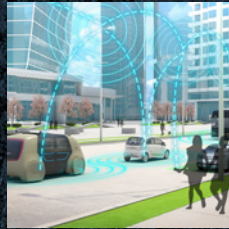GOVERNOR'S ADVISORY COUNCIL ON
CONNECTED AND AUTOMATED VEHICLES

EXECUTIVE REPORT

DECEMBER 2018

MINNESOTA

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EXECUTIVE SUMMARY

What would a future look like where cars and trucks drove themselves? Where Minnesotans could easily find transportation in all parts of Minnesota? Where transportation was affordable and accessible? Where business and the workforce thrive? This is what a future with connected and automated vehicles (CAV) could look like. With the rapid advancements in technology and automobiles, connected and automated vehicles have the ability to transform our society into one that is safer, more equitable, efficient, and sustainable. By proactively harnessing this technology, the state can greatly improve quality of life, prioritizing drivers before cars, and people before technology.

MINNESOTA

EXECUTIVE SUMMARY

BACKGROUND

What would a future look like where cars and trucks drove themselves? Where Minnesotans could easily find transportation in all parts of Minnesota? Where transportation was affordable and accessible? Where business and the workforce thrive? This is what a future with connected and automated vehicles could look like. With the rapid advancements in technology and automobiles, connected and automated vehicles have the ability to transform our society into one that is safer, more equitable, efficient, and sustainable. By proactively harnessing this technology, the state can greatly improve quality of life, prioritizing drivers before cars, and people before technology.

Industry is rapidly developing connected and automated vehicle technology. Most major manufacturers have CAV development programs. Waymo, a subsidiary of Google, began their automated vehicle program in 2009. Waymo has driven more than 10 million miles in automated mode; more than 25,000 miles each day. GM has already installed connected vehicle technology in some Cadillacs; Toyota will add connected vehicle technology to most models by 2021. The industry is moving, and it's moving fast toward the future.

THE INDUSTRY IS MOVING, AND IT'S MOVING FAST TOWARD THE FUTURE.

Many states have already passed CAV legislation to advance safety, economic development and mobility. Nevada was the first state to pass automated vehicle legislation in 2011. Since then, 28 additional states passed laws authorizing CAV. There are over 80 connected and automated vehicle pilots across the country.

MANY STATES HAVE ALREADY PASSED CAV LEGISLATION TO ADVANCE SAFETY, ECONOMIC DEVELOPMENT AND MOBILITY.

MINNESOTA TAKES NOTE

On March 5, 2018 Governor Dayton signed *Executive Order 18-04*, which established the Governor's advisory council on Connected and Automated Vehicles. The executive order recognizes that CAV technology is evolving rapidly and that Minnesota must prepare for the transformation and opportunities associated with the widespread adoption of CAV. While the future of this transformative technology is yet unknown, the advisory council - in collaboration with business, partners and the public - was tasked with recommending changes to Minnesota statutes, rules, and policies to the Governor and Legislature by December 1, 2018.

IMPACTS

If Minnesota doesn't take any action to anticipate CAV technology, it will miss a critical opportunity to use technology for the benefit of Minnesotans and businesses. Failure to take action could jeopardize safety, impose additional infrastructure costs, increase congestion, lose business and economic development opportunities, displace workers, negatively impact public health, and even further increase equity disparities.

KEY THEMES

The advisory council consulted with governmental entities, communities experiencing transportation barriers, transportation stakeholders, the automotive industry, business, labor, technology companies, advocacy groups, and educational institutions. Input consisted of public meetings, public events, online surveys, consultation with Minnesota tribal nations, stakeholder meetings, and feedback from Minnesotans and individuals across the country.

In developing the recommendations below, the advisory council identified six key themes:

Modernize Policy – Current statutes and policies never contemplated automated or connected vehicle technology. State statutes and policies need to reflect changing technologies. The state must proactively engage in modernizing state law and policy. Statues and policy need to be clear, concise, and allow the state to adapt to rapidly evolving technology. The legislature should authorize the safe testing and deployment of automated vehicles and truck platooning.

