wagner – Successful leveraging of infrastructure information for redundancy. A lot of developed solutions limit solutions for flexible environments. A case-by-case basis should be considered.

Ann Shikany – Not all cars interact with infrastructure. Agree that this should be addressed.

Lt. Ianuzzi – Connected vehicle in work zones. If sweeper shown in Phil Koopman's presentation would have had a beacon to communicate with the autonomous vehicle, the safety driver would have known ahead of time. Information collected from vehicles is needed.

Mike Wagner – Be creative. Signage marking to make clear.

Jackie Erickson – Need engagement process for what is needed. Plenty of opportunities for engagement.

## **BREAKOUT SESSIONS**

### **Use Cases for Automated Vehicles**



#### **ANDREW BLUM, EXECUTIVE POLICY SPECIALIST PENNSYLVANIA DEPARTMENT OF TRANSPORTATION - MODERATOR**

#### **NGANI NDIMBIE, WOMEN IN TRANSPORTATION FELLOW TRAFFIC21 INSTITUTE AT CMU**

- Use case for Transportation Network Company (TNC) and e-hailing in paratransit.
- Paratransit – transport of people with disabilities.
- Services by calling a day in advance, could be long wait lists.
- Some services are beginning to offer on-demand services with instant request for services.

#### **JOHN WHITT, LIGHT TACTICAL VEHICLES BRANCH CHIEF US ARMY ABERDEEN TEST CENTER**

- Aberdeen Test Center is like a third-party tester for a range of equipment. Mainly for the Army, but also for other forces and government agencies.
- 88,000-acre facility, with 66,000 used for testing.
- Also provide the engineers that run the test. Drivers for the test.
- Have a software safety group to assess from the safety standpoint.
- Military and commercial applications tested at the facility.
- Ultimate goal is to convoy vehicles.

#### **FRED BERGSTRESSER, GOVERNMENT ACCOUNT MANAGER ROYAL TRUCK & EQUIPMENT, INC.**

- Final-stage manufacturer of safety trucks.
- Driver of a standard Truck Mounted Attenuators (TMA) truck is put at risk for back injuries.
- Autonomous TMA takes the driver out of the truck and a high-risk situation.

## **DAVID DE NOTARIS, EXECUTIVE DIRECTOR PENNSYLVANIA DEPARTMENT OF LABOR AND INDUSTRY, OFFICE OF VOCATIONAL REHABILITATION**

- One out of every five people has some type of disabling condition that can affect some aspect of their lives.
- L&I helped over 9,000 people get access to work.
- Access equals success.
- The cell phone has opened opportunities.
- Ensure that accessibility is built in to AVs, not an add-on.
- Should be a requirement and not a feature.
- Need to include people with disabilities (being inclusive) when it comes to this technology.

## **MODERATOR/AUDIENCE QUESTIONS**

### **QUESTION**

What do you think the responsibilities are between the equipment and pedestrians, and pedestrians and the equipment?

### **ANSWER**

Ngani Ndimbie – Challenges include pick-up and drop-off locations. They need to occur in safe places. We need to understand the needs of the passenger. Pedestrian safety must come first.

### **QUESTION**

What is the timeframe and process for equipment to start with military applications and move to commercial ones?

### **ANSWER**

Fred Bergstresser – Technology can begin with military applications.

John Whitt – Working as a research project. It will eventually move to a full research program with formal methodology in a year or so. No issue with declassification since using commercial technology.

### **QUESTION**

Can a vehicle with no driver be used today for people with disabilities?

### **ANSWER**

David DeNotaris – It is crucial that we trust the people developing the technology to have everyone's best interests in mind. People would be willing to one day use a vehicle without an operator in it. Will need testing for bad weather, etc. Hopefully, this new technology will create new jobs and allow people to have access to jobs.

Ngani Ndimbie – Paratransit driver would take on a different role. The human element will still be needed. It could be more beneficial to the customer.

Fred Bergstresser – The human element is also still needed in the platooning of trucks. In Colorado, the driver was moved to the main truck to have eyes on the autonomous vehicle and help to monitor the whole system.

John Whitt – We can't test these vehicles the same way we test other vehicles. The vehicles will use machine learning to understand the test. Targets need to look like people, animals, etc. And, the sensors need to react like they are people, animals, etc.

### **QUESTION**

What are the changing roles and what needs to change in society?

### **ANSWER**

John Whitt – It is a group problem. Everyone needs to work together to do what they can to make the technology work, safely and effectively. Software has to change. Proprietary software is an issue. Need to be able to "prove" the technology is safe.

David DeNotaris – Creativity is important. What’s the interface going to be like? Will you need a driver’s license? In the different cases, what will things look like? Think inclusive, not exclusive.

Fred Bergstresser – Education and training so people can move into the new roles.

Ngani Ndimbie – Will get a great response when the technology aids society. Solve problems we already have.

#### **QUESTION**

Fuel costs, cost of transportation. Are these being considered?

#### **ANSWER**

John Whitt – There will be a fuel economy saving for the military if the application works. Could avoid rubbernecking and other issues from the commercial side. There will be fuel economy and logistics saving.

#### **QUESTION**

What language would the panel like to see in legislation?

#### **ANSWER**

David DeNotaris – Language that makes the technology inclusive for people with disabilities. Example: “Operating the vehicle” could be confusing language.

Ngani Ndimbie – Information-sharing agreements that allows use of TNCs on roads. Language such as the percentage that need to be wheelchair accessible, etc.

#### **QUESTION**

Are there concerns with the technology, people being left behind, the 50-year-old former bus driver getting a new job, etc.?

#### **ANSWER**

Ngani Ndimbie – Many types of employment could be impacted, some of which depends on what the policy-makers decide will be impacted. Our policies need to make public transit more attractive. Develop a series of policy decisions to get us to where we need to be.

Andrew Blum – In-between, where we can find valuable uses for the technology before it is fully autonomous.

#### **QUESTION**

Who will be the early adopters?

#### **ANSWER**

David DeNotaris – Pennsylvania has the third-highest senior population in the U.S., behind Florida and Texas.

- Seniors will want to be the first early adopters.

- Young people will want to adopt.

- There are industries we haven’t yet thought about that could benefit.

- It will be a game-changer for those providing medical services.

## Business Models and Financing Strategies



### STACIA RITTER, DIRECTOR OF POLICY AND EXTERNAL AFFAIRS PENNSYLVANIA TURNPIKE COMMISSION - MODERATOR

#### ROBERT MUDGE, PRINCIPAL THE BRATTLE GROUP

Public-Private Partnership (P3) financial aspects:

- P3s harness private capital, management, and innovation. Transfer risks. It's not a dedicated revenue stream.
- Nationally, there were more than 200 P3 projects in 2017 vs. only 20 from 2006-2017.
- 30 states, including DC, have launched P3s since 2015.
- In 2006, 80% of P3 projects focused on transport compared to 50% now. More interest in non-transportation infrastructure needs: water systems, energy, commercial/retail development, etc.
- State's current financial stream (gas taxes) will disappear. Will tolls disappear as well? How will infrastructure finance change? What will need to be funded?
- Re-building our infrastructure will not only focus on type of concrete or the number of steel beams but how the technology will come into play.
- States will need to determine how to finance new signals, lane striping, telecom and broadband, electric charging stations, etc.

#### RICHARD VOITH, PRESIDENT AND PRINCIPAL ECONSULT SOLUTIONS

Determining infrastructure pricing:

- User-based mileage fee used on specific roadways and time of day.
- The connectedness of AVs will allow tracking of travel that in turn allows it to be priced.
- Prices could be set such that traffic is diverted to other routes via congestion pricing so that all traffic flows more freely.
- Prices could be set so that there is sufficient revenue to add capacity where beneficial.

Infrastructure pricing and infrastructure investment could be planned in such a way as to encourage land use patterns that are deemed more productive. Land use patterns matter and infrastructure investments always affect land use patterns. Travel pricing with AVs could help ensure investment in infrastructure leads to productive and desirable land use patterns.

### **BARRY EINSIG, GLOBAL AUTOMOTIVE AND TRANSPORTATION EXECUTIVE CISCO SYSTEMS**

AV technology advances around the world:

#### **Europe**

- GDPR act – regulation on data protection and privacy for all individuals.
- Regulations will be harmonizing across Europe.
- Restrict manufacturers' scope of sharing data with third parties.
- Goes into effect May 2018.

#### **Netherlands**

- Leading in testing automated cars and intelligent transportation systems (ITS).
- As cars become more and more automated, this innovation will run simultaneously with increasing data communication between cars on the road and installation of ITS infrastructure at the roadside.
- Fewer legal restrictions to allow manufacturers to develop and test self-driving vehicles.

#### **Singapore, aka "Smart Nation"**

- Global leader in the development of automated vehicle technology from a policy and practice perspective.
- Downtown MRT (Mass Rapid Transit) and LRT (Light Rail Transit) driverless technology. Taxis, street sweepers, buses are automated.
- Currently deploying truck platooning technology by enhancing wireless communications between trucks (5G technology) which will allow the distances between trucks to be safely reduced and lower fuel costs.

### **MODERATOR QUESTIONS**

#### **QUESTION**

As automated vehicles take over our roadway systems, will we have more data than we know what to do with? How will we protect that data? How will we use it?

#### **ANSWERS**

- We will need to determine what data to share.
- Who should store and receive that data?
- Will there be a cost of sharing the data?
- Will we need to put policies in place on who can collect and share data?
- What are the public and private benefits of the data?

#### **QUESTION**

Will there be impacts to electric utility companies? How will they be involved?

#### **ANSWERS**

- There will be more electricity demand. Better electrical smart grids.
- Electric companies are beginning to integrate electric vehicles into their future plans.

- Need to develop and install more electric charging stations. Faster charges will be in demand as more AVs will be on the road.

## AUDIENCE QUESTIONS

### QUESTION

Where can more information be found about Michigan's self-driving vehicle testing facility?

### ANSWER

“The American Center for Mobility”



## Planning for Automated Vehicle Infrastructure



**GEORGE MCAULEY, DEPUTY SECRETARY FOR HIGHWAY ADMINISTRATION PENNSYLVANIA DEPARTMENT OF TRANSPORTATION - MODERATOR**

**KARINA RICKS, DIRECTOR PITTSBURGH DEPARTMENT OF MOBILITY AND INFRASTRUCTURE**

Still believes AV technology holds promise for safety and increasing mobility.

Challenges remain and need to be acknowledged in how states and local governments can drive toward desired outcomes.

Cities and mobility need to be planned together to consider circulation patterns.

Prioritize people over vehicles ... avoid being “star struck” by the technology.

What do we do if we go toward full autonomy when parking revenues are a major source of income?

Pittsburgh is putting together a working group on autonomy.

Need to develop a comprehensive vision, plan, and policies toward end goals.

Revise regulations on curb management, parking requirements, revenue replacement, and lane management.

Repair infrastructure in communications, energy systems, traffic controls, and maintenance /state of good repair. We need a sound operating platform for this technology.

Define data protocols. Many cities are looking for ways to share data, but have not established protocols. Is it subject to right-to-know laws, etc.

**MATT SMITH, NATIONAL CONNECTED AND AUTOMATED VEHICLE PROGRAM MANAGER MICHAEL BAKER INTERNATIONAL**

As promising as the technology is, there are many things we don't know...especially how it is going to look down the road.

Not everyone is going to be adopting and accepting of this technology at the same speed, by urban and rural geography. Some areas will adopt at different speeds.

The knowns are we will have mixed traffic—smart systems interacting with dumb drivers.

It may be 30 to 40 years of having a mixed fleet; still need to plan for drivers making very human mistakes. We can't disregard the rest of our infrastructure and motorists.

Transit may adopt AV technology first with fleet delivery systems which could translate into a lot of benefits. These vehicles are using the same infrastructure.

No definitive answers, but scenario planning could be done with the land use changes. There are likely to be significant changes within urban areas.

Start educating your workforce, network engineers, and application developers. Start to cultivate more than just engineers.

Our biggest challenge ahead will be planning and designing for mixed fleets.

### **SAM VAN HECKE, SENIOR ASSOCIATE CAMBRIDGE SYSTEMATICS**

This is a topic that people want to engage in. It is an environment of incredible uncertainty.

Incorporate AV/CV (automated/connected vehicles) into planning documents; we need that guiding documentation.

Educate and inform regional leadership and staff. Be part of the state and local conversation. This creates the foundation for implementation.

### **SANAH BAIG, PROGRAM DIRECTOR FOR RESILIENCE, ECONOMIC DEVELOPMENT AND TRANSPORTATION NATIONAL ASSOCIATION OF COUNTIES**

The National Association of Counties (NACo) represents 3,069 governments across the U.S.

Counties operate 4% of bridges and one-third of transit systems; counties can play a huge role in infrastructure systems and in planning for the deployment of AV/CV technology.

Many citizens are older and not accepting of the technology. We are working to clear up the confusion.

Convened 31 elected officials in Pittsburgh last year to discuss the implication of where the testing is happening and what the economic development advantages are so we can make future-facing investments now.

Infrastructure deployment will be in using the roadways we have more efficiently. Still need to work on building in digital infrastructure to enhance data management and communications networks.

Scenario planning is important for elected officials to think about what the future might look like. There's a lot for us to wrap our heads around and our elected officials need to be bought in.

### **AUDIENCE QUESTIONS**

#### **QUESTION**

What kind of business models are emerging for AV?

#### **ANSWER**

Matt Smith – There could be alternate business models out there but the challenge for us now is that they are being held close to the vest by third parties.

Karina Ricks – Some of the business models will be problematic because of sunshine laws, etc. New funding strategies such as Public Private Partnerships can help expand the amount of dollars we have to work with.

An emphasis on asset management data and keeping it current will become more critical for things like construction and land closures. Obtaining that operational data that will help AV operate safely. Agencies are taking on increased data management roles.

**QUESTION**

What will the impacts to land use be?

**ANSWER**

Sam Van Hecke - Parking lots and garages are huge [revenue generators] for our urban areas. There is a need for infrastructure in our urban cores, for electric vehicle charging stations, etc., within our plans. Do the fronts of all buildings begin to resemble the fronts of our school buildings and school drop-off areas?

If we continue to invest in auto mobility and infrastructure, we can more easily imagine what kind of future we are going to get.

**QUESTION**

What did the City of Pittsburgh do to plan for AV? What did the city have to do?

**ANSWER**

Karina Ricks - Nothing.

**QUESTION**

So is this a moot conversation?

**ANSWER**

Matt Smith - If you look at AV, investment in infrastructure could be minimal-to-nothing. There would be more required though for CV. We should still begin having the planning conversations now.

George McAuley -- Data coming from the vehicles can help us with traffic systems management.

**QUESTION**

I believe AV buses can help reduce our storm water infrastructure needs, but how do you get the municipalities work together?

**ANSWER**

Karina Ricks - Incorporating green infrastructure into development and right-of-way is part of what we do here in Pittsburgh.

**QUESTION**

Is there a master plan for this technology across the state?

**ANSWER**

Matt Smith – Not sure about a master plan; however, sharing data should be a must. The Smart Cities concept does seek to look at how technology can benefit and influence housing and public works projects.

Karina Ricks - We tend to be enamored with talking about a small subset of what we do but we still need concrete workers, etc. as many of these jobs will remain in building our streets and infrastructure. Not everybody in the future is going to be out of a job if you can't work with predictive analytics, etc.

George McCauley - You have an opportunity to work with your local governments to advance this technology.

## LUNCH: DEVELOPING AND MOTIVATING OUR WORKFORCE OF THE FUTURE



### **BILL PEDUTO, MAYOR CITY OF PITTSBURGH**

Pittsburgh's story is one of innovation; not built on steel but innovation. Through the Bessemer process, more steel was produced in Pittsburgh during WWII than in Germany and Japan combined.

There were air and water issues resulting from manufacturing and the disparity between haves and have not's. Pittsburgh created the first clean air act before EPA to ensure the future was reliant on non-toxic air. Partnership between government and industry. Created unions and middle class.

With downturn in steel production came 19% unemployment which is greater than the number of people who moved from New Orleans after Hurricane Katrina. Exported young people in the 1980s and 1990s.

Past doesn't need to be wedded to future. Therefore, in 1979 the first robotic program was developed at CMU. Today seeds have taken root and Pittsburgh has new economic opportunities.

In two years there has been significant job creation and investment from over five different industries to develop a center of robotics and autonomous vehicles in Pittsburgh.

Leading the world once again with new industry that has ability to change people's lives.

Must be prepared to address challenges so need to make sure it is being built out for everyone. Don't keep people out because of income. Not built only for smartphones but landlines.

Exactly what do we need to be doing with new industry? Work with universities to make sure network systems are working within industry for safety and efficiency.

Connection of vehicles will create an efficient and effective system and lessen the need for idling.

Bumps and challenges will happen but continual moving forward with pragmatic approaches.

Pittsburgh's innovation is the 4th industrial revolution. The opportunity to be part of an urban lab is part of Pittsburgh's present.

## LUNCHEON SPEAKER



### YVONNE LOPEZ-DIAZ, VICE PRESIDENT, HR DIRECTOR HNTB

Discussed adapting workforce training for the next generation and share stories about growing and mentoring.

Prepare workforce of tomorrow and focus on “What am I going to do to grow next-generation leaders?”

New people are entering the workforce at a rapid pace and in large numbers.

How do you attract, develop, engage, and motivate a generation that will be key to our future?

The Millennial generation is a generation like no other.

As Millennials are entering the workforce in large numbers and will be leaders of future we need to understand what makes them tick. Appeal to what they like to do.

- Have fun—Millennial friendly

  - Work-life balance and variety of how they accomplish goals and collaborate with others.

  - Difficult to get generations to work together.

- Very socially conscious about their work and want to make a positive impact on society.

  - Highlight community and societal efforts (key part of being wired).

- Development and professional growth important—internal/external empowered to make difference in an organization and society. Want feedback but rarely ask for it.

  - Just because they are interested doesn't mean they aren't a flight risk.

  - Managers need to be thoughtful and development can include external training, meetings, job training.

  - Lack of development is a reason why they leave.

  - Didn't see a career path, no training, want to learn something new. Cannot miss opportunity.

Inspirational book titled Greater Than Yourself—focuses on how truly great leaders in life and in work cause others around them to be greater than you. Have others achieve more than you. Read the book and had an “aha” moment.

