Planning for C/AV Deployment:
The Federal Perspective and Coordination and Collaboration with
Transportation Stakeholder Associations and Organizations
AMPO Connected and Autonomous Vehicles (C/AV) Working Group
Meeting 3: November 13-14, 2017 in Washington, DC

The AMPO C/AV Technical Working Group held its third meeting from November 13-14, 2017 in Washington, DC. The first day of the meeting was a focused discussion between the AMPO C/AV Working Group and its federal partners in the United States Department of Transportation (U.S. DOT) and United States Environmental Protection Agency (U.S. EPA). The second day of meetings included the federal partners along with a diverse group of AMPO's peer agencies, such as the Conference on Minority Officials, Eno Center for Transportation, I-95 Corridor Coalition, Institute of Transportation Engineers C/AV Task Force, National Organization of Development Organizations, National Association of Regional Councils, and Transportation Research Board. The objectives of the meetings were to identify:

- The roles, responsibilities, relationships, and opportunities for collaboration between local, regional, and federal agencies and peer associations and organizations on issues related to C/AVs
- Topics of concern to these partners, their relevance to MPOs, and potential for collaboration on topics identified as high priority areas
- Gather perspectives on issues already identified as concerns for MPOs in earlier working group meetings, including:
  - Challenges, concerns, and needs as C/AVs are addressed in the transportation planning process, such as:
    - Training, tools, and technical capacity building
    - Data collection, analysis, and modeling
    - Staffing and resources
  - Policy level structure and guidance
  - Differences in planning and infrastructure needs, challenges, potential benefits, and applications of CV and AV
  - Strategies for incorporating C/AVs in metropolitan transportation plan and Transportation Improvement Program (TIP)
  - Strategies for establishing effective planning practices and scenario planning processes
  - Key triggers (e.g., adoption rate and introduction of emerging technology) in C/AV deployment and implementation
  - Current or upcoming projects and initiatives or opportunities for coordination and collaboration among meeting attendees

The meeting opened with the agencies providing an update of the status of activities, opportunities, challenges, and needs related to C/AVs in their agencies and organizations. The discussion highlighted the congruence of opportunities, challenges, and needs shared by the diverse attendees participating in AMPO's C/AV Working Group meeting series. Topics discussed during this meeting overlapped in some cases with topics identified at the previous working group meetings, including:

- Institutional readiness
  - Staff capacity building
  - Incorporating C/AV into organizational processes and structure
- Integration into the transportation planning process
  - Need for a C/AV vision for the region and nation
  - Policies and investment strategies to support both current needs and the vision for the desired future
  - "Future-proofing" investment decisions so they will not be rapidly outdated by the introduction and implementation of new technology
  - Balancing the needs, priorities, and maturity levels of the different states (especially for multistate MPOs)
- Engaging policy boards and stakeholders on C/AV technology
  - Raising awareness
  - Educating and informing
  - Managing expectations
- Potential C/AV impacts on revenue sources
  - AV electrification and gas tax revenue
  - Changes in VMT or road usage (e.g. zero-occupant vehicles)
  - New approaches to tolling and revenue collection
- Managing uncertainty of the impacts of C/AV deployment scenarios on the regional and national transportation system
  - Potential indirect impacts include
    - Land use and built environment changes
    - Repurposing/reclaiming parking
    - Managing pickup/drop off activity with shared AVs
    - Shift in balance between personal travel and goods movement
  - Modeling benefits and limitations
    - Models are helpful (if they are not too complicated) in assessing a range of "what ifs" related to future scenarios
    - Models are built on expectations derived from our knowledge of past behavior and may be misleading when applied to a future with considerably more uncertainty
    - Documentation is critical to prevent model assumptions and inputs from being misunderstood as outputs
      - There is evidence of a "herd effect" in how models are set up (where different models start using assumptions because others used them previously, without any clear rationale for using that specific assumption in the first place).
    - Models can help understand the "limits of the possible" (e.g. bottlenecks in pick-up/drop-off capacity for shared AVs)
    - No amount of modeling can reduce the intrinsic uncertainty of how people will respond to and use the new technologies as they are deployed in greater and greater numbers
- Equity and Environmental Justice considerations in deployment and transportation system investments

- Cybersecurity for vehicles and data
- Data Management
  - Collection, storage, analysis, and sharing of data generated by C/AV vehicles and infrastructure
  - Data generated by public infrastructure as a potential revenue source
  - Exploring quid pro quo arrangements with communications providers (e.g. trading right-of-way access for access to data and information channels)
- Freight
  - Deployment timelines and needs may differ compared to lightweight vehicles and transit
  - Automation of freight and delivery may significantly change personal shopping travel
- Transit
  - Deployment timelines and needs may differ compared to lightweight vehicles and freight
  - Cost effectiveness of certain types of services may change (e.g. paratransit, last-mile access)
  - Relationship between app-enabled private transport and public transit may become more complex, and require new approaches to funding, revenue management, and interoperability
- Transportation Network Companies/ridesharing
  - Relationship to transit is complex (see above)
  - May entail shifts in ownership and use of private vehicles
  - May continue to be disruptive even without C/AV

The attendees also discussed many new topics. A significant new item discussed by the working group was C/AV deployment impact on infrastructure stresses and loadings. The U.S. DOT is conducting research to explore how the platooning of vehicles may affect loadings on bridges and ramps, which is especially of concern for long span bridges and ramps. In order to reduce loadings, it may be necessary for vehicle platoons to increase following distances prior to arriving at long span bridges and ramps. Attendees also explored the possibility for existing spans to be reinforced and design guidelines updated. In addition, the driving precision of C/AVs may allow them to track with much greater precision within a lane, which has the potential to increase stresses on pavements and an increase in rutting. This could also necessitate a careful examination of current design practices.