Equity – The State must prioritize mobility strategies that address accessibility, equity, environmental sustainability, and public health.

Minnesota can be a leader in reducing disparities for communities disproportionately impacted by limited access to transportation and opportunities. State and local government CAV policies and initiatives must prioritize people and communities first in developing a multimodal transportation system.

Proactive Leadership and Public Engagement – State leadership and collaboration will be critical for promoting CAV benefits for Minnesotans. The continuation of the advisory council, the Interagency Connected and Automated Vehicles Team (I-CAV), stakeholder groups and public engagement are critical to guiding statewide CAV policy.

Input from industry, academia, government and the public ensures all Minnesotans have an equal voice in advancing CAV.

Public Education and Outreach – Most Minnesotans have limited experience with this rapidly developing technology. To better understand the benefits and limitations of CAV, there should be statewide educational opportunities for the public to experience the technology through demonstrations and offer feedback.

Funding and Revenue – To ensure the technology is safely and effectively deployed, the state must: modernize infrastructure to adapt to emerging technology; conduct pilot projects to engage the public; research CAV to support unique Minnesota needs; train drivers on how to safely use the technology; and prepare our future work force. The State will need to collaborate with local governments and invest in research and pilots to prepare for emerging CAV technologies. The current transportation revenue structure does not meet current demand, and options for diversifying and supplementing existing revenues will be needed.

Partnerships – Public-private partnerships are crucial in promoting collaboration amongst government, academia, and private industry to shape standards and policy, share best practices, identify infrastructure needs, address data and cyber security concerns, promote accessibility and equity, ensure environmental and health benefits, and enact licensing requirements to safely operate CAV. The state will also need to address private industry's future use of public rights-of-way for CAV.

ADVISORY COUNCIL RECOMMENDATIONS

The advisory council conducted extensive public engagement and gathered feedback to guide future CAV policy. Dozens of public meetings involving hundreds of participants formulated recommendations on transportation infrastructure, vehicle registration, driver training and licensing, accessibility, equity, revenue, traffic regulations and safety, economic development, business opportunity, workforce preparation, insurance and liability, cyber security and data privacy, and land use and planning. In addition, hundreds of online public surveys were submitted on these policy areas.

Based on the themes and input obtained from the public engagement process, below is a summary of the advisory council recommended changes to statutes and policies to prepare Minnesota for CAV.

The full list of recommendations can be found in Section VII (Advisory Council Recommendations) and Appendix C (Policy Subcommittee Recommendations).

SAFE AUTOMATED VEHICLE TESTING

- Authorize in statute the commissioners of public safety and transportation to safely test automated vehicles on public roadways.

    - Authorize testing without human drivers present in non-commercial vehicles to advance mobility options for persons with disabilities. Only authorize testing without humans present in closed conditions in limited areas prior to testing on public roads to minimize safety risk.

- Require human drivers to be present at all times when testing commercial vehicles.

- Require the commissioner of transportation to submit an annual report on automated vehicle testing, applications to test, and automated vehicle activities authorized by the State of Minnesota.

- In addition to testing, develop a future plan to safely deploy these vehicles for personal, public and commercial use.

TRUCK PLATOONING

- Allow in statue the department of transportation and public safety to authorize truck platooning, in collaboration with the applicable public authority with jurisdiction of the roadway.

LEADERSHIP AND COLLABORATION

- Establish a future transportation mobility executive committee in 2019 to continue the work of Governor Dayton's Connected and Automated Vehicle advisory council to guide statewide policy, and report annually on CAV activities.

- Continue stakeholder subcommittees and create a public engagement plan to ensure Minnesotans have a strong voice in creating statewide CAV policy.

- Continue the Interagency Connected and Automated Vehicle Team designated in the executive order, and continue with the Minnesota Department of Transportation as the lead agency in this effort. The I-CAV team should be expanded to include other state agencies, local government and Tribal governments.