No longer about me and the here and now. In whom do I need to invest my time? Who is your Greater Than Yourself? How will you replicate your success? What are you doing to raise the rung and lift others?

Assembled young professionals and asked them, “If the firm could do something different what would it be?” Desire for growth and development, interconnectivity with peers (engage with peers at levels across departments so they can solve challenges to not operate in silos), the firm’s support for social and community engagement. Six young professionals discussing these topics have grown to 100 professionals. Organize learning events and community and social issues. Make sure people are empowered and can go and do. Make a difference. All managers did was listen.

Focus on engagement. Seek work environments where they are trusted by supervisors. Flexibility to make decisions and make it their own way. Whose responsibility is your career? Their responsibility to take it forward and say where they want to go.

Learn the hard way through trial and error. Let fail to learn judgment, vision, critical thinking, problem solving, listening.

Leverage their passion for technology. Empower them to assume leadership roles through tasks such as meeting with a client or a special project.

Future is in their hands, let us all do our part to help them.

Know how to attract, know what is important, know what motivates.

Helping them get there starts with us.



## **BREAKOUT SESSIONS**

### **Automated Vehicles and the New Age of Public Transit**



#### **COURTNEY EHRlichMAN, PRINCIPAL THE EHRlichMAN GROUP - MODERATOR**

Courtney introduced panelists and asked each to provide a brief overview of their perspective of AV in the transit realm.

#### **KATHERINE EAGAN KELLEMAN, CHIEF EXECUTIVE PORT AUTHORITY OF ALLEGHENY COUNTY**

Transit story of Port Authority.

Prior to Port Authority experience with autonomous vehicles. Public procurement and start-up/emerging technology. Role of autonomy in micro-economy.

How to make old technology better with emerging technology opportunities

- Connected vehicle projects

- Right-to-work state (FL), union employment

Systems do not always provide easiest connections; Transportation Network Company (TNC) may provide faster, easier service.

Lyft story: no way transit can replicate TNC software. Rideshare is not able to compete with TNC.

Rideshare partnership opportunity – First Transit and Transdev, taxi business provides rideshare to provide connection to hubs. 50% subsidy by state with 1-2 people per trip. No union involved—no transit operators were fired, but they were relocated to other routes.

Ridership is down in the Pittsburgh area partly due to Uber and cheap gas.

#### **ART GUZZETTI, VICE PRESIDENT AMERICAN PUBLIC TRANSPORTATION ASSOCIATION (APTA)**

Resident of Pittsburgh and can relate to Port Authority story.

Guiding principles of transit perspective of automated world.

- It is a good thing (new tool in the tool box).

2 More efficient, serve customers better.

3 Best to learn through one pilot project at a time.

Automated transit service currently exists in LA; also consideration to start in a transit desert to connect new customers to existing transit routes. Automated vehicle (in place of bus) to serve low-density communities.

Shared ride – Boston is a prominent example of partnership with Transportation Network Companies (TNC).

Bus Rapid Transit (BRT) systems have automated docking systems—existing technology and application.

Potential uses – Garages and bus yards could use automation for greater efficiency.

Workforce challenges – Forward-looking job opportunities (needs to be a coordinated effort).

Opportunity – Automated vehicles to serve transit hubs.

Challenge – Potential for AV to lead to more traffic and sprawl development patterns.

Eligibility of federal transit funds will need to be revisited (automated system = fixed guideway, small starts program, etc.)

APTA response to FTA RFC – how to change, focus should be direction/outcomes/intent.

Transit agencies need to adapt.

Impediments to AV transit = legal, programmatic, institutional, workforce.

- ❖ Funding is important.
- ❖ Failure needs to be embraced, but can't expect agencies to take the risk. Need to use pilot project approach.
- ❖ Agencies or private partners will need new fleet of new vehicles. Smaller vehicles for more frequent service.
- ❖ FTA requirements need to be thought about differently/adjusted.

### **SHEILA GOMBITA, EXECUTIVE DIRECTOR WASHINGTON COUNTY TRANSIT AUTHORITY (FREEDOM TRANSIT)**

Fast public transit network in Pennsylvania (envy of other states in nation); particularly rural transit network.

Public transit in rural communities provided primarily through shared-ride operations by rural agencies.

Many rural communities rely on this service; 50% more trips by customers with disabilities.

Ensure access to all, inclusion of service, including affordability. These customers/stakeholders need to be at the table as policy is developed.

TNC not currently competitive to transit rideshare in rural areas due to expense to TNC for operation.

### **STEVE BUCKLEY, NORTHEAST REGIONAL MANAGER PLANNING, ENVIRONMENT AND TRAFFIC, WSP**

Experience from Toronto and relationship with Uber.

Business model of some TNCs is to "kill" transit; profit-oriented, currently operating with no rules. Will proliferation of TNC impact transit and spark decline in transit operations?

Transit agencies need to put a game plan together sooner rather than later.

FTA request for comment regarding current and near-term future of AV transit; regulatory barriers to deployment of automation. Defined five use cases for automated transit:

1 Transit bus advanced

2 Shuttles

3 Maintenance yards

4 On-demand services

5 BRT

## MODERATOR QUESTIONS

### QUESTION

What are the concerns regarding ride hailing, automation, and impact to transit service?

### ANSWER

Steve Buckley – Is the public sector set up to respond? TNC is not regulated – Uber “pool” example. Concerned that rural areas are forgotten. Needs structured for mobility of the future and require TNC to be engaged and “play ball.”

Art Guzetti – Current model of public transit operations – Europe model moving toward “mobility as a service”-type model. Use of contracts and partnerships to serve communities. Future of public transit likely pointing in that direction.

### QUESTION

Do we worry about AV serving transit trips (5% mode share) or private automobile (95%)?

### ANSWER

Katherine Eagan Kelleman – Higher mode share public transit commute patterns (i.e., to downtown Pittsburgh) likely not as impacted by TNC. TNC model focused on revenue. Transportation policy needs to acknowledge transportation serves different users. Need to consider the market for non-discretionary users of public transit.

Sheila Gombita – Vehicle ownership is viewed by society as primary way moving forward. Folks don’t want to share rides if they have the opportunity to drive alone. Public transit needs to be viewed as a good thing, not bad or less desirable mode of choice. We need to reduce the number of vehicles on the road, not add.

### QUESTION

There is a disproportionate use of ride hailing by younger people (age 35 and under). In urban areas younger people are willing to let go of car ownership. How do you see transit agencies of the future operating?

### ANSWER

Katherine Eagan Kelleman – Tri-generational workforce and economy. Different generations with different sensibilities. Many young Millennials never owned a vehicle or have a driver’s license. Research on health impacts of walkable communities could influence the future to promote less driving. Transit is not likely to change much due to inflexibility of regulatory oversight agencies. Not known to be innovative. Individual transit agencies need to be creative. Public transit service cannot be compared to commercial logistics (UPS, etc.). Autonomy can’t replicate human thread of public transit.

Art Guzetti – Change will be incremental. A Millennials and Mobility research paper discussed what the best choice is for a particular trip. Options are no longer limited to personal vehicle vs transit. Jacksonville automation of skyway is interesting case example of innovation. Big market unfolding with auto companies pursuing the AV market. Market will move ahead of policy if policy cannot move fast enough.

Sheila Gombita – Public transit agencies need to prepare for the future by developing public/private partnerships to serve as mobility managers and address needs of elderly for “door-through-door” service.

Steve Buckley – A mobility organization is the organization of the future. What does that structure look like? Partnering? Government is not usually best for innovation or leading cutting-edge change.

Katherine Eagan Kelleman – Now is the time to acknowledge communities with the political will as the ones that will succeed where others will likely trail behind.

Art Guzetti – Policy framework identified by Robin Chase: plan together, prioritize people over vehicles, transportation beyond curbs, invest more in high capacity fixed route services, promote equity.

## AUDIENCE QUESTIONS

### QUESTION

What is the plausibility of dedicating lanes to AV transit buses—possibilities, thoughts?

### ANSWER

Art Guzetti – Transit regardless of automation is the key.

Katherine Eagan Kelleman – Seattle is a great example of infrastructure to support transit. AV in Tampa used ¾-mile busway to determine if AV shuttles will work. Interfaced with trained operators. Vendor was unable to provide prototype, but there is possibility for the future.

### QUESTION

Regulatory and equity: Advocates should place their efforts where—federal, state, or local level?

### ANSWER

Art Guzetti – All of the above.

Sheila Gombita – State-level: Autonomous Vehicle Task Force currently does not have public transit represented. Need to advocate.

Steve Buckley – Local.

### QUESTION

What are some of the most common misconceptions regarding AV and transit?

### ANSWER

- ¶ NC is the solution for linking transit trips; last mile.
- ¶ transit AV will solve mobility problems for disabled community and elderly.
- ¶ Although large and competitive, emerging market will focus on public good.
- ¶ Bus drivers can be easily replaced. Most people are not aware of the customer service/focused aspect of transit operators. The human element is forgotten.

## Goods Movement, Logistics, and Automated Freight



### **BECKY BRADLEY, EXECUTIVE DIRECTOR, LEHIGH VALLEY PLANNING COMMISSION, MODERATOR**

### **TED DENGEL, MANAGING DIRECTOR FEDEX GROUND, OPERATIONS TECHNOLOGY**

E-commerce is driving our growth by 15% to 20% every year with no signs of stopping.

New freight trips are being generated...home to store, warehouse to warehouse, and warehouse to store, etc.

Key transportation hubs are where we are going, not just FedEx or Amazon. This is a huge drain on the labor market and surrounding land use. Everybody wants their package quickly, but there is a cost to that.

Even without e-commerce, there is a huge driver shortage as that profession is not as attractive as other jobs to Millennials. We are also delivering to more and more rural areas and suburban areas. Challenges are driving us to automation, both in the warehouse and over the road.

Progression of technology: in-building autonomous vehicles, in-yard autonomous vehicles, on-highway platooning, on highway point-to-point, on-and-off highway, in city/neighborhood.

We hear about drones in the media, but we don't see that as a realistic option unless it is for disaster recovery. We don't see a future in it.

We need autonomy in order to survive. Autonomy is needed at the lowest levels of our operation to move people to higher levels. In the long run, this will help create jobs.

### **STEVE BOYD, VICE PRESIDENT OF EXTERNAL AFFAIRS PELOTON TECHNOLOGY**

We are focused on driver-assisted solutions.

There are an increasing number of truck original equipment manufacturers (OEMs) that are involved in platooning: Delphi, Daimler, Bendix, etc.

Peloton PlatoonPro is focused on driver teamwork, not self-driving trucks.

It only pairs trucks.

We are teamed with 3 of the 4 major truck OEMs in America.

Collision avoidance and disc brakes on all the axles of the tractors to reduce liability and improve braking, with easier maintenance.

4Efficiency reduces fleet fuel costs and emissions.

Driver-assisted platooning is a state-regulated issue. The automation we are doing is partial automation, similar to cruise control.

Legislation in Pennsylvania is expected to move forward soon in the Senate.

#### KEVIN PETERSON, CO-FOUNDER AND SOFTWARE LEAD MARBLE

E-commerce is driving logistics. It is easier to buy a pair of shoes from a distribution center 111 miles away than from one 1 mile away. Our logistical systems make it so. This affects everything from food to pharmacy products, etc.

Our infrastructure is not built to support that level of growth and commerce. In London, 10% of traffic is delivery trucks.

There are large personnel shortages. With 15% growth, you need new jobs and new processes in order to make the logistics system more efficient.

#### ANDY ALDEN, EXECUTIVE DIRECTOR INTERSTATE 81 CORRIDOR COALITION

Discuss trends impacting freight and why a transition to automated systems would be helpful to freight.

Just-in-time manufacturing impacts delivery and has become much more important. We have more handling and transfers than we've had in the past.

USDOT projects that overall freight levels will grow by 40% by 2045. Think of how long it takes to construct a new lane of highway.

70% of all goods by weight in the U.S. move by truck; 97% of all consumer goods.

Need to look at our inland highways and associated transportation concerns.

Our Liquid Fuels Tax base is insufficient. We are at about 51% of where we need to be. Need to move toward other approaches, such as a mileage-based user fee.

The Interstate was designed for 15% truck volumes, but it is at more than 41%. Ports are dredging to handle larger ships. Crash incidents account for approximately 25% of congestion nationwide.

Automate freight for efficiency and to reduce congestion, make up for the commercial driver shortage, and to improve safety.

94% of crashes are attributed to driver error. Machines don't get drowsy, high, or angry.

Freight automation applications include ports and intermodal drayage, highway, urban freight automation, and last-mile connections.

Unmanned aerial vehicles (UAVs) primary uses:

Physical presence/deterrents (clear wildlife from runways).

Transport: goods, weapons, materials, people.

Elevated and mobile platforms: verify congestion or an incident on the roadway, system host (e.g., cellular communication nodes).

#### AUDIENCE QUESTIONS/COMMENTS

##### QUESTION

What is the MPO doing regarding site planning?

##### ANSWER

Ted Dengel – We are looking at smaller buildings to take some of the burden off some areas that are very constrained.

##### COMMENT

Becky Bradley – MPO is in a partnership with 3 other states just to deal with the sort of freight issues we are experiencing. The types of warehouses are evolving. There are 13 different Amazon distribution facilities, for example. In the next six months, we will be issuing a land use guide for planners in Pennsylvania in terms of how we manage freight growth in land use management.

## Careers and Opportunities in Automated Vehicles



**EILEEN CIPRIANI, DEPUTY SECRETARY FOR WORKFORCE DEVELOPMENT, PA DEPARTMENT OF LABOR AND INDUSTRY, MODERATOR**

**ROBERT KOCH, DEPARTMENT CHAIR, OCCUPATIONAL TRADE PROGRAMS COMMUNITY COLLEGE OF ALLEGHENY COUNTY (CCAC)**

Teaches the automotive program at CCAC.

The current workforce of automotive mechanics/technicians is aging out.

Schools need to teach completely new repair techniques on autonomous vehicles.

Working on how community colleges can help businesses recruit and retain young employees.

**JOE KANE, SENIOR RESEARCH ASSOCIATE AND ASSOCIATE FELLOW BROOKINGS INSTITUTION METROPOLITAN POLICY PROGRAM**

Focuses on the intersection between infrastructure and economic development and how establishing metrics and finding data can paint a better picture.

There are more transportation workers than manufacturing workers. It's an overlooked sector in terms of workforce impact.

**ABBY LOUGHREY, AUTONOMOUS VEHICLE OPERATIONS MANAGER AURORA INNOVATION**

Builds software with auto manufacturers.

Manages the team of testers and focuses on hardware and software quality assurance.

What do we do with issues that can't be fixed by looking at a manual?

**JOHN DEVLIN, PRESIDENT AND CHIEF EXECUTIVE OFFICER PENNSYLVANIA AUTOMOTIVE ASSOCIATION**

Represents 900 new franchise car dealers and 100 heavy duty truck retailers.

There is a shortage of technicians that is worsening.

People who sell vehicles need to be trained in new technologies too.

## MODERATOR QUESTIONS

### QUESTION

How do we assess current/future state of talent when we're not sure where we're going?

### ANSWER

Robert Koch - Public outreach programs. CCAC works with the Pittsburgh Clean Cities Coalition for a public outreach event to promote alternative fuel and different types of transportation. This year's event will be in October in Oakdale.

Joe Kane - Skeptical of projections without data. We need to retrain existing workers on the newest technology. Rural vs. urban needs to be considered. Hopeful there will be more clarity over the next few years.

John Devlin – Vo-tech is different from what it was a few years ago. Math and science are critical.

### QUESTION

What types of candidates are eligible?

### ANSWER

Joe Kane - Non-traditional pathways should always be considered. You don't need to know how to code.

John Devlin - Second careers are possible. Schools need to improve STEM subjects. No coding needed, just problem solving.

Abby Loughrey - Problem solving is key. It has nothing to do with school/training. Aurora is looking for people who are excited by challenging problems.

Robert Koch - There is a hand skill part of the industry that isn't getting paid attention to. Co-ops/apprenticeships are really important. We need to emphasize mentoring. Advisory Councils need to be created and looped in.

### QUESTION

How do people in the workforce today get ready?

### ANSWER

Joe Kane - The days of people working for one employer are over. We need to clarify why people move employers and track/communicate better about those transitions.

John Devlin – The average automotive dealer has 40-50 employees. They're not good at mentoring. Government and community organizations could step in to help with mentoring process.

Abby Loughery - People need to get curious. We're handling traditional automotive technology (brake, steering, throttle) with software. Humans are good at adapting.

Robert Koch - We don't know what to tell people 45 and over. They don't want to change.

Abby Loughrey - Existing employees have plenty to offer, they just need a few more pieces of information. The education piece isn't as expansive as people claim it is.

### QUESTION

Are there ways of using computer games to get kids starting to think about transportation jobs? Do you know of any existing programs?

### ANSWER

John Devlin - I think computer gaming is a great partnership idea, but it would take large auto manufacturers to get it off the ground.

Robert Koch - Engagement is the key. Travel to local elementary school for second graders every year to demonstrate simple machines. It's difficult to invent something.

**QUESTION**

How do you engage women?

**ANSWER**

John Devlin - We're not doing a good job.

Robert Koch - We need to engage counselors to encourage women to go into transportation. Women engineers need to get involved.

Joe Kane - STEM industries need to be talking to each other about bringing minorities and women into the transportation industry.

**QUESTION**

Where is the current emphasis on AV?

**ANSWER**

Abby Loughrey – Commercial side of the industry.

John Devlin - Truck driver jobs are hard to fill. Finding people with CDL qualifications is really hard.

Eileen Cipriani - Elected officials need to know creative problem solving is a skill that needs to be worked on in schools.

**QUESTION**

Is there any way social media could expose kids to transportation jobs?

**ANSWER**

Robert Koch - Use video and social media, like the show "Dirty Jobs."

John Devlin - The social media kids use is constantly changing so a big part is keeping up with those trends.

Joe Kane - Branding needs to be prioritized.

**QUESTION**

What is your parting advice to policy makers on how to deal with emerging technology?

**ANSWER**

Robert Koch - Maintain funding sources for high schools and vocational schools. Training is becoming expensive and schools need to stay current.

John Devlin - Social media is critical. Young people are learning through social media platforms, so employers should consider using those technologies.

Joe Kane - We're at a unique economic moment between increasing diversity and an aging workforce.