The attendees also discussed the importance of considering the full range of emerging technologies (e.g., Smart Cities, electrification, shared carpooling, and crowdsourcing) and the potential for their impacts to coalesce for a larger scale of influence not only on the transportation system, but also on air quality and other secondary impacts. As technology spurs changes to vehicles (e.g., efficiency), mode choice, fuels, technology, travel demand, and land use and the built environment will be significantly impacted. Attendees also expressed concern that different technologies (e.g. connected vehicles, automated vehicles, and cooperative automated vehicles) are often bundled together for discussion, even though their needs, benefits, impacts and potential deployment scenarios and timeframes are likely to be quite different.

The discussion moved to the impacts of C/AV technology on the performance measures implemented by MAP-21 and the FAST Act. The attendees identified potential opportunities for C/AV

technology to aid in achievement of the measures, such as improved safety and reduced congestion due to less frequent incidents caused by human error, but identified uncertainty in congestion and air quality impacts related to vehicle miles traveled in C/AV deployment and adoption scenarios. Attendees also wondered how the measures may need to evolve as deployment and implementation of C/AV moves forward.

In trying to address the uncertainty in deployment and implementation, attendees suggested three strategies. The first to make investment decisions that support the future transportation system with or without C/AVs—ensuring the community understands that what is implemented today will make their lives better today and in the future as technology is deployed and implemented. Second, to make investment decisions that support and guide the transportation system to the desired future. Finally, to identify specific elements to help guide incorporation of C/AV technology into transportation planning processes and stakeholder involvement:

- Potential deployment scenarios (e.g., early adoption and contained deployment scenarios such as low speed automated shuttles serving corporate or academic campuses, mixed fleet scenarios, and full deployment/market share penetration)
    - o Explore in terms of different MPO contexts, for example, the differences in impacts, adoption, and potential MPO actions on major city centers, mid-sized city centers, suburbs, corporate/university campuses, major highways/urban areas, and rural areas.
- "Drivers": aspects of technology and society that are not controlled by transportation agencies (e.g., market share)
- "Levers": activities that transportation agencies and their government partners have influence over (e.g., land use and investment decisions)
- Triggers, tipping points, and timelines: key moments that define important shifts in how the transportation system is operating (due to the presence or absence of expected effects from "drivers" or "levers")
- Four dimensions of readiness: vehicle systems technology (largely private sector driven), supportive infrastructure, responsive institutions, and community acceptance.

A major focus of the meeting was potential collaboration and partnerships to address the issues brought up by the meeting participants. Attendees identified the need for support at the federal level which might include:

- New policies and regulations, as well as adjustments to existing policies and regulations
- Guidance for planning and investment decisions to ensure interoperability, safety, equity, and consistency in national deployment and implementation
- Guidance on effective use of funding and investment as the technology spurs significant changes to the transportation system.

At the state, local, and regional levels, the attendees suggested establishing policies that might:

- Help manage land use and the built environment,
- Manage congestion, spikes in VMT, and air quality impacts

- Maintain the transportation agency's role as stewards of the transportation system who ensure all modes and users (especially vulnerable road users such as bicyclists, pedestrians, and persons with disabilities) have access to a safety, equitable, and efficient transportation system.

At all levels an overarching vision is needed--at the national level, consistent with the federal planning factors, and; at the state, regional, and local levels to guide specific investments and policies. However, while guidance, policies, and visions are needed, attendees recognized that it is important to provide flexibility and not stifle the potential applications and benefits of C/AV technology.

Based on the discussion, the attendees identified the following as high priority tools and resource needs:

- Development of a matrix, such as the following one, that identifies issues related to C/AV deployment and implementation, the associated impacts (benefits and consequences), potential MPO actions, and opportunities for partnerships

Issue	Impacts (benefits and consequences)	Likelihood of impact	Intensity of impact	Importance regionally/ nationally	Role/potential actions of MPO	Role/potential actions of MPO partners

- Identification of C/AV deployment scenarios to assist MPOs as they explore the uncertainty of C/AV technology in their transportation planning processes (foundational work on such scenarios is underway at FHWA for release in 2018)
- Identification of the high priority leadership roles for MPOs and their partners related to C/AV deployment and implementation, including in areas that have not traditionally been their purview, such as coordination of public and private activities.
- Identification, for example in the form of a matrix, the specific drivers, levers, and dimensions of readiness described above:

	Likely associated outcomes	Triggers	Tipping points	Timeline (near-, mid-, or long-term)	Role/potential actions of MPO	Role/potential actions of MPO partners
Drivers						
Levers						
Dimensions of Readiness						
Vehicle systems technology						

Infrastructure					
Institutional					
Community					

- Development of a vision for the transportation system at different scales (national, state, regional, and local).
- Development of a self-evaluation kit for MPOs related to C/AV deployment and implementation.
- Establishment of a forum for regular dialogue among MPOs and their partners, for example in the form of a quarterly conference call.
- Development of venues and resources for capacity building
- At the federal level, development of an integrated source for notices on available resources, ongoing activities, and other materials.
- Development of Federal guidance for priority investment decisions through public involvement at national, state and regional level, and through consultation with private sector stakeholders

This is the third in a series of four whitepapers that will be developed by the AMPO C/AV Working Group over the course of 2017-18. Each of the four whitepapers and related meeting materials will be made available on the AMPO website and can be found at www.ampo.org.