Governor's CAV advisory council meeting held on November 27, 2018

TRANSPORTATION INFRASTRUCTURE

- Invest now in fiber optic communications, signal system modernization, improved pavement markings, telecommunications, smart signage, traffic management data, and encourage investment in vehicle electrification to support emerging CAV technologies that also support human drivers.

- Prioritize safety needs for all road users (e.g. pedestrians, cyclists, persons with disabilities, transit, and railroads) when making infrastructure investments for CAV.

- Fund testing on existing publically owned infrastructure, assessment of infrastructure to support automated vehicles and truck platooning, and operational needs to maintain CAV infrastructure.

VEHICLE REGISTRATION, DRIVER TRAINING AND LICENSING

- Develop standards for test drivers of automated vehicles and create a statewide curriculum for driver/user training on the limitations and benefits of the technology.

- As the technology develops, reconsider and update driver licensing requirements to allow people with disabilities, veterans, aging, and others who may not have driver's licenses the ability to independently utilize automated vehicles.

ACCESSIBILITY AND EQUITY

- The state must ensure that CAV pilot projects are conducted in urban, suburban and rural Minnesota to allow the public equal opportunities to learn about the technology and help guide policy decisions.

- Conduct pilot projects in areas with aging populations, persons with disabilities, low-income communities, in communities of color, and tribal nations.

- Recognize tribal regulatory sovereignty and the need for state-tribal uniformity when enacting CAV regulation through continued consultation and coordination.

- Invest in CAV training and workforce development opportunities and ensure existing workforce has access to retraining opportunities.

- Ensure that rural Minnesota is prepared for changing technologies and CAV by investing in broadband and other infrastructure that connects Minnesota.

REVENUE

- Create a public-private working group to conduct a comprehensive review of current and future revenue options for transportation funding and make recommendations on how to diversify and supplement transportation funding to reflect emerging technologies.

Automated shuttle demonstration during 2018 Super Bowl in downtown Minneapolis with the National Federation of the Blind of Minnesota

TRAFFIC REGULATIONS AND SAFETY

- Determine what data needs to be collected specific to CAVs and vehicle collisions.

- Enact policies that support human and automated driving, while also protecting vulnerable road users such as cyclists, pedestrians, aging populations and transit users.

ECONOMIC DEVELOPMENT, BUSINESS OPPORTUNITY AND WORKFORCE PREPARATION

- Allow automated vehicle testing to promote Minnesota as a center to educate the public and attract industry.

- Modernize workforce and apprenticeship opportunities to ensure that our future workforce is prepared for CAV.

- Develop training programs and establish a training fund for state educational institutions to develop training for drivers, operators, mechanics and other organizations that may be impacted by CAV.

INSURANCE AND LIABILITY

- Adopt consistent definitions of driver, operator, owner and automated vehicle in state statute to address CAV.

- Require proof of minimum financial liability for automated vehicle testing consistent with other states.

CYBER SECURITY AND DATA PRIVACY

- Update the Minnesota Data Practice Act to expand the definition of private data to address what government collects about humans who travel in automated vehicles and protect personal data by anonymizing, aggregating and summarizing private data.

- Adopt and develop security protocols early in application development to significantly minimize cost and address cyber security risk.

LAND USE AND PLANNING

- Maintain current delegation of powers for transportation infrastructure planning at all levels of government, and the authority for land use planning largely remain with local and regional government.

- Assist local government, transit providers and metropolitan organizations in funding CAV pilot projects, training, and research. Ensure best practices and information is shared with all communities throughout the state.

/Autonomous
/Sensing
/Communication
/Battery
/Navigation
/Mirrorless
/Ecology

CONNECTED AND AUTOMATED VEHICLES OVERVIEW

In 2017, 358 people were killed in traffic crashes on Minnesota roadways. Nationally, 39,141 people lost their lives. In more than 94 percent of fatal crashes, human error – such as distracted and impaired driving - contributed to the collisions. CAVs may significantly reduce crashes because the technology relies on sensors, software, data, road infrastructure, and electronic communications to operate safely.