Abby Loughery - The military is a good example of how to incorporate individuals from a variety of backgrounds. Individuals learn how to problem solve and learn new technologies.

## **PLENARY SESSION: ECONOMIC AND SOCIAL ROUNDTABLE**



**CAROL KILKO, DEPUTY SECRETARY FOR BUSINESS FINANCE, PA DEPARTMENT OF COMMUNITY AND ECONOMIC DEVELOPMENT, MODERATOR**

**DENNIS DAVIN, SECRETARY PA DEPARTMENT OF COMMUNITY AND ECONOMIC DEVELOPMENT**

- ¶The AV industry is, and will continue, utilizing PA universities and technologies.
- ¶Strong research and development is followed by increases in manufacturing.

**DAVID RUPPERSBERGER, PRESIDENT PITTSBURGH REGIONAL ALLIANCE**

- ¶There are currently 1,200-1,500 employees in the Pittsburgh area working in the AV sector. This number shows there is a lot of room for growth in this field.

**SUSIE SNELICK, EXECUTIVE DIRECTOR WORKFORCE SOLUTIONS FOR NORTH CENTRAL PA**

- ¶Workforce Development Boards are designed to keep the pulse on workforce needs of industries and AV is still being learned about.
- ¶AV poses the greatest transportation revitalization since the personal automobile over 100 years ago.
- ¶There are 49 occupations for growth in AV at an average salary between \$75,000-\$98,000.
- ¶The Center for Workforce Information & Analysis (CWIA) within the PA Department of Labor & Industry projects 200,000-250,000 jobs will be lost in PA due to AVs.

**SUE MUKHERJEE, ASSISTANT VICE CHANCELLOR FOR EDUCATIONAL INTELLIGENCE PENNSYLVANIA STATE SYSTEM OF HIGHER EDUCATION**

- How many of the projected 6.3 million jobs in 2026 will require post-secondary education and how do policymakers engage with communities/schools/workforce groups to encourage post-secondary attainment?

### **BRAD MARKELL, EXECUTIVE DIRECTOR INDUSTRIAL UNION COUNCIL AT AFL-CIO**

- 1 The debate over jobs gains/losses should be done in the public forum.
- 2 Manufacturing loss can lead to programming/repair gains.

### **SHOSHANA LEW, CHIEF OPERATING OFFICER RHODE ISLAND DEPARTMENT OF TRANSPORTATION**

1 Rhode Island's five principles of autonomy:

- 2 Safety
- 3 Sustainability/fuel reduction/environmental concerns
- 4 Improved/equitable mobility
- 5 Growing the economy and supporting workforce
- 6 Smart cities/data management/intellectual property

### **MODERATOR QUESTIONS**

#### **QUESTION**

As the agency responsible for community and economic development, how can DCED facilitate acceptance of AV?

#### **ANSWER**

Sec. Davin – Policymakers need to think of technology in how to best improve communities and businesses as well as account for technological advancements in disbursement of state resources. In other words, by the time an improvement is made, often the technology has made that improvement outdated and that needs to be accounted for.

#### **QUESTION**

Given Pittsburgh's growth, how has the Pittsburgh Regional Alliance's strategy changed?

#### **ANSWER**

David Ruppertsberger -

- 1 Adapting to AVs is a work in progress as some methods simply do not mesh with the sector.
- 2 There is a strong need to get beyond the research and development opportunities available in AV.
- 3 An examination will need to be done for the benefits of side industries tied to AV.

#### **QUESTION**

What does the workforce development system need to do to prepare for AV? Has it received any advice from the federal Department of Labor?

#### **ANSWER**

Susie Snelick - The workforce systems need to start planning now and partner with all interested parties, including those who may lose their jobs.

#### **QUESTION**

How has higher education begun to prepare for AV workforce needs?

#### **ANSWER**

Sue Mukherjee - Students are the state's richest asset, so the aim is to prepare them as much as possible for careers through a special attention to skills over specific jobs.

### QUESTION

What is AFL-CIO doing to prepare for AV?

### ANSWER

Brad Markell - AFL is bringing in experts to talk to members to prepare and learn about the field to help both workers and communities.

### QUESTION

What is the leading challenge Rhode Island is addressing? What was Rhode Island's stakeholder engagement?

### ANSWER

Shoshana Lew - Rhode Island is looking for the best places to test AVs—both from a geographic and economic standpoint.

•RIDOT is investing heavily in the infrastructure of the Providence Innovation District with AV in mind as well as aiming to fill the existing transit gaps.

•The State reached out to academics first (Brown, URI, etc.) followed by cities/towns/local communities.

## AUDIENCE QUESTIONS

### QUESTION

How do we strategize for those left behind?

### ANSWERS

Brad Markell – The challenge is to not leave anyone behind. AV provides a fresh start in transit equity.

Sue Mukherjee – There needs to be STEM improvement in minority outreach, but also keep in mind that older white men will be disproportionately left behind. This is an opportunity to create strong pipelines and we shouldn't wait for outcomes before advancing that effort.

Sec. Davin – There needs to be lessons learned from the natural gas industry, both positive and negative. One of the reasons PA is a leader in that field is it got ahead of the job loss concern.

Shoshanna Lew – This is still a human endeavor, with people making technological breakthroughs and being needed for the technical jobs.

### QUESTION

Is this the place to discuss guaranteed basic income as a way to deal with job displacement?

### ANSWER

Brad Markell – The universal idea in Labor is guaranteed basic income. It is a bad idea as it negates dignity and is socially disruptive.

### QUESTION

The lack of broadband is an issue heard time and time again. What is the governor doing to combat it?

### ANSWER

Sec. Davin – The governor views broadband as an equality issue and has taken finding a solution head on. A successful initiative will help the business and education communities.

**Tuesday, April 10th**

**BREAKFAST AND FEATURED SPEAKER**



**ALICIA NOLAN, PENNSYLVANIA DIVISION ADMINISTRATOR FEDERAL HIGHWAY ADMINISTRATION**

Recently assigned as the Pennsylvania Division Administrator. Worked through FHWA with Colorado DOT on AV technology and how it is presented to the rest of the country.

Pennsylvania has been doing a great deal with AV technology.

The country is learning about this new technology, including safety. It is a new frontier for transportation safety.

We embrace technology and take the risk, but with it there are challenges.



**BRYANT WALKER SMITH, ASSISTANT PROFESSOR, UNIVERSITY OF SOUTH CAROLINA, SCHOOL OF LAW**

Focus is to talk about the trustworthy company.

Background

South Carolina was a leader in the railroad revolution. The railroads were the best friend of Charleston. The first steam boiler explosion was also in South Carolina. Why? The engineer found the whistling sound annoying.

The Common Carrier Doctrine is a common law principle. It holds that particular companies who transport people from place-to-place have duties above and beyond the reasonable care standard—highest degree in care. In passing the courts recognized the responsibilities incumbent on companies starting in the industrial revolution with rail roads.

Manufacturing in the 1930s and 1940s brought about strict products liability, altering the relationship between consumer and producer. California Justice Traynor held the view that manufacturers owe obligation to the greater public and the public should rely on claims by companies as a remedy.

With shift in products and services comes shift in trust.

Shift in services—19th Century

Shift in products—20th Century

Shift from products to service in 2018

Today, there are new issues of trust. There is a loss of trust and the loss of the willingness to believe information presented.

Need to build trust and trustworthiness instead of lack of trust.

AV companies are trusted by the regulators. This statement is incorrect.

Regulations for vehicles are not approved.

Many of new technologies through vehicles have not been regulated and have no federal standards. Rather decisions are made by companies to deploy systems on vehicles.

Regulators do not have capacity. Therefore, regulators put trust in companies to have a responsibility to their consumers.

Reality: We trust that what we agree to is more or less reasonable.

According to Justice Traynor we do not have the capacity or knowledge to understand all risks.

Who reads Consumer Reports, the owner's manual of their vehicle, or the online agreement for a service or product that includes a checkbox saying you agree? Not many people.

What makes a company worthy of trust? How safe is safe enough?

It is unrealistic to expect there is a definitive answer before deploying. We use products and services that deliver value. Safety might not be the primary decision in using the service, e.g., Do you trust the Uber driver? Do you ask them for their driver's license? Can you trust a company? Are they worthy of trust?

Principles of Trustworthy Companies

Fidelity – A company keeps its promises; accepts liability when it is its fault (we will take care of you). AV levels of automation are promises.

Competence – This is controversial. We are not licensing software engineers but we expect that there are external steps taken to be reasonably safe—internal and external.

Public Expectations – People see promises not being made. Need to manage public expectations. Systems will not be perfect.

Reasonably safe – Market is based on what is believed to be reasonably safe system. Hardware, software, people, process. Companies should be willing to stand up and be reasonably safe. Makes subjective belief reasonable.

Updates evidence – The aviation industry has done this for years as matter of legal duty. Update products based on information and data available on products.

Acts in response to evidence – If a company sees a safety concern, it does something about it.

Mitigates harm – A company mitigates harm in the event of failure because there will be failure.

Recognizes when failure causes harm and fully and properly compensates – Different from law. Should not rely on non-disclosure agreements, e.g., would not accept that from a stock. Have at least the same expectation from AV technology.

Give a full accounting of incidents and response – Are companies willing to step up and provide information?

10. Need to have innovation in technologies, but also approaches to validate. Need to be new approaches to demonstrate safety as well as flexibility and discretion to companies that innovate.

11. With great power comes great responsibility. Companies have tremendous power over lives and how we live. Including obligation to earn and be willing of public trust.

## **PENNSTART TESTING AND TRAINING FACILITY**

### **SECRETARY LESLIE S. RICHARDS PENNSYLVANIA DEPARTMENT OF TRANSPORTATION**

Announcing a partnership between PennDOT, PA Turnpike Commission, and Penn State University to begin site planning and design for an AV safety training facility.

Pennsylvania Safety, Transportation and Research Track (PennSTART) will be a state-of-the-art facility envisioned to benefit emergency responders, transportation organizations, and research institutions ([www.Pennstart.org](http://www.Pennstart.org)).

PennSTART is designed to address safety, training, and research needs in six key areas: traffic incident management (TIM); tolling and intelligent transportation systems (ITS) technology; work zones; commercial vehicles; transit vehicles; and connected and automated vehicles.

A press release will be issued during today's Summit.

PRESS RELEASE: [www.penndot.gov/pages/all-news-details.aspx?newsid=480](http://www.penndot.gov/pages/all-news-details.aspx?newsid=480)

### **MARK COMPTON, CEO PENNSYLVANIA TURNPIKE COMMISSION**

There are 1,188 traffic deaths each year in Pennsylvania. We are trending down, but it is not enough.

We have said enough is enough. Putting workers on the other side of cones is dangerous.

This research is impactful and ensures the continued safety of travelers and responders now and in the future.

### **NEIL SHARKEY, VICE PRESIDENT FOR RESEARCH PENN STATE UNIVERSITY**

PennSTART will provide teaching and research while ensuring the safety and advancing safe vehicle automation.

It will merge research with technology transfer, leading to deployment.

## **EXECUTIVE CHAT: POLICYMAKER MEETS PIONEER**



### **SECRETARY LESLIE S. RICHARDS PENNSYLVANIA DEPARTMENT OF TRANSPORTATION and CHRIS URMSON, CHIEF EXECUTIVE OFFICER AURORA INNOVATION**

Secretary Richards and Chris Urmson discussed trends in AV technology, leadership, and the future.

Questions were posed by Secretary Richards.

#### **Discussion Questions**

##### **QUESTION**

You moved from CMU to Google. What do you see as the biggest concerns and challenges moving forward?

##### **ANSWER**

When we started AV with Google, we asked, “Is this possible? How do we thoughtfully introduce AV technology and how does it benefit society?” Over-trusted the capabilities of the technology. On a prototype you need to pay attention. Get technology to the point where you could turn your back. Get product safe and compelling for user. Convinced it will be delivered and figure out how we make that happen.

##### **QUESTION**

How does Aurora help build message of safety? One of the biggest challenges of public buy-in success is how the public embraces the technology.

##### **ANSWER**

Not only public buy-in, but make sure they are appropriately conscious of the technology. The use of technology terms can lead to confusion about what you are talking about. There is a difference between driver assistance technology and driverless technology. There is a communication challenge. Explain to people what the true competence is and when will we deliver. Building trust is very important. Give policy makers a transparent view. Aurora’s mission is to deliver: safely, efficiently, broadly.

### **QUESTION**

We anticipate the workforce make-up of PennDOT will look different in the future. What type of skill sets do you want to have for innovation and safety? Who do you want?

### **ANSWER**

Safety is first. Benefits of AV technology: safely, efficiently, broadly. The status quo is unacceptable. What we have now is broken. It won't be perfect, but better over time and drive to zero crashes. Workforce development for the industry requires very broad skill sets. We are deep into software technology which is complicated by most product standards. How is technology integrated into local transportation regulations in cities; how do legislators develop thoughtful policy? Operational and have process around it. It will require a broad set of people and will be much less of a monoculture.

### **QUESTION**

Aurora has California operations in San Francisco and Palo Alto and now in Pittsburgh. You have opened 40,000 square feet of space in the city. What is the coolest thing you have gotten to do?

### **ANSWER**

Being with Mike Wagner in the Atacama Desert. It's as close to Mars as you can get.

Participated in an Ambassador of Technology presentation and spoke after a doctor who developed medicine for people who are blind. Suddenly they could see. He was recognized for his work benefitting people who couldn't see and improving their ability to get around. This demonstrated that the work we do is very impactful for people. We all take transportation for granted, but it is a fundamental part of everyday life. Six million people don't have that freedom. The ability to positively impact how they get from point A to B on their own is profound.

Sec. Richards – The technology is good for the elderly as it increases the ability to get around. Don't have to say, "maybe you should hand the keys over."

Chris Urmson – We are social animals; improving the ability to get around is profound.

### **QUESTION**

What are the best ways for public and private sectors to work together?

### **ANSWER**

Communication is the most important. Engage between the public and private sectors. Make sure you aren't surprised. Learn what matters from stakeholders. It is a great responsibility to work with the public sector to hear voices. Provide a safe space to share. Have frank conversations and provide details. But there is commercial reality in a highly competitive space. Companies need commercial privacy.

### **QUESTION**

What is different working in California and Pennsylvania? You weren't aware of what was going on in Pennsylvania until recently. What are you looking for? Improve the messaging?

### **ANSWER**

We have been engaging with NHTSA and California DMV having very open and frank dialog. Pennsylvania did not have this type of dialog in the past. Not aware it was on a priority list in Pennsylvania. Legal climate in the U.S. is critical to innovation. Innovation is quicker in the U.S. versus Europe. In the U.S. you can do something unless the law says you can't. In Europe, unless there is law, you can't. This allows the U.S. to innovate dramatically.

The way the federal government operates is a very thoughtful response without being overly prescriptive. When you get a vehicle on the road it will look very different. Make sure regulation is not overly prescriptive so changes can be made.

**QUESTION**

How do you view competition? Pennsylvania is working on an autonomous shuttle—Slow-moving transit from an airport to campus to a train station.

**ANSWER**

Technology is too important to have an egocentric view. We need technology to be broadly adopted. Status quo is not acceptable. The technology is important both socially and as an economic boom. The more skilled people in a space, the more minds; the better the result.

**QUESTION**

There are so many unknowns at this Second AV Summit. One thing we can agree on is there are so many unknowns. How will transportation look in 2028? Pick a few things.

**ANSWER**

See the broad deployment of self-driving vehicles. First through transportation networks. In fair weather cities, public transit buses, human drive augmented by last-mile mini carriers. These should be at a price point either revenue-generating or revenue-neutral. Los Angeles turnstiles provide only 11% of the actual transportation budget. Decrease the cost by factor of 10 to offer real public transit not sapping local budgets. A handful of companies providing and disappointingly difficult to develop. Partner with technology companies to provide the interface and autonomous driving vehicles. Reduce road fatalities by 5 - 10%. It takes 15 years to turn over vehicles. It will be an exciting place in 2028.

**QUESTION**

At what point does PennDOT not issue driver licenses?

**ANSWER**

It is a ways off. There will be a place and time when people will drive for sport and fun and the menial part of driving goes away.

**QUESTION**

There are certain things about being in a car, especially for kids. Keys, freedom, it is exciting. What will that mean for kids and how we get around in the future?

**ANSWER**

Be in control and in control in your destiny. You move from being helmsman to captain—take me there. Still have control. For young drivers that part is the most dangerous. Same ability to control but not having to drive is pretty appealing, but with lower risk. I don't see it as a loss of freedom in any way.

**QUESTION**

Are there any topics that weren't covered here that we should be aware of for future conferences?

**ANSWER**

We need to find a good way to talk to the public about what is different about the layers of autonomy. The five SAE layers (1, 2, 3, 4, 5) are a good engineering tool, but it doesn't speak to people. Within the industry there is also confusion. We need to come up with accessible language to talk to the public. Fully self-driving through different systems of assistance. How do we educate about what different systems are and what to expect?

## QUESTION

Conversations are becoming easier but there are still worries about union impacts. People see it is coming. Automakers talk about and they assume they will not be selling more and more cars. Younger people don't want to own cars so business models will change. Are you surprised by those conversations?

## ANSWER

A technology that deeply impacts all of us is always a challenge. Don't see how it doesn't happen. Our livelihood is wrapped up in transportation. How as a society and nation do we provide for a transition? It has been done poorly in the past. If not done correctly, based on macro-economic trends the individual impacts could be devastating. Moving from one industry sector to another is no easy answer. We are starting to think of it now and we need to have those conversations.



## PLENARY SESSION: THE LEGAL LANDSCAPE



### **JASON SHARP, CHIEF COUNSEL, PENNSYLVANIA DEPARTMENT OF TRANSPORTATION, MODERATOR**

- Introduced panelists.
- Follow-up with PennDOT perspectives after panelists.

