2021 WEBINARS ON CONNECTIVITY

During 2021, this National Academies-TRB Forum presented a series of webinars on vehicle connectivity and its role in AVs and shared mobility. The following is a summary of the presentations and discussions that took place during these webinars.

1. State and Regional DOT Perspectives on Connectivity

February 22, 2021

The National Academies-TRB Forum on Preparing for Automated Vehicles and Shared Mobility presented a webinar for Forum participants on February 22nd discussing the future of connectivity from the perspective of state and local transportation agencies.

Forum participants from the Minnesota DOT, Virginia DOT, Washington State DOT, Washington State Transportation Commission, and the Maricopa County Arizona DOT provided summaries of the current status of connectivity and what the future may hold.

There was general agreement that connectivity is essential to achieving the full potential of automated vehicles (AVs), but that state and local agencies need more predictability and guidance to help reach this potential. Challenges include a lack of standards, changing legislative and regulatory environments, differing urban vs. rural environments, lack of incentives for private sector investments, and balancing short and long term maintenance and asset management needs. A number of participants expressed support for the federal government and national organizations to provide a strong leadership role in addressing these needs.

Regarding the investments that state DOTs have made in DSRC, it was mentioned that many states are now broadcasting DSRC, but that hardly anyone is listening at this point. The state DOTs expect to continue to maintain what they have already invested in, but will also be moving on to other options.

Another topic of discussion was the importance of cooperation between the public and private sectors in pursuing connectivity between vehicles, infrastructure, and users. It was pointed out that the private sector currently has major concerns over the reliability of the public sector in such a partnership.

Participants were also reminded that the transportation community has faced great uncertainties throughout our history – uncertainties that research and experience have helped to address.

2. National and Regional Perspectives on Connectivity

March 12, 2021

On March 12th, the National Academies-TRB Forum on Preparing for Automated Vehicles and Shared Mobility presented its second of three webinars on connectivity and its role in AVs and shared mobility. This second webinar focused on the perspective of national administrations and

regional organizations. The final webinar in the series will focus on the perspectives of OEMs and other industry representatives.

The March 12th webinar included presentations from the U.S. DOT, the U.S. Department of Energy, Transport Canada, and the Eastern Transportation Coalition. Greg Winfree, Executive Director of the Texas A&M Transportation Institute and a Co-Chair of the Forum, moderated. Among the common themes that came out in the presentations and discussions were the following:

- Automation and connectivity together can amplify the benefits of each
  - Connectivity can enable AVs to communicate with other users
  - According to the DOE, cooperative connected automated vehicles can reduce energy consumption by upwards of 25% for these vehicles
- Connectivity provides an opportunity for the public and private sectors to collaborate
  - Connectivity may help OEMs address some of the remaining obstacles to deploying highly automated vehicles and to expand operational design domains (ODDs)
  - Public agencies need to figure ways to scale up these innovative ideas in partnership with the private sector
  - Private sector pooled innovation funds can be a way to overcome these challenges
  - Increasing market penetration is the key to realizing benefits for connectivity
- The current degree of uncertainty regarding FCC safety bands have made it difficult for the public and private sector to plan investments
- Most of the data currently being generated by vehicles is not being captured

3. OEM and Industry Perspectives on Connectivity

April 8, 2021

On April 8th, the National Academies-TRB Forum on Preparing for Automated Vehicles and Shared Mobility presented its third in a series of three webinars on connectivity and its role in AVs and shared mobility. This third webinar focused on the perspective of private sector organizations.

While the point was made by many that connectivity is, and will continue to be, a component that is critical to the success of deploying automated vehicles, various viewpoints were expressed on the potential for cooperation between the public and private sectors.

One perspective that was raised was that, absent federal regulations and/or market interest in specific connectivity features, there may not exist a strong business case for the private sector to invest in vehicle connectivity with the infrastructure. Supporting this was the view that most automotive safety features today are the result of federal regulation, and that this probably needs to occur in the area of connectivity.