 MINNESOTA

SECTION I
CONNECTED AND AUTOMATED VEHICLES OVERVIEW

In 2017, 358 people were killed in traffic crashes on Minnesota roadways. Nationally, 39,141 people lost their lives. In more than 94 percent of fatal crashes, human error – such as distracted and impaired driving - contributed to the collisions. CAVs may significantly reduce crashes because the technology relies on sensors, software, data, road infrastructure and electronic communications to operate safely.

CAVS MAY SIGNIFICANTLY REDUCE CRASHES BECAUSE THE TECHNOLOGY RELIES ON SENSORS, SOFTWARE, DATA, ROAD INFRASTRUCTURE AND ELECTRONIC COMMUNICATIONS TO OPERATE SAFELY.

CONNECTED VEHICLES

Connected vehicles use different technologies that allow vehicles to communicate with each other, infrastructure (e.g. traffic signals), pedestrians, cyclists and other objects, such as trains and smart-phones. Connected vehicles can provide information and alerts to drivers and other vehicles, which reduces crashes, improves traffic flow and saves energy.

An example of CV technology is truck platooning. Platooning uses technology to electronically link vehicles, which can reduce congestion, save fuel and minimize driver stress.

Connected and automated vehicles are vehicles that combine both automated and connected technology, therefore the acronyms AV and CV mean very different types of technology; CAV is an acronym that is a broad term that encompasses both CV and AV technology.

PLATOONS ELECTRONICALLY LINK VEHICLES, WHICH CAN REDUCE CONGESTION, SAVE FUEL AND MINIMIZE DRIVER STRESS AND FATIGUE

AUTOMATED VEHICLES

Automated vehicles use sophisticated computer programming, cameras and sensors to take control over some, or all, aspects of a driving task. The federal government adopted the Society of Automotive Engineers levels of automation, as seen in Figure 1, on the following page.

MINNESOTA

FIGURE 1 - SAE AUTOMATION LEVELS

LEVEL 0

NO AUTOMATION

LEVEL 1

DRIVER ASSISTANCE

LEVEL 2

PARTIAL AUTOMATION

LEVEL 3

CONDITIONAL AUTOMATION

LEVEL 4

HIGH AUTOMATION

LEVEL 5

FULL AUTOMATION

Level 0 (No Automation) – The human driver performs all tasks.

Level 1 (Driver Assistance) – Technology assists the human driver by performing steering, accelerating, or braking tasks. Examples of Level 1 technology already available include adaptive cruise control and lane keeping assist.

Level 2 (Partial Automation) – Technology assists the human driver by managing both steering and speed under certain conditions. These vehicles require the driver to monitor the surrounding environment, and are commercially available.

Level 3 (Conditional Automation) – In addition to Level 2 abilities, these vehicles can also monitor the environment. A licensed driver is still required to intervene and take control when the system notifies the driver. This technology is developed but not yet commercially available.

Level 4 (High Automation) – These vehicles are capable of operating with or without a steering wheel, pedals, or a human driver. These vehicles, in certain environments, can handle most driving tasks on their own. Limited level 4 vehicles are commercially available.

Level 5 (Full Automation) – These vehicles can drive, without a human driver, at anytime, anywhere and under any conditions. No level 5 vehicles are commercially available.

ELECTRIC VEHICLES

Many AVs are being built as electric vehicles, but the future is still unclear if the industry will broadly adopt electric vehicle technology. EVs use an electric motor as the primary propulsion system. Types of electric vehicles include battery electric vehicles (100 percent electric), hybrid-electric vehicles (fuel engine and electric drive, energy generated from the engine and not a plug-in) and plug-in hybrid electric vehicles. Electric vehicles can be charged at home, work or other public places that provide charging stations. There are a limited number of stations that rapidly charge EVs. Infrastructure investment is important to support electrification and automated vehicles. Advancing electric vehicles promotes Minnesota's goals to reduce greenhouse gas emissions, pollution, and meet the states climate change reduction goals.