### **EMILY FRASCAROLI, COUNSEL FORD MOTOR COMPANY**

- Why would Ford send a lawyer to an AV summit?
  - There are mobility issues around the country. Benefits of AVs are substantial in terms of mobility, lives, congestion.
  - The rapid advance of AV technology is important. Lack of regulatory framework is a barrier to innovation. Freedom of movement drives human progress.
  - Trust and consumer opinion is important.
  - Terminology – Consistently describe the wide range of vehicles and technology. Be clear and concise about discussing new technologies. New aspects require different types of discussion.
    - The Society of Automotive Engineers (SAE) has developed levels of automation for clear discussion. Today we will discuss Level 4 and above.
  - At the federal level, there are no existing requirements unique to AVs.
  - The NHTSA federal autonomous vehicles policy is a non-regulatory approach to ensure state and the federal governments have tools to make roadways safe.
  - Why did NHTSA introduce voluntary guidance instead of rulemaking?
    - Avoid patchworks of requirements.
    - Tools interpretation and exemption.
      - Interpretation requests to NHTSA for exemptions on up to 2,500 vehicles.
    - S1885 AV Start Act passed the House. Delineates clear responsibility. NHTSA sets federal performance.  
<https://www.congress.gov/bill/115th-congress/senate-bill/1885>

Ford and Domino's Pizza are working on a pilot to assess the role of self-driving vehicles in groups from the consumer perspective. Pilots are in Ann Arbor, Michigan; and Miami, Florida. Vehicles are manually driven by a safety engineer. Consumer reactions/perspectives with the technology are assessed in an effort to build consumer trust.

### BRYSON DATT, MEMBER BURNS WHITE

Liability issues – Will speak to how liability is currently established and the legal framework for future accidents.

Civil litigation is incredibly common. Accidents are the greatest catalyst for new litigation with over 100 deaths per day. As much as a fully loaded passenger jet.

According to NHTSA, there were 6 million accidents in 2010 and twice that number occurred and were not reported to police. A total of 94% of accidents are caused by operator error. Only 2% of accidents are attributable to the vehicle. For operator error, most claims are based on the theory of negligence.

Negligence – driver (94%)

- Duty of care to plaintiff.

- Breach of duty of care.

- Causation – failure caused accident.

- Damages were sustained – injury and property damage.

Product liability (design defect) (2%)

- Risk of utility test

- Consumer expectations test – must prove as safe as a reasonable consumer would expect.

In the future, increased technology and less dependence on human pushes liability to the product rather than the driver. Complex product liability claims are costly, long, and proprietary technology is at risk. However, there are fewer accidents and deaths. Some law firms will be seeking product liability claims.

Is the traditional court system the appropriate venue for AV-related litigation?

- Good as is Legal System – based on search for truth, the judge, and random jurors.

- Entering a new era – look at a new system for taking on AV issues.

Litigation is highly expensive and extremely costly. Exhaustive, time-consuming, intrusive.

Under discovery, confidential, proprietary information is shared. Information is detailed, comprehensive, often difficult to comprehend, and confusing for some jurors. Many believe current framework is fine, others think it is not ideal.

What are the solutions?

- Avoid litigation – If data is harvested, preserved, interpreted it could help determine who was at fault. Unique position in this industry to present data.

- Arbitration clause – Consumer contract to limit ability to file a lawsuit in a traditional court system. Much attention after the Arizona accident. According to Sen. Blumenthal, the concern is how the arbitration clause is scrutinized. Fair, but needs to be resolved by educated jurists.

- Specialized Court – limited and exclusive jurisdiction. Technical complexity so therefore a possibility. Nothing mentioned so far.

- Artificial Intelligence – Consider AI a “driver” with moral and legal liability.

- National Car Insurance Fund – Northwestern University Law Review article. For riders, car-sharing companies. Money maintained in a fund by NHTSA.

<https://scholarlycommons.law.northwestern.edu/cgi/viewcontent.cgi?referer=https://www.bing.com/&httpsredir=1&article=1213&context=nulr>

Currently, litigation is based on operator error. In the future there will be fewer accidents, and litigation, when it does occur, will be based on the theory of product liability. It may make sense for companies to look at alternative legal frameworks.

### JASON SHARP, CHIEF COUNSEL PENNSYLVANIA DEPARTMENT OF TRANSPORTATION

Pennsylvania's AV Taskforce including PennDOT, DCED, Department of Insurance, PSP, academia, etc., has been beneficial.

It is helpful to learn from other people because this space didn't exist before.

Draft best practices that could be put into place in anticipation of legislation.

SB 427 – Testing liability legislation pending in state senate.

HB 1952 – Rep. Rothman bill work zone automated vehicle. Work zone safe. Passed House 191 – 0.

Are self-driving cars legal? Probably legal but don't know for certain.

If it is not prohibited you can do it. Written laws imply that a person is driving.

There are references to animal-drawn transportation in legislation, but not AV.

Want to make it clear, to make it legal. Transitions have been done before: horse - train - car - driverless.

Learn lessons from past deployment.

AV will bring so many benefits and disruptions that it is not transportation issue, it is an everything issue.

Educate human drivers about HAV operations. There are many areas to address:

Govern behavior of people so people are not gaming the system.

Transit as the last-mile connector. Will there be shared ownership of fleets?

Vehicle code – You and your vehicle. How does it look when you don't own or have a timeshare or are transported by a transit firm? How do you pay your fair share going forward? Regulate driver and owner—what about transit and public transit agencies?

Land use issue – zoning office. There is currently a sea of parking. How does parking look when you are "Waiting for my car be called around?" Does the parking footprint reduce? What does that look like when the AV fleet changes the traffic pattern? How does it affect local land use?

Safety inspections – We don't know. In Pennsylvania at what point do you look at modifying and changing inspection because car and driver are one? What do you test driver for? Different types of vehicles on the road.

Passenger responsibilities – People that might choose to not learn how to drive. What are their responsibilities? Just a passenger?

Traffic stops – Are you in the vehicle? Modify laws like Lt. Ianuzzi said earlier.

Safety is the primary mission. In addition to fatalities, there are injuries that bring financial and emotional scars. The potential for what it can save is unbelievable.

## **FACILITATED SESSION: FEEDBACK**



### **SHERI COLLINS, DEPUTY SECRETARY FOR TECHNOLOGY AND INNOVATION (MODERATOR) PA DEPARTMENT OF COMMUNITY AND ECONOMIC DEVELOPMENT, MODERATOR**

Facilitated discussion to obtain feedback on issues discussed and content of the conference.

Safety is paramount. The appropriate level of testing is needed to save lives.

It is important to be constantly aware. Be cognizant of having situational awareness.

Accessibility of AV technology is key to success. Not created equal but should be afforded the same opportunities to be successful.

### **Moderator/Audience Questions/Comments**

#### **QUESTION**

What do you think about the AV Policy Taskforce?

#### **ANSWER**

Amy Kessler, NCRPDC – Throughout the conference, noticed discussion of pilot programs and testing in urban communities, but not rural communities. Rural communities are disadvantaged by limited transportation options. How do we test for rural solutions?

Roger Cohen, PennDOT – This is a very important challenge. The Governor has made a broader agenda in bridging the urban–suburban–rural divide, education, medical access, and broadband. We want to hear ideas from rural planning organizations. MPOs like Tri-County Regional Planning, DVRPC, and other more urban areas are already providing suggestions. We would like to hear RPOs come up with pilots and ideas. Northern Tier has ideas for rural transit filling gaps. PennDOT will be looking for pilots.

Amy Kessler, NCRPDC – Consider the North Central RPO as part of that rural voice.

#### **COMMENT**

Stan Caldwell, Carnegie Mellon University – CMU's Traffic 21 institute was awarded \$300,000 to develop innovative projects under Mobility 21's Smart Mobility Challenge. PennDOT, DCED, SPC, Allegheny Conference partnered with the 10 counties in the region to address the real-world problems with technology. The award funded six municipalities and four counties. CMU would like to expand on that next year and is interested in taking it statewide. Good model to demonstrate not just about cities but rural needs. <http://mobility21.cmu.edu/smart-mobility-challenge/>

## QUESTION

Joy Ruff, JMT – Participated in discussions of goods movement logistics and automated freight. Commend link with planning and education. Learned about space and land use models and freight logistics. Will the AV Task Force be thinking about tools needed by local and county government? There will be a changing world of site development. If not, please do.

## ANSWER

Roger Cohen, PennDOT – Asked Will Clark from York County Planning Commission about land use. AV Task Force has had an early focus on safety policy. Many more interests have asked to be task force participants. Community and regional planning is the key to safe testing and deployment. With a more connected environment we can create a safer platform for automated vehicles.

Shari Collins, DCED – Engagement with legislative members is needed. Understanding challenges and work that needs to get done. Jason Sharp discussed progress and there is a long way to go. Need to do it right. Utilizing higher education through Penn State, the PA Turnpike Commission, and PennDOT will focus on workforce development. L & I speaker was not as concerned with unions, but about the new opportunities the technology brings.

Rick Vilello, DCED Deputy Secretary Community Affairs and Development – Oversee all 2,561 municipalities in Pennsylvania. Smallest is a 12-resident municipality in Clinton County. Concerned with distressed municipalities that have monetized parking systems to pay pension obligations for a 60-year period. What are these communities going to look like in 20 to 30 years? Some local governments are milling paved roads and turning back to gravel roads. Some do not have a computer. Parts of the discussions were very exciting while others were very scary. Local elected officials do not have the capacity to address. The transition will be much faster than transition from horse and buggy to automobile. Local governments are nowhere near far enough along. They are focused on addressing pensions, healthcare, sewer, and water.

## QUESTION

Shari Collins, DCED – How many local elected officials are at the summit? Some concerns from local elected officials were heard at the September 2017 PAAV Summit in State College. There is uncertainty. What will impact be on some communities?

## ANSWER

Matthew Doebler, Pribanic & Pribanic, LLC (also a Commissioner from Aleppo Township, Allegheny County) – Presented in the fall to the Western PA and Allegheny County Association of Township Commissioners. There were a number of eye rolls and blank stares. Decisions are being made in Borough and Township meetings where officials do not understand the impact yet. The Borough of Sewickley is working on a new parking garage. We really need to be building those connections.

## COMMENT

Ron Drneovich, State Transportation Commission – What we don't have is a realistic projection of how it can evolve over time. Developers indicate technology is ready in 2 to 3 years. Rural communities have no idea what is going on. This will evolve over time. What is the realistic curve?

## COMMENT

Brenda Beal, PA Turnpike Commission – What will insurance look like in 20 years? What about commercial side? What will it look like for service plazas, truck stops, how do we move freight? What do we move at point A and B?

## COMMENT

Cody Houser, GAI Consultants – Constituents are not pressuring officials because they are not aware of the issue. Go on a Friday afternoon or Saturday to where people are. Have citizens hear from all the experts. Outreach about the future.

Barb Sloan, Cambridge Systematics – Benefits afforded to elderly. Are there equal efforts to educate population so they are not afraid to be involved in technology? Is the elderly population represented? Is ARC on taskforce?

Roger Cohen, PennDOT – Mark Kopko met with ARC to be aware of concerns and there is will and eagerness to engage. ARC is putting together classes for elderly drivers to deal with new technology. So many areas of interest are starting to converge.

## COMMENT

Becky Bradley, LVPC – Lehigh Valley has the infrastructure in place to work on the land use and transportation connection. We already have access through municipal governments. Similar to local officials. Our economic development community does not know what is coming at them—educate to recruit business in partnership with planning community. Freight community already moving in direction of automation. Ways to support as subtask is a key as PA is a funnel for freight.

#### **COMMENT**

Helen Loeb, Children's Hospital of Philadelphia – How do you connect with elderly? A highlight of the Summit was the talk about accessibility for people with a disability. Glad this was in the program. CHOP conducting research on driving simulator for the self-driving situation. All demographics are being recruited to participate: socioeconomic status, age, gender. What do they know? Go in a simulator ride. What do you think? There is a difference in terminology. For older people, self-driving means a car that you drive yourself. Very important to connect through education. Conduct town halls, find new ways to relate to it.

#### **QUESTION**

Chris Prisk, MASITE President – Is there a scenario to end autonomous vehicles from use due to the Arizona accident? What could we do now to make sure it doesn't happen?

#### **ANSWER**

Sheri Collins, DCED – Town halls can be used. Governor Wolf has initiated “Cabinet in Your Community” to pull together state agency secretaries and go out into communities for open town hall sessions. There might be an opportunity to use this platform for AV outreach.

#### **QUESTION**

Dave Totten, SPC Transit Section – There are conflicting predictions about AV impacts and skeptics of the last-mile solution. Is there an opportunity to use existing demonstration service program to do some autonomous vehicle pilots for last-mile?

#### **ANSWER**

Roger Cohen, PennDOT – Working with PSU Harrisburg to deploy autonomous shuttle on campus to connect to new Amtrak Middletown station and then on to HIA. Financed with transit grants. Hopefully more of these kinds of pilot ideas come forward with PennDOT.

Andrew Blum, PennDOT – We will collect and use data one pilot at a time.

#### **COMMENT**

Barry Einsig, Cisco – Automated systems feel like a lifetime away. Would like to see actual demonstrations or site visits for the small steps. People need to see that we can share small, incremental steps and help build credibility for small governments. Have a conversation about parking. Parking revenues down. Shared vehicles happen now.

Shari Collins, DCED – Parking was discussed at 2017 PAAV Summit in September. Many municipalities would have open curb space. There is potential for revenue generation, but different revenue levels compared to what we have today.

#### **QUESTION**

Sheri Collins – How does mass transit play in the space? How do we engage them in conversation?

#### **QUESTION**

Eric Boerer, Bike Pittsburgh – No bike and pedestrian representation on the AV Task Force. We are sharing road with AVs every day. Surveyed 1,000 people in Pittsburgh region about their interaction with AVs and received a mixed response. People feel hopeful for potential safety improvements. Some are more comfortable with AV than with human drivers. If there is an issue with AV cars, who is it reported to? There are no “How is my driving?” stickers. Report that an AV passed so close that a mirror hit a pedestrian. Not enough to contact 911. What do citizens do in those situations? People have worries. Will the machine pick up bad habits? There is hope in technology, but practical fears.

#### **ANSWER**

Sheri Collins, DCED – Autonomous vehicle will always be cautious. In a test vehicle on a Pittsburgh bridge—a normal driver would have sped up and cut the car off. The autonomous vehicle let the car move in. Like Bryant Walker-Smith discussed, with power comes responsibility.

## QUESTION

Sheri Collins, DCED – If you could ask one thing of the AV Policy Task Force what would it be? Is there one thing to share or are there areas of discussion to focus on?

## ANSWER

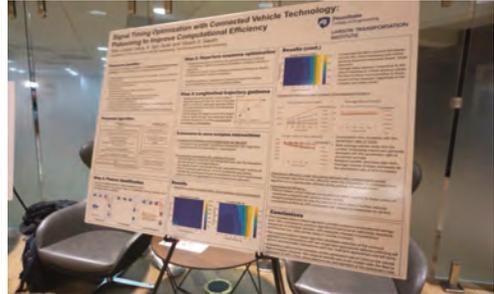
Ann Sellers, Structure Green Design Group (also elected official, designer, stormwater manager, involved with various trail groups) – Automated vehicles impact everything. Reduction in parking, reduced amount of parking lots and impervious areas, stormwater management benefit. Developers might ask, “What's in it for me?” Taxpayers might ask, “How does this reduce taxes?” Connectivity via automated vehicles means lots of tangential, happy outcomes.

Audience member comment - The Level 1 driver systems we see in our work in truck systems are beneficial and there is an ongoing role for operators. There are new, good jobs and the health of drivers will improve. People will be able to take a break. The fears that have been stoked aren't happening. The conference provided information to talk better and more effectively about the new good jobs and amazing technical support jobs in freight system.



## GALLERY – PA AV SUMMIT 2018 MOMENTS





**APPENDIX A**

**2018 PENNSYLVANIA AUTOMATED  
VEHICLE SUMMIT PANELIST BIOS**



**Andy Alden** serves as the Executive Director of the Interstate 81 Corridor Coalition and leads the Eco-Transportation and Alternative Systems Research Group at the Virginia Tech Transportation Institute. He is a registered professional engineer who has worked in the environmental and information technology fields, as well as the development and deployment of vehicle data acquisition systems. His current focus is advancing safe and sustainable transportation through the application of emerging and alternative technologies. Recent research has focused on automated “last mile” shuttles, road weather safety, bus transit efficiency, animal-vehicle conflict, applied road salt impacts, and the use of unmanned aerial systems in support of surface transportation.



**Sanah Baig** is the program director for economic development, resilience and transportation and infrastructure in the County Solutions and Innovation (CSI) department. In this capacity, she develops and manages research, training and technical assistance programs designed to elevate thought leadership and convene networks of county government officials with federal, business and philanthropic leaders. These programs cover a wide range of topics including economic diversification in transitioning economies; solar energy deployment; disaster recovery and resilience planning; and innovations in transportation planning. Before joining NACo, Sanah worked for the U.S. Department of Agriculture in a variety of capacities. Most recently, she served as an advisor to the secretary on rural development programs, the rural opioid crisis and special projects. Prior to that role, Sanah was a special advisor for the Rural Opportunity Investment Initiative, acting deputy White House liaison and confidential assistant to the undersecretary of marketing and regulatory programs. Sanah holds a bachelor’s degree in foreign affairs and psychology from the University of Virginia and speaks fluent Urdu/Hindi.



**Fred Bergstresser** is Government Account Manager for Royal Truck & Equipment, managing government activities including procurement strategy, government relations, and Royal’s representation on NCUTCD Temporary Traffic Control (TTC) Technical Committee, ATSSA Innovation Council, Pennsylvania Automated Vehicle Policy Task Force, and is a founding member of the Automated Vehicle Coalition. Fred leads Royal’s Autonomous Impact Protection Vehicle (AIPV) project.



**Stephen Boyd** is Co-founder and VP of External Affairs for Peloton Technology, a Silicon Valley-based connected and automated vehicle technology company that is bringing innovations in safety and efficiency to the freight transportation industry. In this role, he leads public affairs, government relations and market development for the company. For the last decade, Steve has worked with leading edge transportation and energy enterprises and advocated for policy change and market innovation to accelerate progress in these sectors. Previously he has served as an Assistant Press Secretary in the White House, a Producer at the PBS NewsHour, and held a variety of roles with technology companies, federal agencies, political campaigns, and public policy initiatives. Steve holds an Environmental Science degree from Pennsylvania State University with minors in Economics and Political Science and studied international business at the University of Manchester (UK).