However, it was also pointed out that good progress was made on V2X over a 15 year period leading up to about the year 2014. The broad industry belief in the early years that "autonomous" operations did not require public sector connectivity seemed to be changing. Many companies were working with state DOTs behind the scenes. Divisions over V2X protocols, and the recent FCC actions on DSRC, have interrupted this, leading to increased uncertainties.

The current degree of uncertainty surrounding the connectivity issue that was raised in the first two Forum connectivity webinars continued be stressed in this third webinar. It was stated that the profession must acknowledge that the various components of ACES (automated, connected, electric, and shared vehicles) are not being developed and deployed on the same timeline. The timeline for highly automated vehicles, for example, has lengthened considerably from earlier expectations. On the public sector side, the question of where additional funding will come from to support connectivity remains unanswered.

On a more optimistic note, while there is uncertainty today, many see opportunity ahead.

The FCC rule narrowing the safety band has still not been published in the Federal Register, leaving open the possibility of changes. Regardless of the outcome, the public and private sectors can work together to determine the priorities of how to best use the final safety band.

In addition, the importance of connectivity has become increasingly apparent over the years. Presenters offered long lists of the benefits of connectivity, and FHWA has done extensive research on the benefits of connectivity to the end user.

It was again stressed that support from the general public is key to deploying connectivity in a large enough scale to make a real difference. The need for a unified set of talking points was mentioned, beginning with terminology. For example, "cooperative automation" may be a better PR term than V2V, V2I, V2X, etc.

It was emphasized that the benefits of connectivity to the traveling public need to be clearly demonstrated and articulated. It is important to communicate the benefits beyond safety. Support was expressed for pilot programs that can exhibit benefits and answer questions, such as those initiated in the 1990s for intelligent transportation systems.

4. How Will Connected and Autonomous Vehicles Affect Light-Duty Vehicle Fuel Economy?

June 24, 2021

On June 24th, the National Academies Board on Energy and Environmental Science presented a webinar to the National Academies/TRB Forum on Preparing for Automated Vehicles and Shared Mobility on the potential fuel economy impacts of connected-automated vehicles (CAVs). The presentation was based on the Board's recent report "Assessment of Technologies for Improving Light-Duty Vehicle Economy 2025-2035," which is available at Assessment of Technologies for Improving Fuel Economy of Light-Duty Vehicles-Phase 3 | National Academies

Some of the key points presented by Gary Marchant (Committee Chair, Arizona State University) and Therese Langer (Committee Member, American Council for an Energy Efficient Economy) were the following:

- Unprecedented change is predicted during 2025-2035 period for technology in light-duty vehicles (LDVs)
- CAVs are capable of fuel savings, but not assured
- Issues for lower level CAVs and fully autonomous vehicles are fundamentally different

    - CAVs energy impacts focus on individual vehicles, vs. autonomous vehicles which would be determined more by vehicle ownership and miles traveled
- CAVs can provide fuel savings up to 8 percent by optimizing velocity and minimizing acceleration events
    - With reliable V2I, this could increase to 20 percent
- Full penetration of autonomous vehicles could plausibly impact energy consumption by -40% to +70% (DOE National Labs, Gohlke 2020)
    - Most likely impact of +10%
- To ensure savings, automakers need to be encouraged to design for efficiency of CAV technologies
- Agencies should consider actions to guide system effects of autonomous driving, including policies to promote vehicle sharing and complementarity to less energy intensive modes
- Agencies should consider regulating fleet AVs differently from personally owned vehicle; consider electric vehicles mandate
- AVs share of market in 2035 highly uncertain, but likely to fall in 0-40% range
    - Fleets could comprise 40%-60% of AV sales

The presentation slides are available online at the event link for the webinar: https://www.nationalacademies.org/our-work/forum-on-preparing-for-automated-vehicles-and-shared-mobility-services#sectionPastEvents

5. V2X Communications—New Directions, Opportunities, & Challenges

November 4, 2021

On November 4, 2021, Steve Kuciemba presented the Forum with a summary of NCHRP Web-Only Document "Evaluation and Synthesis of Connected Vehicle Communication Technologies," along with information on developments since this document was finalized. Mr. Kuciemba's slides are included in a separate document.