SHARED MOBILITY

Shared mobility is the idea that transportation services, such as transit, bike sharing, scooters, ridesharing, on-demand services, micro transit and other modes of transportation, could be shared among users. Mobility as a service allows users to arrange various modes of transportation in a single intermodal trip, such as a bike share to public transit stop and then a rideshare to an ultimate destination. MaaS considers fewer personally owned vehicles and instead incorporates solutions used as a service. With the expansion of transportation service models, the world is experiencing a change in the way people travel. Fewer people may choose to own private vehicles either due to social behavior or the costs of the technology. The future is unclear about the adoption of shared use.

INFRASTRUCTURE INVESTMENT IS IMPORTANT TO SUPPORT THIS EVOLVING TECHNOLOGY.

WITH THE EXPANSION OF MOBILITY AS A SERVICE, THE WORLD IS EXPERIENCING A CHANGE IN THE WAY PEOPLE TRAVEL.

ADVISORY COUNCIL PURPOSE & CAV OBJECTIVES

Governor Mark Dayton's Executive Order 18-04 established the Governor's council on Connected and Automated Vehicles on March 5, 2018. The advisory council, co-chaired by the Minnesota Department of Transportation Commissioner Charlie Zelle and Xcel Energy President Christopher Clark, includes 13 volunteer members appointed by the governor and ex-officio members from state agencies and the legislature. Members represent a wide variety of sectors and organizations, including transportation, local government, technology, business, advocacy, accessibility and tribal governments. The council members were selected by Governor Mark Dayton through the Minnesota Secretary of State's open appointment process, which allows all persons to have equal opportunity to participate in statewide leadership.

SECTION II
ADVISORY COUNCIL PURPOSE & CAV OBJECTIVES

PURPOSE

Governor Mark Dayton's _Executive Order 18-04_ established the Governor's Advisory Council on Connected and Automated Vehicles on March 5, 2018. The advisory council, co-chaired by the Minnesota Department of Transportation Commissioner Charlie Zelle and Xcel Energy President Christopher Clark, includes 13 volunteer members appointed by the governor and ex-officio members from state agencies and the legislature.

MEMBERS REPRESENT A WIDE VARIETY OF SECTORS AND ORGANIZATIONS, INCLUDING TRANSPORTATION, LOCAL GOVERNMENT, TECHNOLOGY, BUSINESS, ADVOCACY, ACCESSIBILITY AND TRIBAL GOVERNMENTS.

Members represent a wide variety of sectors and organizations, including transportation, local government, technology, business, advocacy, accessibility and tribal governments. The council members were selected by Governor Mark Dayton through the Minnesota Secretary of State's open appointment process, which allows all persons to have equal opportunity to participate in statewide leadership.

THE COUNCIL WAS TASKED WITH THREE DUTIES:

THE COUNCIL'S DUTIES

1. Consult with governmental entities, communities experiencing transportation barriers, transportation stakeholders, the automotive industry, businesses, labor, technology companies, advocacy groups and educational institutions.

2. Prepare and submit a report to the governor, the chairs and minority leads of the Minnesota House and Senate Transportation and Public Safety committees, and the Minnesota Legislature by Dec. 1, 2018 that recommends changes to statutes, rules and policies in the areas of:

- Transportation infrastructure and network
- Cyber security and data privacy standards
- Vehicle registration, driver training, licensing, insurance and traffic regulations
- Promotion of economic development, business opportunities and workforce preparation
- Accessibility and equity for all Minnesotans, with a particular focus on rural communities, elderly Minnesotans, Minnesotans with disabilities, low-income communities, communities of color and Minnesota tribes on preparing Minnesota for connected and automated vehicles.

3. Provide advice and support to the governor, Department of Transportation, the Department of Public Safety and other governmental entities to support the safe testing and deployment of CAVs.

OBJECTIVES

The advisory council first identified goals and priority areas for Minnesota, recognizing the strong relationship with automated vehicles, connected vehicles, electric vehicles and shared mobility. Many AVs are being built on electric vehicle platforms, which impacts how infrastructure is built, land is used, regions are planned and highways are funded. Car companies and transportation network companies such as Uber and Lyft are considering how automation and shared mobility could transform transportation. Shifts in the ownership or operation models for shared electric vehicles could also impact infrastructure, mobility options, lane use, planning and liability. With these principles, the council identified the following vision, mission, goals and values for Minnesota as it considers CAV policy.