**Becky Bradley** has 20 years of experience in city, regional, economic development, historic preservation, and transportation planning, including significant implementation experience in small town revitalization, roadway re-design, and trail construction. She has been the Executive Director of the Lehigh Valley Planning Commission (LVPC) since August 2013 and is leading a \$3.3 billion regional transportation planning program, as well as balancing the needs of the Lehigh Valley's rapidly growing population through this organization's county planning responsibilities. Prior to joining LVPC, Bradley was the Director of Planning, Codes and Development at the City of Easton, where she was instrumental in the over \$500 million revitalization of the community, including the addition of the Lehigh Valley's first sculpture trail, the state's first road diet and the opening of over 60 restaurants and shops. Bradley lives with her husband and beloved dachshund in rural Lehigh County. They are avid hikers and can often be found on the Appalachian Trail over the weekends.



**Steve Buckley** has over twenty years of experience in the transportation industry including design, operations, maintenance, policy, planning, programming, and funding. Steve recently served as General Manager of Transportation for the City of Toronto. While in Toronto, Steve initiated and led a City working group on Automated Vehicles, commissioned the white paper "Driving Changes: Automated Vehicles in Toronto", and created a Divisional Automated Vehicle Work Plan. Since then, he has been invited to speak by over two dozen State DOTs, MPOs, transit agencies, and City DOTs on how public sector agencies can plan for and shape the introduction of AVs into cities. Steve earned Master's Degrees in Transportation and in City Planning from the University of California - Berkeley and a Bachelor's Degree in Civil Engineering from Syracuse University. He currently serves as the Chair of the Transportation Research Board's Committee on Transportation Issues in Major Cities, and serves as a Lecturer in the University of Pennsylvania's City & Regional Planning program.



**Eileen Cipriani** is deputy secretary for workforce development at the Pennsylvania Department of Labor & Industry. In her role, she oversees the commonwealth workforce system, which includes 23 local workforce areas. Eileen was instrumental in the planning, drafting and now implementation of Pennsylvania's first comprehensive state plan under the Workforce Innovation and Opportunity Act. In her current role, she oversees the implementation of WIOA as the many changes are executed statewide. She coordinates the departments interagency projects that are an effort to facilitate collaboration and reduce duplication in workforce service delivery. In addition to her work as Deputy Secretary, she is also a member of the STEM Advisory Committee, TEAM PA, the PA Interagency Health Equity Team, PA Assistive Technology Council, Aging Council Workforce Workgroup and the Environmental Quality Board. She has a Bachelor of Science from Bloomsburg University and a master's in organizational management from Misericordia University. Eileen lives in West Wyoming, PA with her husband. They have two grown children.



**Mr. Bryson Datt** is the co-chair of the Transportation and Logistics practice group at Burns White. He maintains a diverse litigation practice with a focus on representing national and regional transportation clients in the defense of catastrophic losses. He also regularly advises transportation and logistics clients on business operations, insurance coverage, and regulatory compliance. In addition to his transportation practice, Mr. Datt counsels and represents clients on complex commercial litigation matters. His experience includes protecting and furthering clients' interests in business and commercial disputes, unfair competition, and trade-secret and business-protection litigation. Mr. Datt is a 2004 graduate of the University of Pittsburgh School of Law. He received his B.A. in East Asian Studies and Politics from Washington and Lee University in 2002. Prior to attending law school, he worked at the Chinese University of Political Science and Law in Beijing.



**Dennis M. Davin** was appointed to serve as Secretary of the Department of Community and Economic Development in January 2015 by Governor Tom Wolf. Prior to his appointment, Secretary Davin served as Director of the Allegheny County Economic Development since March 2004. During his time at the Allegheny County Economic Development, Secretary Davin was responsible for the overall development and implementation of the economic development strategy for Allegheny County. He managed funding from local, state and federal resources to implement economic development activities such as: site development, new job creation initiatives, community development and affordable housing for approximately 1.25 million citizens in 130 municipalities. He also served as Director of the Allegheny County Redevelopment Authority and Executive Director of the: Industrial Development Authority, Hospital Development Authority, Higher Education Building Authority and Residential Finance Authority. Secretary Davin is a former board member and treasurer of the Allegheny County Airport Authority; as well as a former member of the Pittsburgh Regional Alliance Partnership, Three Rivers Workforce Investment Board, International Economic Development Council, and National Association for Industrial and Office Parks, as well as a Carnegie Mellon University Center for Economic Development Fellow.



Since 1993, **David De Notaris** has had the privilege of serving as a job developer, assistive technology instructor and coordinator of independent living, advocacy and work-based learning initiatives. As the Executive Director of the Pennsylvania Office of Vocational Rehabilitation, he currently leads an amazing team of over 900 dedicated professionals, investing approximately \$200M in state & federal resources to assist individuals with disabilities in achieving competitive, integrated employment. Last year, OVR worked with 6,000 employers and helped over 9,300 residents of PA who happen to have disabilities find jobs, resulting in a return of \$77M in state and federal dollars. David believes that access equals success: when we can help individuals with disabilities access the same information as their classmates, neighbors, colleagues and peers, they can get the same education, training opportunities and jobs! David and his wife Mariann live in Hershey, PA with their 3 children David, Marykate and Emily and their big dog Valentino.



**Ted Dengel** is the Managing Director, Operations Technology, for FedEx Ground. In this role, Ted leads a team of technology professionals responsible for the research, development, implementation, and support of field-based technologies at FedEx Ground. These technology areas include automated parcel sortation, mobile and fixed automated data collection (scanning, imaging, weighing, and dimensioning), and robotics. Ted also chairs a FedEx enterprise-wide technology council focused on identifying common technology solutions across all FedEx operating companies and ensures collaboration and consistency in the application of new technology. Ted has more than 23 years' experience at FedEx Ground in operations technology and other operations engineering functions. He holds a bachelor's degree in industrial management from Carnegie Mellon University and a master's degree in industrial engineering management from the University of Pittsburgh.



**John Devlin** is President and CEO of the Pennsylvania Automotive Association where he has held various positions over the last 35 years. John received the designation of CAE Certified Association Executive in 1997. He's been active in the community. He is past President of Big Brothers/Big Sisters of the Capital Region and serves on the PCRB (PA Compensation & Rating Board) classification and rating commission. John is a graduate of The Pennsylvania State University and has a degree in accounting and finance. He currently serves as Chairman of the Board of Members 1st FCU.



**Courtney Ehrlichman** is Principal of The Ehrlichman Group. The Ehrlichman Group radically re-visions mobility and prepares communities and organizations for a digital and autonomous future. Prior to The Ehrlichman Group, Ms. Ehrlichman served as the Deputy Executive Director of the Traffic 21 Institute and Mobility21 National USDOT University Transportation Center at Carnegie Mellon University. During her tenure at Traffic21, she oversaw research and deployment of transportation technology projects in partnership with USDOT, PennDOT, and the PA Turnpike, growing a USDOT Tier 1 center to a USDOT National center with over \$45 million in research funding and an expanded multi-modal focus; led academic commercialization efforts; served on the ITSA Advocacy Trust where she contributed to the development of Federal AV legislation; and created fellowships for students to increase diversity in the workforce. Courtney proudly serves as a board member of the Intelligent Transportation Society of PA and is a founding member of the Women's Transportation Seminar Pittsburgh Chapter. She received her Bachelor's degree in Architectural Studies from the University of Pittsburgh and her Master's degree in public management from the Heinz College at Carnegie Mellon University.



**Barry Einsig** is the Global Automotive and Transportation Executive in Cisco's Internet of Things and Applications Group responsible for driving the growth strategy, business planning, thought leadership and solutions designs and validation for all modes of transportation. Barry has been in the industry for over 19 years serving in a variety of roles providing industry leading solutions for Automotive, Transportation, and Public Sector systems. Barry is a patent holder for Video Quality of Service deliver over LTE services. He is an advisor for Singapore Ministry of Transport for their Connected and Highly Automated vehicle systems. Barry works globally with customers in all modes of transportation including: Network Rail, Deutsche Bahn, Dallas Fort Worth Airport, Port of Hamburg, SFMTA, Transport for London, BNSF, WMATA, AMTRAK, DART, PA Turnpike, TMR Australia, Metrolinx Toronto and many others.



**Jackie Erickson** is a robotics-focused public relations and government affairs consultant based in Pittsburgh, Pennsylvania. After a decade of public policy experience including service as Southwestern Pennsylvania Regional Director for U.S. Senator Robert P. Casey Jr., Jackie chose to follow her passion for robotics, serving first as Director of Communications for Astrobotic Technology then founding a boutique consulting firm dedicated to telling the stories and advocating for the greater good of robotics. Jackie's clients span sectors such as defense, logistics, shealthcare, agriculture, and transportation. Jackie is the Pittsburgh robotics cluster representative for the Robotics Industry Association, Co-Founder of the Pittsburgh Robotics Network, and a member of PennDOT's Autonomous Vehicle Policy Task Force.



**Justin Erlich** is Uber's Global Head of Policy for advanced mobility initiatives, including Autonomous Vehicles, Urban Aviation, and Freight. He spent the previous two years on the leadership team of former California Attorney General (now U.S. Senator) Kamala Harris overseeing technology policy, strategy, and operations. Prior to that role, he worked as a strategy consultant for McKinsey & Co. as a part of the Public Sector and Sustainability practices, focused on the future of cities. He has a law degree from NYU and a bachelor's degree in government from Harvard.



County Executive **Rich Fitzgerald** took office on January 3, 2012, and he's currently in his second term. After more than 18 years in public service, including 12 on County Council, he still relishes his role working with others to make the county a great place to live and work, and he's bullish on the region's future. Under Rich's leadership, the county has concentrated on economic development and job creation to great effect, and for the first time since the end of the Pittsburgh region's industrial era in the 1970s, the county is managing growth instead of decline. It boasts an excellent quality of life, low unemployment rate and cost of living, and a diverse and thriving business community. Raised in Pittsburgh's Bloomfield-Garfield neighborhood, Rich graduated from Carnegie Mellon University with B.S. in Mechanical Engineering with a business minor. He and his wife, Cathy, a pharmacist, live in Squirrel Hill. They have eight children.



**Emily Frascaroli** serves as Counsel for Ford Motor Company, where she advises globally on automotive safety, regulatory, and product liability issues, including a focus on autonomous vehicles, mobility, and cybersecurity. She has extensive experience handling regulatory matters with NHTSA and other governmental entities, product defect investigations, and complex product litigation cases. She is also a lecturer at the University of Michigan Law School where she teaches a class about the legal issues involved with autonomous vehicles, and she is co-chair of the Legal and Insurance Working Group of the University of Michigan Mobility Transformation Center. In 2017, she was appointed by Governor Rick Snyder to the Michigan Council on Future Mobility. She earned her JD, cum laude, from Wayne State University (2001) and was an editor of the Wayne Law Review. She received her BS in aerospace engineering from the University of Southern California (1995) and her MEng in aerospace engineering from the University of Michigan (1996). Prior to practicing law, she worked in engineering at both Ford and NASA (Dryden Flight Research Center).



**Ms. Sheila Gombita** is the Executive Director of the Washington County Transportation Authority (Freedom Transit), a position she has held since the agency was formed in 2001. She is responsible for managing and directing the public transit agency which provides approximately 300,000 trips per year with an annual operating budget of \$6.6 million. Ms. Gombita is a Certified Community Transit Manager and holds a Bachelor's Degree in Psychology from Edinboro University of Pennsylvania. Since 2010, Ms. Gombita has served on the Pennsylvania Public Transportation Association Board of Directors and was the first female elected to Chair the organization.



**Art Guzzetti**, a 39-year professional in public transportation at the local, state and national levels, serves as Vice President-Policy for the American Public Transportation Association (APTA), the trade group for the public transportation industry. Among other things, Mr. Guzzetti is responsible for APTA's extensive policy development and research agenda, and for advancing policies favorable to public transportation with Congress, the Administration, state and local governments, with grassroots and stakeholder organizations, and with public policy think tanks. Prior to coming to Washington in June 1997, Mr. Guzzetti had 16 years of management experience with two of the nation's leading public transportation systems: New Jersey Transit, and the Port Authority of Allegheny County. Mr. Guzzetti has a Political Science degree from Edinboro State University, and a Master of Public Administration Degree from the University of Pittsburgh. Among other position, he is the immediate past national president of the Transportation Research Forum. He is married 39 years and is father to four children and the grandfather of five.



**Lieutenant Brian Ianuzzi** has served with the Pennsylvania State Police for the past 21 years in various roles. In April 2016, he was assigned to the Bureau of Patrol to serve as the Director of the Safety Program Division. In that role, Lt. Ianuzzi oversees the Vehicle Fraud Unit, the Collision Analysis and Reconstruction Unit, emergency vehicle lighting/designations, emergency towing, traffic incident management, crash reporting, and work zone enforcement. He is a member of Pennsylvania Department of Transportation's Inspection Advisory Board, Pennsylvania Department of Transportation's Traffic Records Coordination Committee, and Pennsylvania Autonomous Vehicle Task Force.



**Joseph Kane** is a senior research associate and associate fellow at the Brookings Institution's Metropolitan Policy Program. Kane's work focuses on a wide array of built environment issues, including transportation and water infrastructure. Within these areas of research, he has explored infrastructure's central economic role across different regions as well as its relationship to opportunity and resilience. Across several projects, he has concentrated on the use of innovative datasets, combining them with other qualitative measures to better assess current and future infrastructure needs. From the exploration of metropolitan freight trends to the first-ever analysis of infrastructure jobs at a metropolitan level, he has coordinated the production of new metrics and developed other interactive content to better inform decisions by policymakers and practitioners across the country. Prior to Brookings, Kane was an Economist at the U.S. Bureau of Labor Statistics. He holds a master's degree in urban and environmental planning from the University of Virginia and a bachelor's degree in economics and history from the College of William and Mary.



**Katharine Eagan Kelleman** is chief executive officer of Port Authority of Allegheny County. Prior to joining Port Authority, Kelleman worked at Hillsborough Area Regional (HART) in Tampa, Fla. in several executive leadership roles, including chief of service development, chief operating officer, and chief executive officer. During her tenure at HART, Kelleman grew ridership by more than 20 percent; adopted technologies like the OneBusAway application; expanded public-private partnerships with entities like MegaBus, Red Coach and Coast Bike Share; launched a regional fare program; and oversaw HART HyperLink – the nation's first transit agency-operated rideshare program. Prior to her time at HART, she worked in leadership roles for the Maryland Transit Administration and Dallas Area Rapid Transit (DART). She began her career in public transit as a transit planner in San Angelo, Texas. Kelleman received her Bachelor's degree in art history from the University of Colorado at Colorado Springs and her Master's degree in public administration from San Angelo State University.



**Carol Kilko** serves as Deputy Secretary for Business Financing, an appointment made in January 2018. In this role, Carol manages the Commonwealth's grant, loan and tax credit programs. Carol began her second career with DCED in June 2015 as a Special Assistant for Workforce Development, moving to Deputy Secretary of Administration in April 2016 Carol when appointed by Governor Wolf. During her first tour with DCED – 2000 through 2006 - Carol worked with the Governor's Action Team and DCED's Business Retention and Expansion Program. From April 2006 through June 2015 Carol served as the Director of Training Services for the Pennsylvania State Association of Township Supervisors (PSATS). Carol holds a Master's in Public Administration and a Bachelor of Public Policy from Penn State University.



**Robert (Bob) Koch**, department chair for occupational trade programs at the Community College of Allegheny County in Pittsburgh Pa. and a professor/coordinator for the Ford ASSET (Automotive Student Service Educational Technician) training program for 30 years. Bob is also the director for the Pennsylvania State Inspection and Emission Inspection classes at CCAC as well as an instructor for over 29 years. He is an ASE certified master automotive technician and L1 advanced diagnostic certified technician. He is also a Ford Motor Company Certified Instructor with over 40 years in the industry. He has instructed students on all facets of automotive repair to include diagnosing advanced vehicle systems. He is a member of the Alliance of Automotive Providers of PA and a member of the Petroleum Retailers and Auto Repair Association in Pa. Bob is also a NATEF certified team leader that evaluates automotive programs in both secondary and post-secondary schools. Bob also works with Pittsburgh Regional Clean Cities bringing alternative fuel training to western Pa.



**Shoshana M. Lew** is Chief Operating Officer of the Rhode Island Department of Transportation. Most recently she served as Chief Financial Officer and Assistant Secretary for Budget and Programs for the U.S. Department of Transportation, where she managed the teams that developed and implemented the transportation department's \$76 billion budget and performance review program. She also served as vice chair of USDOT's Credit Council. Prior to holding the position of CFO, Lew served as Deputy Assistant Secretary for Transportation Policy at USDOT, where her work included accelerating permitting and delivery of infrastructure projects. She also worked at the U.S. Department of the Interior, and the Office of Management and Budget and Domestic Policy Council within the White House. Prior to her federal service, Lew worked at the Brookings Institution. A graduate of Harvard College with a B.A. in history, Lew also has an M.A. in history from Northwestern University.



**Abby Loughrey** is Autonomous Vehicle Operations Manager at Aurora Innovation. She leads a growing Pittsburgh team that tests autonomy software in vehicles to ensure safe and effective driving. Abby is passionate about building inclusive and powerful teams driven to solve intimidating problems. Abby recently made the career transition into autonomous vehicles from BloomBoard, a technology startup where she led the configuration and implementation of data platforms for state governments. Abby has written books on data policy, taught marine science aboard a sailboat in Puget Sound, and designed chairs in Denmark. She holds a B.A. from Stanford University and an M.Ed. from the University of Pittsburgh.



**Brad Markell** is the Executive Director of the AFL-CIO Industrial Union Council (IUC) and chairs the AFL-CIO energy task force. The IUC is a group of 12 unions with over 4.5 million members, including 1.2 million in manufacturing. Brad also leads AFL-CIO's work on energy policy, and worked closely with the U.S. State Department to win worker-friendly language in the Paris Agreement. Before coming to the AFL-CIO, Brad worked for the UAW in Detroit for 15 years, where his duties included bargaining and public policy advocacy on environmental issues. Brad's board and committee service on behalf of the labor movement includes the MIT Lean Aerospace Initiative, the Manufacturing Skills Standards Council, the International Research Network on Autowork in the Americas, the Coalition for Justice in the Maquiladoras, the Michigan Climate Action Council, the National Academy of Engineering's Making Value in America committee, and the International Labor Organization's expert committee on just transition. Brad has degrees from the University of Michigan and Wayne State University. He has been a member of the UAW since 1976, and is a member of Local 14 in Toledo, Ohio.



