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## Theme #11: Connected and Automated Vehicles and Emerging Technologies

### Data

1. Identify methods to capture the costs, return on investment, and metrics for rural technology demonstration projects.
2. Document emerging data resources and how they can be collected and applied in rural areas.
3. Identify strategies to integrate data collection systems between regional partners to foster coordination and performance standards.
4. Identify and document the benefits of SAE Level 1 automation for rural transit and paratransit operations.
5. Identify and document the benefits of SAE Level 2 automation for rural transit and paratransit operations.
6. Identify and document the benefits of SAE Level 3 automation for rural transit and paratransit operations.
7. Identify data sources and describe methods of accounting for variations in fleet turnover rates when computing the benefits and costs of rural safety improvements and connected and automated vehicle (CAV) deployments.
8. Evaluate the need for publicly-subsidized high-definition digital mapping to support connected deployments in rural areas.

### Demonstration/Pilot Projects

1. Implement demonstration/pilot projects to test the functionality of connected and automated vehicles (CAVs) in rural terrains and assure that rural communities are not marginalized by CAV deployments.
2. Create a central location to document all rural connected and automated vehicle (CAV) demonstration projects.
3. Identify and pilot technologies to decrease response time for rural emergency responders.
4. Identify the impacts, opportunities, and gaps of new vehicle technology on rural systems.
5. Identify innovative methods for ITS devices to enhance safety in the rural context.
6. Identify equity issues affecting rural connected and automated vehicle (CAV) deployments.
7. Identify automation experiences from the agricultural sector that are relevant to on-highway connected and automated vehicle (CAV) deployments.

### Electric Vehicles

1. Identify and document the operation and maintenance costs and cost-effectiveness of electric vehicles utilized for rural transit/paratransit fleets.

2. Identify best practices for transitioning public fleets from conventional vehicles to new technologies.
3. Evaluate the technical and business requirements for providing publicly-accessible electric vehicle (EV) charging infrastructure in rural areas, including methods of cost recovery and the potential for integrating EV charging sites into rural tourism/economic development plans.
4. Identify typical distances driven for everyday rural trips and compare to the range characteristics of electric vehicles.

### Infrastructure and Maintenance

1. Evaluate the economics of maintaining connected vehicles and automated vehicles in rural and remote communities.
2. Analyze the economics of building and maintaining connected vehicle infrastructure in rural areas.

### Marketing and Public Outreach

1. Develop educational materials to help agency fleet managers determine which advanced vehicle technologies to specify when procuring vehicles.
2. Identify characteristics of successful public outreach programs to help rural consumers determine which technologies to purchase when buying new vehicles.
3. Document the effectiveness of programs aimed at helping elderly drivers understand and use the technology in their vehicles.
4. Identify characteristics of successful programs for communicating benefits and limitations of connected and automated vehicle (CAV) technologies in rural areas and driving differences in rural and urban areas.
5. Evaluate rural public attitudes toward connected and autonomous vehicles to identify possible barriers to CAV acceptance.

### Planning

1. Develop a timeline of anticipated future technological advancements relevant to rural transportation.
2. Identify methods for identifying and predicting connected and automated vehicle (CAV) effects on rural travel patterns.
3. Create a rural connected vehicle sustainability plan pilot, template, and training.
4. Identify vehicle-to-infrastructure technologies relevant to rural areas and small communities. Determine costs, benefits and legal liabilities associated with deployment or non-deployment. Develop guidance on deployment thresholds and funding of operation and maintenance.
5. Evaluate the impact that connected and automated vehicles (CAV) and other emerging technologies will have on tribal and Federal lands (including national parks), including barriers, benefits, costs, and planning recommendations.
6. Initiating the systems engineering process for rural connected vehicle corridors (NCHRP 08-120).

## Rural Barriers

1. Identify barriers to connected and automated vehicle (CAV) implementation in rural areas and solutions so rural areas are not marginalized by technological advances.
2. Document methods to provide traveler information on low technology to benefit remote areas and emergency/natural disaster communications.
3. Develop a process for creating periodic snapshots of rural broadband connectivity. Analyze this data to predict areas that are unlikely to obtain broadband coverage in the absence of regulatory interventions or subsidies.
4. Analyze relationships between rural broadband services and transportation applications of broadband. Evaluate regulatory, institutional, and commercial barriers to broadband expansion.
5. Create an implementation plan for selectively building up broadband across America to assist with traveler information and crisis communication in a disaster.
6. Develop case studies of agencies and projects that have deployed telecommunications infrastructure to rural/remote areas in parallel with highway improvements.

## Technical Standards

1. Develop a technical primer for rural transportation practitioners that describes what is currently known and unknown about the technical requirements for vehicle-to-infrastructure (V2I) devices. Prepare an objective description of the implications of interim and unresolved technical standards (e.g. DSRC vs 5G wireless).
2. Develop design standards for platoon marshalling areas that will be used for assembly and dispersal of groups of automated trucks operated on rural highways.
3. Identify need for possible supplemental navigational aids supporting CAV operations in rural areas.
4. Evaluate the feasibility of using communications alternatives such as 4G or 5G wireless in lieu of DSRC for V2I, I2V and V2V data transfers, and backhaul infrastructure to support roadside equipment (especially in rural areas) (AHB15).