VISION

The Governor's Advisory Council on Connected and Automated Vehicles is a public/private partnership that promotes collaboration among leaders to shape the future of mobility and maximize the potential of transformative mobility solutions to ensure greater access and benefits for all.

MISSION

Engage with stakeholders, private industry, communities experiencing transportation barriers, transportation, the automotive industry, business, labor, technology, advocacy groups, educational institutions and government to advance innovation that safely tests and deploys connected and automated vehicle technology to ensure equity for those with mobility barriers and build public trust to improve the quality of life of Minnesotans.
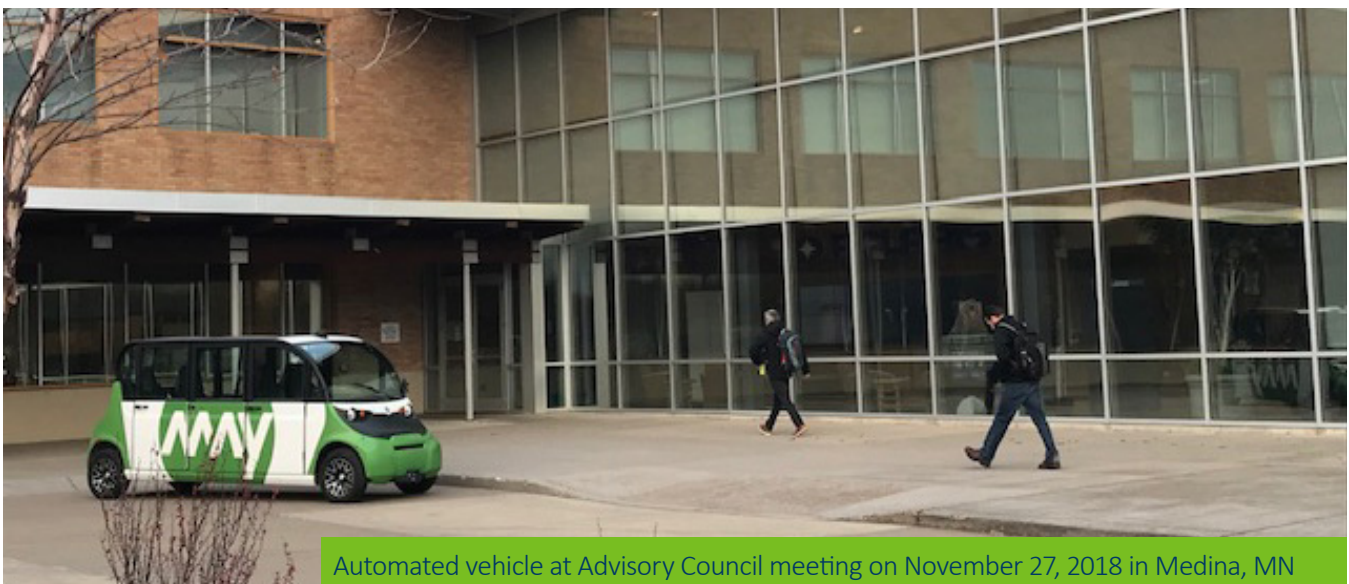
Automated vehicle at Advisory Council meeting on November 27, 2018 in Medina, MN

mn MINNESOTA

THE ADVISORY COUNCIL ESTABLISHED GOALS AND VALUES TO HELP MINNESOTA STRATEGICALLY PLAN FOR CAV.

GOALS

1. Position Minnesota as a place to safely test and deploy CAV to accelerate public benefits and encourage economic and workforce development.

2. Engage and educate the public to build public trust.

3. Develop actionable recommendations to facilitate the adoption of CAV to enhance quality of life, health and the environment while providing flexibility to account for evolving technology.