**Cheryl Moon-Sirianni** is the District Executive at PennDOT District 11 which includes Allegheny, Beaver and Lawrence Counties with 8500 miles of roadway and 1800 bridges. She manages a staff of 787 that includes Design, Construction, Maintenance and Administration personnel. She is a registered professional engineer since 1992 and a graduate of Penn State University. She has worked for PennDOT for 31 plus years holding positions of Assistant District Executive for Design for 13 years, Contract Management Engineer and Project Manager. She has been instrumental in the development of significant regional projects such as the SR 28 Corridor Improvements, Boulevard of the Allies Gateway to Oakland, West End Improvements, West Carson Street Reconstruction in addition to many other bridge, traffic and roadway improvement projects. Her proudest accomplishment though is her daughter Gina who is a junior at PSU studying Industrial Engineering. In her spare time she enjoys golfing, swimming and spending time with her amazing friends.



**Mr. Robert Mudge** is an expert in corporate and project finance matters in the energy industry. He has advised energy clients on issues relating to corporate restructuring, contract terminations or amendments, special capital needs, and acquisitions and divestitures. He also has experience in analyzing contractual, regulatory, financing, and tax matters, and projecting effects on cash flows, earnings, and customer rates. Prior to Brattle, he was a principal at CRA International, where he focused on financial restructuring initiatives for electric utility clients and consulted on matters involving rate design, asset valuation, and project finance structuring and credit requirements. As a former investment and commercial banker at Rothschild, ABN AMRO, and Sanwa Bank, he developed financeable contract structures for large public and private infrastructure projects, utility mergers and acquisitions, bankruptcy restructuring, and power project financings. He also has served as a guest expert for courses on project finance at Georgetown Law School.



**Sue Mukherjee** is the Assistant Vice Chancellor for Educational Intelligence for Pennsylvania's State System of Higher Education. Sue is responsible for providing strategic decision-support for State System stakeholders in a manner that helps with student access and success and assists the System's universities individually and work for the State System, she worked for the Pennsylvania departments of Labor & Industry and Education in various capacities, where she was responsible for development and implementation of policies, programs, and research that enhanced Pennsylvania's education development, data quality initiatives, and workforce development strategies. Sue earned a Ph.D in Administrative Leadership Studies from Indiana University of Pennsylvania, is currently a Fellow at the Center for Education Policy Research at Harvard University's Strategic Data Project, is a member of Governor Wolf's Advisory Council on Education and the Workforce, and was recently appointed as a Commissioner on Governor Wolf's Commission for Asian Pacific American Affairs.



**Ngani Ndimbie** is a MS Candidate for Public Policy and Management at CMU. She's a Pittsburgh native who is passionate about equitable policymaking, economic justice, and healthy communities. Before joining Traffic 21 as the Women in Transportation Fellow, she held positions at some of Pittsburgh's most influential non-profits including the ACLU of Pennsylvania and the Black Political Empowerment Project. Most recently she served as the communications manager for Bike Pittsburgh, a bike and pedestrian advocacy organization. In 2016, Ngani was a Pittsburgh Magazine 40 Under 40 awardee.



**Alicia Nolan** has been working in the Pennsylvania Division Office as the Division Administrator since March of 2018. She started with Federal Highway Administration right out of college and has held several positions within FHWA. Those positions include: Area Engineer, Intermodal Planning Engineer, Regional Air Quality Specialist, Transportation Planning Engineer, Northern Border Transportation Program Coordinator, and Director of Program Management. Most recently, Alicia served as the Assistant Division Administrator in Colorado working closely with the Colorado Department of Transportation on several of their initiatives including implementation of ROADX, various innovative technology deployments and several Major Projects initiatives. Throughout her tenure with FHWA, Alicia has worked on all aspects of the Federal-Aid program, including project planning, environmental review, project design, construction and operation and maintenance related program oversight. She has worked with the International agencies by assignment of the Border Coordinator working closely with CBP and GSA on several international projects.



**Orla Pease**, PE, PTOE is an Associate Vice President for Transportation for AECOM. Orla has 18 years of experience in the management, planning, engineering design and analysis of urban streets, intersections, traffic signals, safety and transit related projects most recently managing the design for the new BRT Direct Bus stations along Roosevelt Boulevard in Philadelphia. The favorite part of her job is getting to solve complex problems by developing innovative ways to get people to where they are going safely and in the most efficient manner possible. Orla has a Bachelor's Degree in Civil and Environmental Engineering, and a Master's Degree in Traffic Engineering from University College Cork, Ireland.



**William Peduto** was re-elected to the office of Mayor of the City of Pittsburgh in the General Election on November 6, 2017, and took office as Pittsburgh's 60th Mayor in January of 2018. Prior to taking office, he worked for 19 years on Pittsburgh City Council - seven years as a staffer then twelve years as a Member of Council. As Mayor, Bill Peduto continues to champion the protection and enhancement of Pittsburgh's new reputation - maintaining fiscal responsibility, establishing community based development plans, embracing innovative solutions and becoming a leader in green initiatives. Since taking office, Mayor Peduto has lead a collaborative effort to make Pittsburgh a leading 21st Century city. The Peduto administration has partnered with the White House on numerous initiatives, resulting in direct access to federal support related to affordable housing, education, economic development, energy efficiency, immigration, manufacturing, community policing, workforce development, technology and transportation. The Peduto administration is working to ensure that everyone benefits from Pittsburgh's transformation and growth because, "If it's not for all, it's not for us."



As Co-Founder and the software lead at Marble, **Kevin Peterson** is responsible for ensuring that the robots are capable of seamlessly navigating the city and efficiently routing to their destination. Kevin builds the software that detects people, cars, and other objects, as well as the proprietary mapping technology to map the city's sidewalks. Kevin graduated Carnegie Mellon University in 2003 with a Master's of Science in Electrical and Computer Engineering, going on to work on his Ph.D. in 2007. As a Masters student, he led one of CMU's DARPA Grand Challenge teams. After graduating, Kevin began work at Astrobotic Technology as the Director of Guidance, Navigation, and Control for over two years before becoming the Chief Technology Officer. Under his leadership, Astrobotic secured over a dozen contracts with NASA, and they won the \$1.75M Google Lunar XPRIZE Milestone Awards for demonstrating advanced capability for landing, roving, and imaging on the Moon.



**Karina Ricks** is Director of Mobility and Infrastructure for the City of Pittsburgh, Pennsylvania. In this capacity, she oversees the introduction and integration of ultra-modern mobility services and the design, maintenance, and operation of legacy infrastructure. Karina is driven by a passion for equitably delivering the physical mobility vital to the social and economic mobility of city stakeholders. Prior to moving to Pittsburgh, Karina resided in Washington, DC and contributed to the dramatic transformation of that city as Director of Transportation Planning, introducing bike share, modern streetcar, electric charging infrastructure and car share services. Between her terms serving the public, Karina was in the private sector as a Principal and Board Member of Nelson/Nygaard Consulting Associates.



**Stacey Ritter** is director of Policy & External Affairs for the Pennsylvania Turnpike Commission. She began her governmental career in the Pennsylvania House of Representatives after graduation from Shippensburg University as a budget analyst for the Democratic Appropriations Committee. After earning her juris doctor degree from Widener School of Law in 2001, she served as legal counsel for the Democratic Committee on Committees. She also served as executive director of the Democratic Intergovernmental Affairs Committee, executive director of the Democratic Commerce Committee, executive director of the Majority Transportation Committee and assistant executive director of the Democratic Appropriations Committee before taking her current position with the Turnpike Commission in September 2011.



**David Ruppertsberger** is the President of the Pittsburgh Regional Alliance (PRA), an affiliate of the Allegheny Conference on Community Development. The PRA markets the benefits of conducting business in southwestern Pennsylvania to companies all over the world that are growing, relocating or expanding. Before joining the Conference, Mr. Ruppertsberger served as the Director of Joint Economic Development Initiatives for Carnegie Mellon University and the University of Pittsburgh from June 2013 to April 2015. Prior to June 2012, Mr. Ruppertsberger served as president and CEO of The Technology Collaborative, a technology-based economic development organization created by the merger of the Pittsburgh Digital Greenhouse (PDG) and the Robotics Foundry in January 2005. Mr. Ruppertsberger joined the Pittsburgh Digital Greenhouse team in 2000 and became president & CEO in 2003. He has served on many local Boards and is an Executive Fellow in the Center for Economic Development at Carnegie Mellon University's Heinz College. Mr. Ruppertsberger has a degree in Economics from the University of Pittsburgh.



**Jason D. Sharp** was appointed Acting Chief Counsel for the Pennsylvania Department of Transportation (PennDOT) in June of 2017 and Chief Counsel in March 2018. Prior to his appointment, he was the Executive Deputy Chief Counsel, serving as chief administrator for three regional PennDOT legal offices that provide litigation and legal support services for forty-five (45) counties, as well as assisting the Chief Counsel in overall management of office's personnel, fiscal and information technology needs. Additionally, Mr. Sharp managed PennDOT's administrative docket program, serving as lead hearing officer. Mr. Sharp also acted as counsel on priority projects and litigation matters including service as lead counsel to Pennsylvania's Autonomous Vehicle Task Force, addressing connected and automated vehicle issues. Prior to his appointment as Executive Deputy, Mr. Sharp was a member of the Office's Real Property Division, litigating before administrative, trial and appellate tribunals, including the Pennsylvania Public Utility Commission, various Courts of Common Pleas and the Commonwealth and Supreme Courts. Mr. Sharp is a graduate of Widener University School of Law and holds a Bachelor of Arts degree in Political Science from King's College.



**Ann Shikany** is working with the National Safety Council to manage their efforts on consumer education and outreach on automated vehicles. Previously she has served in the Portland (Oregon) Bureau of Transportation, the U.S. Department of Transportation (USDOT) and the U.S. Department of Energy. Her policy background includes transportation infrastructure finance, congestion pricing, autonomous vehicle policy and regulation, and women's economic empowerment. In Portland, OR, she led the city's Autonomous and Connective Vehicle work, driving the formal policy, regulations, and pilot activities at the city and state levels. At USDOT, she stood up the Build America Bureau, which combined the department's various infrastructure credit programs and investment expertise under one roof and led the project development for one of the nation's largest infrastructure projects, the New York-New Jersey Gateway program. She has also launched two internationally recognized women's equity programs for both departments of Transportation and Energy.



**Matt Smith** is Michael Baker International's Connected and Automated Vehicles (CAV) Program Manager, located in Detroit, MI. He serves as the national lead for CAV and emerging transportation technology initiatives, supporting over 80 offices nationwide. He has 23 years of experience in Connected and Automated Vehicle Systems, Intelligent Transportation Systems (ITS), traffic engineering, and transportation system management and operations (TSMO), serving as the Michigan Department of Transportation's ITS Program Administrator prior to joining Michael Baker.



Ensuring our students are making informed career decisions, helping our employers remain competitive in this global environment, and assisting our job seekers find gainful employment is what Workforce Solutions is all about. As the Executive Director of this new organization, **Susie Snelick** works with her team to help uncover resources, find creative solutions to help the region grow, and collaborate with partners to support mutual efforts. At the same time making sure policies support innovation while hitting performance benchmarks. Susie has also been fortunate to serve as the chair of the Pennsylvania Workforce Development Association for the past few years as well as serving on the Governor's Middle Class Task Force. Helping to improve lives is what this work is all about!



**Mr. Sam Van Hecke** is a Senior Associate with Cambridge Systematics. He has led projects in emerging transportation technologies with an emphasis on automated and connected vehicles in Chicago, Los Angeles, Ohio, Virginia, and Maryland among others.



**Dr. Richard Voith** is a well-known expert in real estate economics, transportation, and applied microeconomics. Until recently, he taught Cost Benefit Analysis at the Wharton School's Business and Public Policy Department, and Urban Real Estate Economics through the School's Real Estate Department. Dr. Voith remains a Faculty Fellow at the University of Pennsylvania's Institute for Urban Research. Prior to establishing ESI, Dr. Voith held the position of Economic Advisor at the Federal Reserve Bank of Philadelphia. Over the last 15 years, Dr. Voith has served on several National Academy of Science Foundation Advisory Panels addressing topics such as the interrelationships between highway and transit investment and land use, valuing the costs and benefits of transit investments, and the relationships between land use and public health. He has been a guest speaker at numerous forums, including those sponsored by the Lincoln Land Institute, the Brookings Institution, the Urban Land Institute, and the Department of Housing and Urban Development.



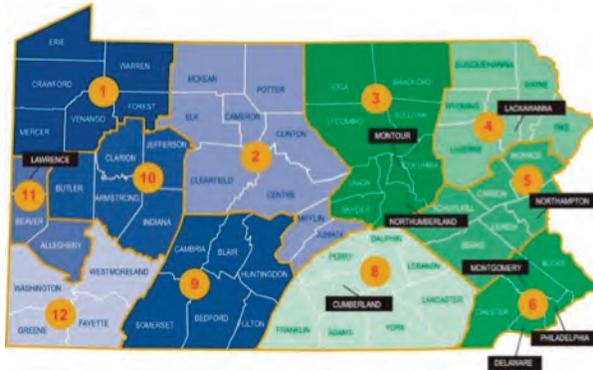
**Mike Wagner** is the CEO of Edge Case Research (ECR), a company founded to make autonomous systems safer. ECR's team brings together some of the world's top software safety and autonomy experts to help clients in the public and private sectors to build better, more reliable, and most of all safer autonomous systems. Mike's experience with autonomous vehicles began nearly twenty years ago, starting at Carnegie Mellon University. Mike built lunar rovers for Red Whittaker, autonomous scientists that explored Antarctica, and self-driving technology for tackling harsh off-road terrain. Ten years ago, Mike and Philip Koopman began researching techniques to design and verify autonomous systems. Today, Mike applies this experience to lead Edge Case Research with the goal of providing validation technology for autonomy across a range of industries including self-driving cars, materials handling, and robotic work cells.



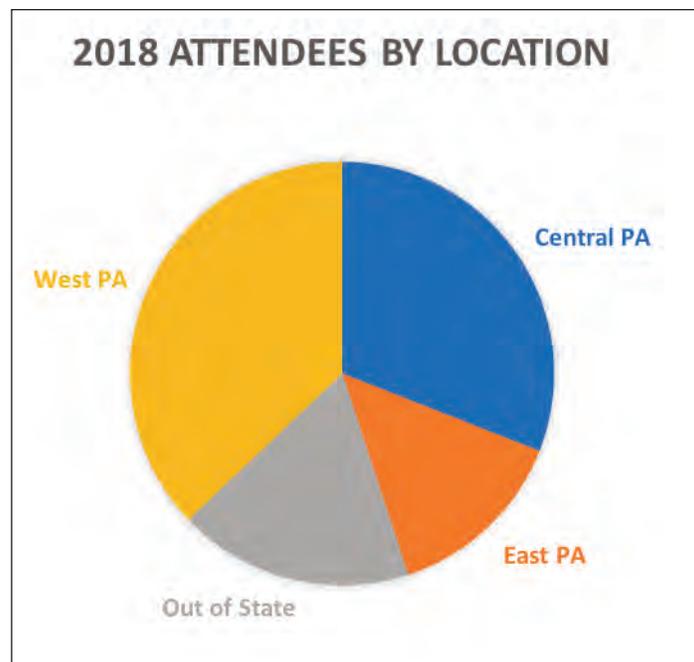
**Mr. John M. Whitt** is the Light Tactical Vehicles Branch Chief at the US Army Aberdeen Test Center. His branch is responsible for testing tactical wheeled and autonomous vehicles for the Department of Defense, Other Government Agencies, and private industry. John has been with Aberdeen Test Center for over ten years and has worked in the areas of ship and submarine shock testing, communications testing, body armor testing, instrumentation development, and autonomous systems test capability development.

## APPENDIX B: PA AV SUMMIT 2018 ATTENDEES

### Summit Attendees by Location:

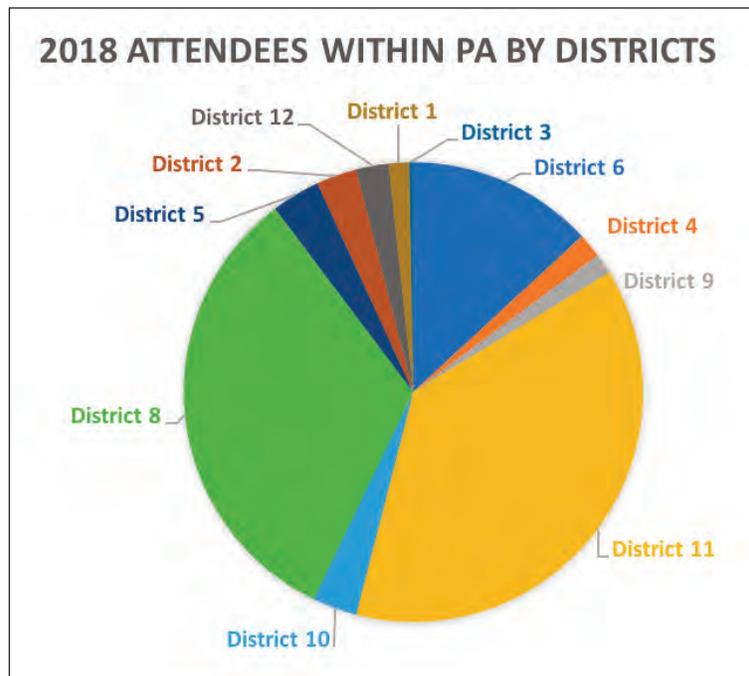


REGION	NUMBER	PERCENTAGE
Central PA (D2, D3, D8, D9)	126	31%
East PA (D4, D5, D6)	57	14%
West PA (D1, D10, D11, D12)	151	37%
Out of State	73	18%
<b>GRAND TOTAL</b>	<b>407</b>	<b>100%</b>



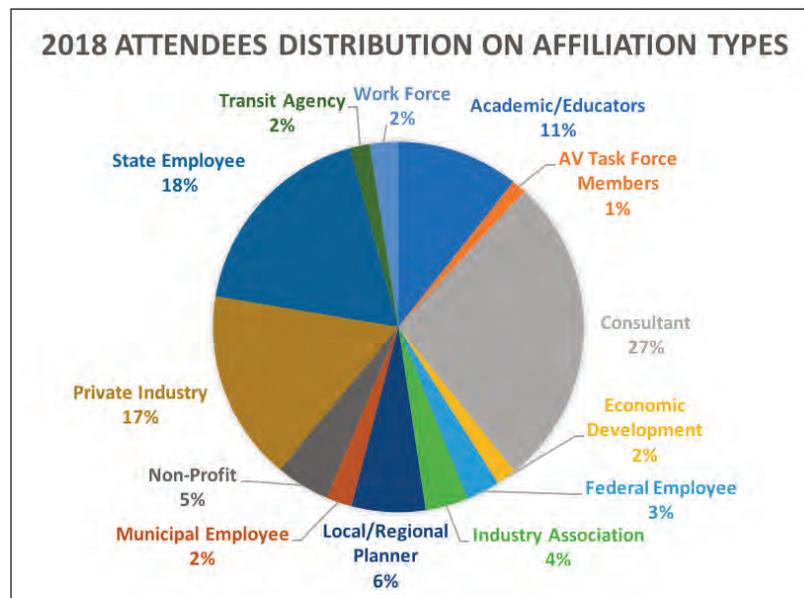
## Attendees by PennDOT Engineering District:

DISTRICTS	NUMBER	PERCENTAGE
District 1	1	0%
District 2	10	3%
District 3	1	0%
District 4	3	1%
District 5	12	4%
District 6	42	13%
District 8	110	33%
District 9	5	1%
District 10	11	3%
District 11	132	40%
District 12	7	2%
<b>GRAND TOTAL</b>	<b>407</b>	<b>100%</b>



## Attendees by Organization Type:

ORIGINAL TYPE	NUMBER	PERCENTAGE
Academic/Educators	43	11%
AV Task Force Members	5	1%
Consultant	110	27%
Economic Development	7	2%
Federal Employee	12	3%
Industry Association	15	4%
Local/Regional Planner	26	6%
Municipal Employee	9	2%
Non-Profit	19	5%
Other	2	0%
Private Industry	67	16%
State Employee	73	18%
Transit Agency	9	2%
Work Force	10	2%
<b>GRAND TOTAL</b>	<b>407</b>	<b>100%</b>



**APPENDIX C – WHITE PAPER**

**THE ‘WHY’S’ OF AVS**

**BY ROGER J. COHEN  
SENIOR ADVISOR TO THE SECRETARY OF TRANSPORTATION**

**APRIL 2018**

## The 'Why's' of AVs

### Vehicle Automation Can Transform How We Travel, Work, and Live

by Roger J. Cohen

The US Department of Transportation forecasts that by 2045, America's population will have grown by 70 million—the equivalent of adding another New York State, Florida, and Texas to the current populace. Most of these additional Americans will be living in the coastal and near-coastal states along the Atlantic, Pacific, and Gulf seabords.

USDOT also projects that 40 percent more freight by volume will be moving across our transportation system. With the recent widening of the Panama Canal, much of that cargo will be entering from Mid-Atlantic ports like New York, Philadelphia, and Baltimore, and then trucking inland through Pennsylvania.

Meanwhile, after decades of steady reduction, the U.S. death toll from vehicle crashes has started to tick upward again—it is up about 14 percent since the record-low year of 2011. The 37,461 deaths in 2016 is roughly equivalent to a fully loaded 747 jetliners crashing every single week. Most fatalities in traffic crashes are teens and adults under 40—lives tragically ended in or before their prime. The annual economic costs of lost productivity, property destruction, and acute and chronic medical care for the injured survivors is in the hundreds of billions of dollars.

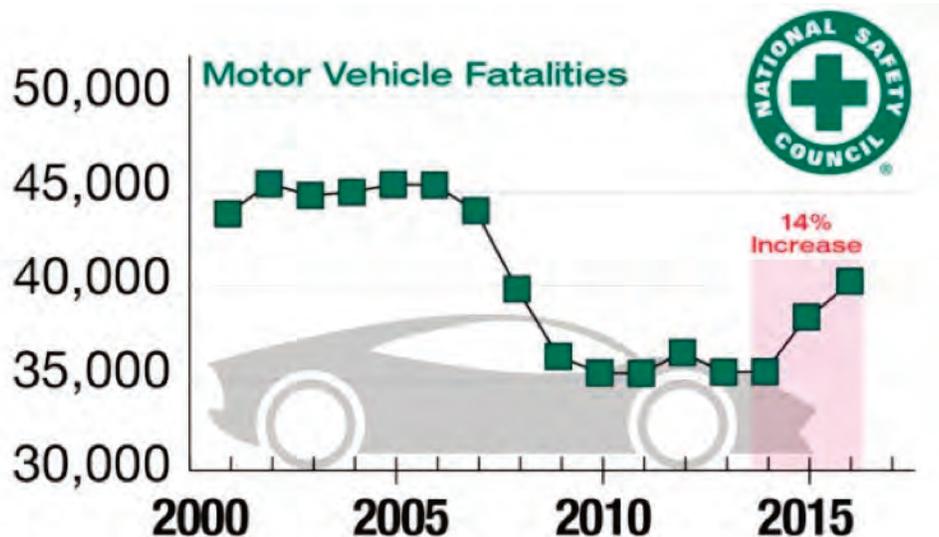


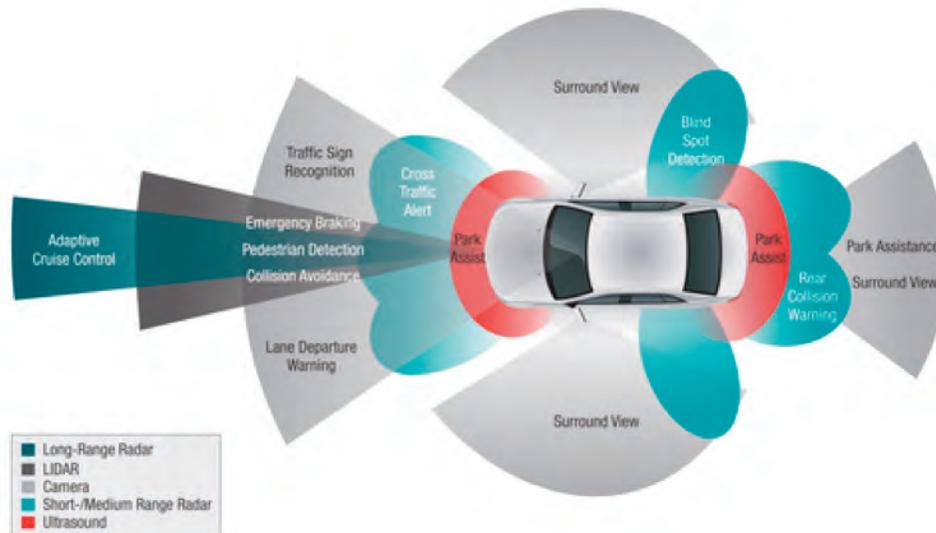
Image courtesy StreetBlogUSA

#### Serious Questions for Transportation

These trends raise serious questions for how we plan and operate our transportation system: How will we handle the projected increase in demand, while making transportation safer for the traveling public? Costly capacity build-outs are impractical. But new vehicle automation technologies can enable the network to operate much more efficiently—in effect, increasing its capacity—while, most importantly, increasing safety on the roadways over the long term.

The world is at the edge of a revolution in transportation technology that will profoundly affect how we all live, work, and travel. Autonomous vehicles—the so-called “self-driving car”—and connected vehicles that communicate with each other, the surrounding infrastructure, and even the cloud, then respond instantly and effectively to road conditions and situations, are improving steadily.

## Autonomous Vehicle Technologies



Source: Texas Instruments

### Pennsylvania at the Forefront

Pennsylvania is at the forefront of the vehicle automation revolution. The Economist named Pittsburgh, along with Silicon Valley, the “main hub of this emerging industry.” The very first autonomous (or self-driving) vehicle, a slow-moving six-wheeler dubbed “The Terragator,” was built in Pittsburgh at Carnegie Mellon University in the 1980s, and CMU continues to pioneer innovations as the technology progresses. Today, Uber is testing dozens of self-driving cars on Pittsburgh’s streets, Ford bought start-up Argo AI, and the city’s economic base has been dramatically transformed from declining steel center to a hip and vibrant high-tech capital.

While the emergence of these new automated vehicles (AVs) is cause for excitement and hope, it’s important to understand that we are at the very early stages of vehicle automation, and there is a long way to go, both in perfecting the technology to the point where it is reliably safe, and in adapting our transportation system to the changes that will be needed to deploy it.

The recent tragedy in Tempe, Arizona, where a pedestrian was struck and killed by a test vehicle being operated in “self-driving” autonomous mode, is a sobering reminder that the technology is not yet ready, and that people’s lives and safety are at stake.

Yet we must recognize that more than nine of ten vehicular fatalities are caused by human-driver error, leading many traffic safety experts to believe that removing the human element from the driving task and replacing it with automated driving technologies that are more perceptive, alert, responsive, and precise than even the best human drivers will eventually lead to fewer crashes and reduce the current public-health scourge of tens of thousands of roadway deaths and hundreds of thousands of serious injuries.

### Huge Benefits

AVs offer society other valuable benefits beyond safety. Self-driving technology will provide mobility and greater freedom for those who cannot drive, such as the elderly and disabled. It will also enable vehicles to operate closer together—for example in convoys of digitally connected trucks called “platoons”—effectively increasing the capacity of the existing network. And, by reducing crashes—the biggest cause of traffic disruption and congestion—it will provide congestion relief and reduce the polluting emissions that result.

For these reasons, the Pennsylvania Department of Transportation (PennDOT) is working with various stakeholders to advance the testing and development of AV technologies. In doing so, our guiding principle has been set forth by Transportation Secretary Leslie S. Richards: To balance innovation with safety, with the safety of the traveling public always our paramount value.

### **Impacts Not Foreseen, Not Intended, Not Welcome**

PennDOT is also keenly aware that emerging technologies often bring unintended consequences, so the Department is engaging with public, academic, and private stakeholders to examine and prepare for possible effects such as changes in workforce demand and job-skill requirements, new business models that challenge existing paradigms, and impacts on land use, travel patterns, and tax revenues, to name a few areas of concern. And like all digital technologies, vehicle automation raises critical issues in the areas of data security, privacy, and control that have yet to be worked out.

To keep safety and innovation in proper balance, PennDOT supports legislation now before the General Assembly that would give the Department the legal authority lacking under current law (which is silent on AVs) to exercise safety oversight of the AV testing currently allowed on public roadways of Pennsylvania.

PennDOT has assembled a task force of stakeholders representing federal and state agencies, local government, law enforcement, affected commercial interests, academia, and the technology and automobile industries to craft policies to keep the public safe on Pennsylvania roadways as AVs are tested and their technology and capabilities improved.

We are also working on various initiatives and demonstration projects with multiple partners to advance particular AV applications. For example, in Middletown, we are in discussions with Penn State–Harrisburg to pilot a slow-speed, driverless shuttle on campus. If proven successful, it may be extended to the nearby Middletown Amtrak station and Harrisburg International Airport. In State College, we are working with PSU's Larson Transportation Institute and the Pennsylvania Turnpike Commission to develop a new testing facility that will be one of the most advanced in North America.



And, with our sister agency, the Pennsylvania Department of Community & Economic Development, PennDOT has convened the Pennsylvania Automated Vehicle Summit, aimed at local and regional officials and planners, workforce professionals, and safety engineers and experts to openly and frankly discuss the opportunities and complex issues that AVs present.

By engaging the decision-makers and citizens from across the Commonwealth at the PA AV Summit, PennDOT and DCED believe that Pennsylvania can remain at the forefront of the transportation technology revolution, and ensure it works for the benefit of all Pennsylvanians.

*Roger J. Cohen is Senior Advisor to Pennsylvania Secretary of Transportation Leslie S. Richards, and serves as co-chair of the Pennsylvania Autonomous Vehicle Policy Task Force.*

## **APPENDIX D - RESOURCES**

1. Pennsylvania Department of Transportation (PennDOT): Autonomous Vehicle Testing [http://www.penndot.gov/ProjectAndPrograms/ResearchandTesting/Autonomous%20\\_Vehicle\\_Testing/Pages/Autonomous%20Vehicle%20Testing.aspx](http://www.penndot.gov/ProjectAndPrograms/ResearchandTesting/Autonomous%20_Vehicle_Testing/Pages/Autonomous%20Vehicle%20Testing.aspx)
2. Pennsylvania Department of Transportation (PennDOT): PennSTART Test Track <http://www.penndot.gov/about-us/media/Pages/PennSTART.aspx>
3. National Highway Traffic Safety Administration (NHTSA): Automated Driving Systems 2.0: A Vision for safety <https://www.nhtsa.gov/manufacturers/automated-driving-systems>
4. National Operations Center of Excellence (NOCoE): Knowledge Center <https://transportationops.org/knowledge-center>
5. Transportation Research Board (TRB): Resources and Databases <http://www.trb.org/AboutTRB/ResourcesandDatabases.aspx>
6. Intelligent Transportation Systems (ITS): Connected Vehicles [https://www.its.dot.gov/cv\\_basics](https://www.its.dot.gov/cv_basics)
7. Intelligent Transportation Systems (ITS): Automated Vehicle Research [https://www.its.dot.gov/automated\\_vehicle](https://www.its.dot.gov/automated_vehicle)
8. American Association of Motor Vehicle Administrators (AAMVA): Autonomous Vehicle Information Library <https://www.aamva.org/Autonomous-Vehicle-Information-Library>
9. National League of cities (NLC): New Autonomous Vehicle Guide Helps Cities Prepare for a Driverless Future <http://nlc.org/article/new-autonomous-vehicle-guide-helps-cities-prepare-for-a-driverless-future>
10. Government Accountability Office (GAO): Comprehensive Plan Could Help DOT Address Challenges <https://www.gao.gov/assets/690/688676.pdf>
11. Eno Center for Transportation: Beyond Speculation Automated Vehicles and Public Policy
12. <https://www.enotrans.org/etl-material/beyond-speculation-automated-vehicles-public-policy>
13. Transportation Research Board (TRB): Evaluation and Testing of Driver-Assistive Truck Platooning <http://trrjournalonline.trb.org/doi/abs/10.3141/2615-02>
14. National Operation Center of Excellence (NOCoE): Knowledge Center <https://transportationops.org/knowledge-center>

## **APPENDIX E - MEDIA COVERAGE**

1. PennDOT, Pa. Turnpike, Penn State University to Collaborate on State-of-the-Art Safety, Training and Research Facility: <http://www.penndot.gov/pages/all-news-details.aspx?newsid=480>
2. Aurora CEO Chris Urmson says self-driving tech is too important not to succeed: <http://triblive.com/business/technology/13520920-74/aurora-ceo-chris-urmson-says-self-driving-tech-too-important-not-to-succeed>
3. Pennsylvania to build test track, training facility for next-gen vehicles: <http://triblive.com/state/pennsylvania/13520898-74/pennsylvania-to-build-test-track-training-facility-for-next-gen-vehicles>
4. PennDOT announces new safety, transportation and research track: <https://www.bizjournals.com/pittsburgh/news/2018/04/10/pennsylvania-dot-announces-new-safety.html>
5. Aurora CEO talks about the future of autonomous vehicles: <https://www.bizjournals.com/pittsburgh/news/2018/04/10/aurora-ceo-talks-on-the-future-of-autonomous.html>
6. Pa. lands a new safety and training hub for transportation technology: <http://www.post-gazette.com/business/tech-news/2018/04/10/PennDOT-pennsylvania-turnpike-commission-penn-state-pennstart-av-summit-pittsburgh/stories/201804100074>
7. Chris Urmson, CEO of Aurora Innovation, says self-driving startups need to cooperate with government: <http://www.post-gazette.com/business/tech-news/2018/04/10/Chris-Urmson-aurora-innovation-self-driving-cars-pittsburgh-pa-av-summit/stories/201804100085>
8. PennDOT Outlines Policy Action Plan for Increased Safety Oversight of Highly Automated Vehicles: <https://gantdaily.com/2018/04/10/penndot-outlines-policy-action-plan-for-increased-safety-oversight-of-highly-automated-vehicles/>
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# **2018 PA AUTOMATED VEHICLES SUMMIT ATTENDEES FEEDBACK SURVEY**

**Data Analysis Report**

Prepared by PennDOT Bureau of Innovations  
May 2018

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## **Background**

This report presents the results of a feedback survey conducted by PennDOT's Policy Office from April 16 through April 30, 2018 to gain insight from participants at the 2018 AV Summit hosted in Pittsburgh on April 9 and 10. The Policy Office commissioned this survey, which was executed by the Bureau of Innovations (BOI).

In an effort to assess the education, planning, awareness, and communication needs of participants, this survey asked respondents to identify successes, challenges, and opportunities to make changes, contributing to the success of future events. The survey was distributed electronically to Summit attendees, and solicited their feedback regarding session topics, speaker recommendations, and planning and awareness efforts for organization and marketing future events of this kind.

Additional survey data, comments and detailed analysis are available from the Bureau of Innovations upon request.

## **Demographics**

Survey distribution was made to an audience of approximately 400 individuals.

A total of 88 individuals initiated survey responses, with a 100 percent completion rate. An average completion rate for a survey of this length is approximately 89 percent.

Based on the number of complete responses (88), the survey had an actual audience participation rate of approximately 22 percent, which is slightly above average. The typical participation rate for an externally distributed survey is between 10 and 15 percent.

This sample size (88 respondents out of approximately 400) allows for a 9.24 percent margin of error at a 71 percent confidence level. This suggests the results presented in this report will be within about 9.25 percent of the true opinions of all Summit attendees 71 percent of the time in survey trials of this size. Considering the sample size, the survey data cannot be said to predominantly reflect the opinions of attendees; however, where there is strong correlation in the data and comments, responses are considered highly suggestive of attendee opinions. To achieve a 3 percent margin of error at a 99 percent confidence level, as is often desired in national polling, 291 responses would have been needed.

## **Summary**

Several key themes emerged regarding the areas in which attendees felt the Summit met or exceeded expectations, and several additional themes emerged regarding opportunities for improvement. Many respondents took the opportunity to express their satisfaction with the Summit, praising PennDOT's and other state agencies' "leadership" in this arena, as well as emphasizing their appreciation for the diversity and knowledge of the speakers and the overall organization of the event. Several respondents suggested locations for future events, as the majority opinion indicated the 2018 venue was too small.

Nearly 72 percent of survey respondents indicated they strongly agree this topic is important for the public to know about, and nearly 57 percent of respondents indicated they agree the Summit was able to cover the most important AV topics. Further, nearly 64 percent of respondents indicated they strongly agree the topic of automated vehicles should be a focus of future PennDOT research.

The “Featured Speaker Philip Koopman” session was the most highly attended, followed by the “Developing and Motivating our Workforce of the Future” and the “Policymaker Meets Pioneer” sessions. The speakers were continually lauded by respondents as being knowledgeable, diverse, engaging, and passionate. Respondents indicated the speakers brought “differing viewpoints” and a “depth and variety” of topics that were interesting, challenging, and reassuring in the sense that “a lot of very smart people are thinking very hard about” AV technology and its future.

In Question 3, the following themes emerged from respondents commenting on what they liked best:

1. The diversity, background, and knowledge of the presenters **(22 comments)**
2. The depth and variety of subjects presented **(19 comments)**
3. The keynote speakers **(15 comments)**
4. The diversity of those in attendance (e.g., the right people, the PA Turnpike Commission, high-level PennDOT leadership, audience members from across the state/country) **(12 comments)**
5. Learning more about the current status of AV technology as well as its future **(9 comments)**
6. The networking opportunity **(8 comments)**
7. The opportunity to learn, exchange information, and engage in discussion **(8 comments)**
8. Taking a deeper look at key issues, such as from safety and legal perspectives **(5 comments)**
9. The location of the Summit **(5 comments)**
10. Appreciation for PennDOT’s prioritization of this issue **(2 comments)**
11. The continued development and outreach on this topic **(2 comments)**

The most suggested opportunities for improvement included:

1. The venue was too small or not conveniently located **(41 comments)**
2. Sessions or topics of interest were not included in the agenda **(32 comments)**
3. The speakers weren’t on-topic, diverse enough, or presentations were too one-sided **(11 comments)**
4. Information was repetitive or too limited in scope **(6 comments)**
5. Breakout sessions forced attendees to choose between interesting/important topics **(5 comments)**

Several respondents provided suggestions for future events, which are covered in the Question 5 summary within this report. Recommendations include broadening the audience, suggestions on topics and speakers, and having autonomous vehicles on-site for demonstrations and observation.

## SURVEY ANALYSIS

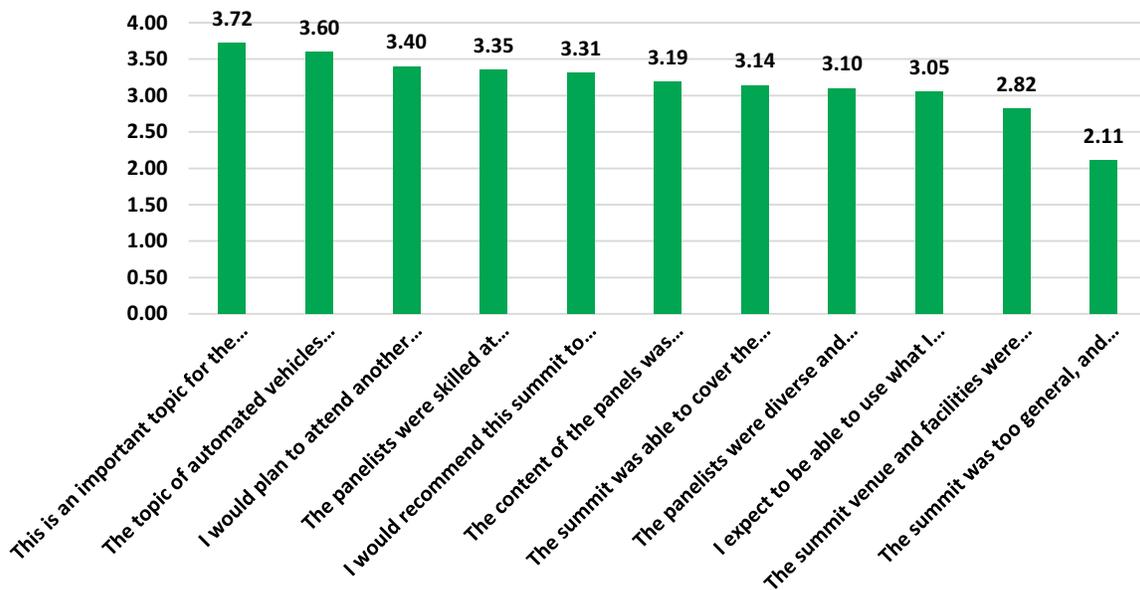
**Q1: Considering your overall experience at the 2018 PA Automated Vehicles (AV) Summit, please indicate your level of agreement with each of the following:**

Respondents overwhelmingly indicated they view this topic as important (3.72 out of 4.00 agreement rating), and believe it should continue to be a focus of future PennDOT research (3.60 out of 4.00 agreement rating). Respondents also indicated they did not view the Summit as being “too general,” (2.11 out of 4.00 agreement rating).

Based on respondent comments throughout the rest of the survey, it is no surprise the “venue and facilities” item ranked low. Respondent comments corroborate this ranking, indicating the location of the venue was “problematic” for some in terms of travel distance.

The breakout room sizes were not large enough to accommodate the number of interested attendees, and the repetitive use of Pittsburgh as a venue were mentioned as areas for improvement at future events.

The slightly lower ranking of the “I expect to be able to use what I learned from this summit in my life/work” item may suggest a need to modify future event agendas. Respondent comments, especially in Question 5 as outlined below, may be worth incorporating as new sessions to other events of this kind, especially as they directly touch on information that directly applies to Summit attendees’ businesses, communities, and regular travel habits.



The table below shows the agreement/disagreement ratings of each item.

Item	Percentage of Respondents Who			
	Strongly Agree	Agree	Disagree	Strongly Disagree
This is an important topic for the public to know about	<b>71.59%</b>	28.41%	0.00%	0.00%
The topic of automated vehicles should be a focus of future PennDOT research	<b>63.64%</b>	32.95%	3.41%	0.00%
I would plan to attend another summit in the future	<b>48.86%</b>	42.05%	9.09%	0.00%
The panelists were skilled at presenting their topics	39.77%	<b>56.82%</b>	2.27%	1.14%
I would recommend this summit to others in the future	37.50%	<b>55.68%</b>	6.82%	0.00%
The content of the panels was engaging and stimulating	32.95%	<b>56.82%</b>	6.82%	3.41%
The summit was able to cover the most important AV topics	28.41%	<b>56.82%</b>	14.77%	0.00%
The panelists were diverse and represented all sides of the topics	29.55%	<b>52.27%</b>	17.05%	1.14%
I expect to be able to use what I learned from this summit in my life/work	23.86%	<b>57.95%</b>	17.05%	1.14%
The summit venue and facilities were suitable	19.32%	<b>46.59%</b>	30.68%	3.41%
The summit was too general, and should have focused more on information specific to Pennsylvania	2.27%	14.77%	<b>75.00%</b>	7.95%

**Q2: Please indicate which panels you attended. Select all that apply.**

Featured speaker Philip Koopman’s session, “Three Key Questions for Self-Driving Cars on Public Roads,” was attended by more than 87 percent of respondents. Featured speaker Yvonne Lopez-Diaz’s session on “Developing and Motivating our Workforce of the Future” and the Day 1 “Policymaker Meets Pioneer: Secretary Leslie S. Richards and Special Guest Chris Urmson” also drew a lot of attendee interest, with nearly 82 percent of respondents indicating they attended those two sessions. The Day 1 AM Plenary Session, “Ensuring Automated Vehicle Safety” followed closely, and was attended by more than 80 percent of survey respondents.

The least attended session, per survey respondents, was “Use Cases for Automated Vehicles,” with only 25 percent of respondents indicating they attended that session. Day 2 Sessions 2b and 2c, “Goods Movement, Logistics, and Automated Freight” and “Careers and Opportunities in Automated Vehicles” were attended by nearly 39 percent and nearly 33 percent of respondents, respectively.

There does not appear to be any relation between time of day, or day of the event (first or second day), with regard to attendance. The “Featured Speaker” sessions drew the most interest, and the two Plenary Sessions also showed a high degree of interest across respondents.

The sessions, in order of attendance from highest to least, are as follows:

1. Featured Speaker Philip Koopman – Three Key Questions for Self-Driving Cars on Public Roads
  - Attended by **87.50** percent of respondents
2. Day 2: Policymaker Meets Pioneer: Secretary Leslie S. Richards and Special Guest Chris Urmson
  - Attended by **81.82** percent of respondents
3. Featured Speaker Yvonne Lopez-Diaz – Developing and Motivating our Workforce of the Future
  - Attended by **81.82** percent of respondents
4. AM Plenary Session – Ensuring Automated Vehicle Safety
  - Attended by **80.68** percent of respondents
5. Day 2: Featured Speaker Bryant Walker-Smith
  - Attended by **72.73** percent of respondents
6. PM Plenary Session – Economic & Social Roundtable
  - Attended by **64.77** percent of respondents
7. Day 2: The Legal Landscape 2050
  - Attended by **61.36** percent of respondents
8. Day 2: Facilitated Feedback Session
  - Attended by **40.91** percent of respondents
9. AM Session 1c – Planning for Automated Vehicle Infrastructure
  - Attended by **39.77** percent of respondents
10. PM Session 2a – Automated Vehicles and the New Age of Public Transit
  - Attended by **38.64** percent of respondents
11. PM Session 2b – Goods Movement, Logistics, and Automated Freight
  - Attended by **32.95** percent of respondents
12. AM Session 1b – Business Models and Financing Strategies
  - Attended by **31.82** percent of respondents
13. PM Session 2c – Careers and Opportunities in Automated Vehicles
  - Attended by **26.14** percent of respondents
14. AM Session 1a – Use Cases for Automated Vehicles
  - Attended by **25.00** percent of respondents

### **Q3: What did you like best about this event?**

Respondents greatly praised the diversity, background, and overall knowledge of the presenters, indicating their appreciation for the inclusion of out-of-state presenters and industry subject matter experts. Twenty-two respondents specifically commented on these factors.

Nineteen respondents expressed satisfaction with the depth and variety of the topics addressed at the Summit. The Automated Vehicle Coalition, the discussion surrounding people living with disabilities, and the topic of training the new workforce were all cited as positive areas of focus.

Fifteen respondents indicated the keynote speakers were the highlight of the event. Twelve comments indicated the diversity of the audience contributed to the event's success, adding that the "attendees were the right group of people to advance conversation." Respondents further welcomed the presence of attendees from PennDOT's leadership, the PA Turnpike Commission, and other organizations across the country and the state.

Nine respondents said they most appreciated learning more about the current status and the future of AV technology. Eight comments reflected on the networking opportunity, and another eight comments cited the “good exchange of information” and positive discussion as a high point of the Summit.

The event location was seen as beneficial to five respondents, and five more expressed appreciation for “taking a deeper look at key issues” from a safety and a legal perspective.

The attendance and support of high-level PennDOT leadership was a positive factor cited by three comments, and PennDOT’s “prioritization of this technology” was highlighted as positive by two additional respondents. One respondent praised the overall “expert discussion,” and the high road taken by industry experts who refrained from name-dropping or touting their own success in the AV arena.

#### **Q4: What did you like least about this event?**

Fifty-one comments reflected on the session topics, and the overall flow of the day.

1. Sessions did not address: **(15 total comments)**
  - The impact of technology on current policies **(2 comments)**
  - A better understanding of the current reality (there were a lot of questions, this is a new topic, we need a future focus, etc.)
  - Actionable strategies (sessions were informative, but information wasn’t actionable)
  - Foundational technologies such as machine learning
  - Human factors and safety research
  - Integration of AVs with the current infrastructure
  - Interaction of AVs with people who need to share the road (e.g., bicyclists, pedestrians, other drivers, etc.)
  - Planning needs (e.g., updating Long Range Plans, TIPs, etc.)
  - Real world examples of how to design infrastructure to accommodate this technology
  - The legislation component
  - The need to continue maintaining the current infrastructure (roads and bridges) while also spending funds on preparing for the advanced technology
  - The need to start planning, in detail, how to prepare for and plan reactions to different scenarios before they happen (“Government isn’t designed to move fast”)
  - The research needed
  - What role can the Government play in shaping or mitigating impacts
2. Include a session that addresses the impact of AV technology, especially on the following: **(8 comments)**
  - Employment
  - Hacking
  - Impact on practicing engineers
  - Land use
  - Oversight of the roadway systems
  - Public safety and trust
  - The environment
  - Transportation agencies

3. Breakout sessions **(5 comments)**
  - Some attendees were dissatisfied with being forced to choose between important or interesting topics **(4 comments)**
  - Too much “unscripted discussion with little focus” in a session
4. An AV vehicle demonstration and/or a tour of CMU, and one suggested the possibility of charging a fee with registration for those interested in the tour **(4 comments)**
5. Discussion/topics were repetitive **(4 comments)**
6. Too many questions and not enough answers **(4 comments)**
7. Summit was “too PA centric,” and the topics weren’t “unique enough” **(3 comments)**
8. Some topics needed more time or detail **(2 comments)**
  - “Disappointed” with the Careers & Opportunities as there are no current job openings and an uncertain future for this technology
  - Developing & Motivating our Workforce of the Future
9. “Little technical learning” for attendees **(2 comments)**
10. Not enough “visionary” opinions were discussed
11. One respondent said open and honest discussion on set-backs, such as the Tesla failure, would be helpful
12. Topics were too limited to safety and employment issues

Forty respondent comments focused on the venue, suggesting a need for larger rooms and additional chairs, especially within the breakout sessions. Respondents felt the breakout sessions were too crowded, and recommended asking attendees to register for specific sessions to better plan for attendance. The columns in the main room made sight-lines and audience participation difficult, and the venue location was seen as difficult to access. Further, several respondents noted there were too many chairs crowded around tables during the Plenary Sessions, and one respondent would have preferred a location within easy walking distance of area amenities such as restaurants.

Twelve respondents commented on the speakers. Comments include:

1. Speakers should have/distribute PowerPoint presentations **(2 comments)**
2. Too many panel discussions; panels weren’t interactive enough **(2 comments)**
3. Less conversation and more presentation would be preferred
4. More private industry representation and discussion is needed
5. Public transit must be part of the task force and more included
6. Q&A should be addressed during sessions
7. Some attendees asking questions had the microphone/floor too long
8. Some speakers were “reaching” on the topic
9. The “Legal Landscape” presentation was “one-sided”
10. The AV impact to convenience (retail, fuel, logistics and businesses) should be discussed
11. The lunchtime speaker’s thoughts weren’t on-topic

Additional comments included praise from four respondents who said there was “nothing to like least” about this “well-run” event.

Final comments included a desire to see the Summit held at the end of the week, rather than at the beginning, longer breaks, and more municipal officials in attendance.

**Q5: If you have additional feedback or suggestions for improving future events, please share your comments below.**

Fifty respondents provided additional feedback in Question 5. Their feedback included:

1. Include sessions on other topics **(28 total comments)**
  - A greater focus on the transition period where AVs are co-existing/sharing the road with non-AV drivers, bicyclists, and pedestrians **(2 comments)**
  - What we should be doing now, and what actionable steps we can take to prepare for this technology **(2 comments)**
  - Balance the focus on technology with the impact to policy (different breakout sessions could focus on these two tracks)
  - Community awareness strategies
  - Consider a broader scope for some topics
  - Demonstrate “field deployments” of technology for AV systems, like traffic signal controlling (show other cities and municipalities what they can do to prepare and progress with AV technology)
  - Discuss the impact of AV technology on the AASHTO Green Book
  - Discuss the impact of AV technology and changes to infrastructure, specifically regarding lane widths, shoulders, barriers, super elevation, etc.
  - Ensure a true focus on AV technology in all sessions
  - Ensure the agenda and talking points are driven by the speakers instead of the moderators
  - Have more answers, examples, and outcomes as opposed to questions and hypotheticals
  - Include a session on AI/Machine Learning to gain a deeper understanding of its strengths and weaknesses with a focus on the impact to safety and legal issues
  - Industries impacted (commercial fleets, maintenance, etc.)
  - Local municipality impact
  - More focus on technology
  - Planning for funding, especially to fund pilot programs
  - Present a more formal plan for the future of AV technology, in five-year increments, beginning in 2020
  - Provide more focus on the users of this technology
  - Provide more interactive opportunities for audience feedback, especially for attendees who don’t like speaking in a public setting but have valuable ideas
  - Research the Mystic, CT conference agenda for more comprehensive topics, including representation from NHTSA, USDOT, and Volpe
  - Show future projections with two tracks – one optimistic, one reserved – to prepare for the reality in the middle
  - Some sessions lacked a true planning focus
  - Strategies for planning to safely interact with roadway and highway workers and emergency responders
  - Training on planning for the future
  - Use of vehicles

2. Suggestions on the venue or location **(14 comments)**
  - A larger venue in a different or better location **(9 comments)**
  - Consider moving the venue around the state **(3 comments)**
    - Philadelphia, State College, Hershey, Lehigh Valley, Scranton, and Harrisburg were all suggested
  - Include signs outside each breakout room announcing the topic
  - The noise during the breakout sessions was disruptive
  - There were too many chairs around the tables in the Plenary Sessions
3. Praise for a well-organized event **(13 comments)**
  - This event was excellent, well-planned, and well-organized **(9 comments)**
  - Attendance was great
  - Excellent location
  - Keep supporting this topic, especially with good leadership demonstrated by PennDOT and other state agencies
  - The presenters were very knowledgeable
4. Attendees would like access to on-site demonstrations of automated vehicles **(6 comments)**
5. Broader list of attendees **(5 comments)**
  - Invite local government/municipality representatives
  - Invite local PennDOT District-level traffic engineers and staff involved in current and future projects
  - Invite representatives from impacted communities
  - Invite various constituencies (e.g., those who develop legislation, land use, planning services, etc.)
  - The Summit should be open to the public
6. Suggestions on speakers **(3 comments)**
  - Invite speaker Bryant Walker-Smith back as he was “dynamic, passionate, and interesting”
  - Invite speakers from ride-sharing companies
  - Invite speakers from the automotive industry
7. Condense the Summit to a one-day session
8. Consider a lower registration fee
9. Continue to hold this Summit, perhaps in the spring and fall, across Pennsylvania
10. Diversify speakers (e.g., have different speakers than those who presented last year)
11. Expand the Summit to a full two-day event with a broader, less redundant agenda
12. Provide hard copies of slide presentations, or ensure the speakers use visual aids



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