4. Recommend shared mobility strategies to address accessibility and equity.

VALUES

1. Safety solutions that save lives and improve public health

2. Innovation that harnesses opportunities and mitigates risks

3. Equity for all Minnesotans

4. Environmental sustainability

Governor's CAV advisory council meeting held on November 27, 2018

WHY CAV IS IMPORTANT TO MINNESOTA

CAV technology is advancing rapidly around the world. Most major vehicle manufacturers are developing these technologies in partnerships with the technology industry. Across the U.S. and internationally, automated cars, trucks and buses are being tested and deployed. While it is unclear when this technology will be fully available, it is clear that CAV is the future of transportation and may fundamentally change the way we live our lives.

SECTION III
WHY CAV IS IMPORTANT TO MINNESOTA

CAV technology is advancing rapidly around the world. Most major vehicle manufacturers are developing these technologies in partnerships with the technology industry. Across the U.S. and internationally, automated cars, trucks and buses are being tested and deployed. While it is unclear when this technology will be fully available, it is clear that CAV is the future of transportation and may fundamentally change the way we live our lives.

Minnesota should proactively harness the benefits and manage the risks of a changing transportation system to better the quality of life for all Minnesotans.

The potential benefits of CAVs include:

Increased Safety

In 2017, an estimated 39,141 people were killed on the U.S. transportation system. Nearly 94 percent of these fatalities were caused by human factors, such as distracted driving, speeding or impaired driving. Automation has the ability to save lives.

Greater Mobility and Equity

CAV may reduce transportation barriers for persons with disabilities, the aging population, low income communities and many others. CAVs could provide Minnesotans broader access to live, work and play where they choose, regardless of income, race, geography, disability, age or other factors that historically have contributed to transportation barriers.

Economic and Workforce Development

Minnesota is competing in a global market. This technology provides Minnesota with an opportunity to maintain a competitive business edge nationally and internationally in the movement of goods, services and people.
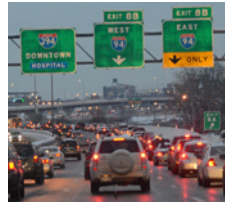
Efficiency

CAVs may reduce traffic congestion and improve traffic flow at intersections, work zones, during adverse weather conditions, reroute traffic and may also assist in incident management.
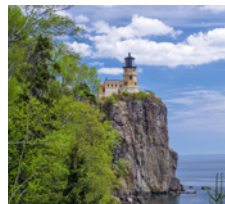
Maximize Health and Environment

CAV could help the state rethink the way we plan communities to maximize health and sustainable multimodal transportation. AV may reduce greenhouse gas emissions and other air pollutants with the expansion of electric vehicles.

CRITICAL OPPORTUNITY

If Minnesota doesn't take any action to anticipate CAV technology, it will miss a critical opportunity to use technology for the benefit of Minnesotans and businesses. Failure to take action could jeopardize safety, impose additional infrastructure costs, increase congestion, lose business and economic development opportunities, displace workers, decrease health benefits and even further increase equity disparities.

STATE AND FEDERAL ROLES IN CONNECTED AND AUTOMATED VEHICLES

The safe testing and deployment of CAV technology will rely on developing policies, regulations and guidance at the federal, state and local levels. The U.S. Department of Transportation's National Highway Transportation Safety Administration enforces the Federal Motor Vehicle Safety Standards, which includes investigating recalls, regulating equipment and issuing industry guidance. States have authority to license and train drivers, register vehicles, enact and enforce traffic laws and regulate insurance and liability.

STATE AND FEDERAL ROLES IN CONNECTED AND AUTOMATED VEHICLES   IV

SECTION IV

STATE AND FEDERAL ROLES IN CONNECTED AND AUTOMATED VEHICLES

The safe testing and deployment of CAV technology will rely on developing policies, regulations and guidance at the federal, state and local levels. The U.S. Department of Transportation's National Highway Transportation Safety Administration enforces the Federal Motor Vehicle Safety Standards, which includes investigating recalls, regulating equipment and issuing industry guidance. States have authority to license and train drivers, register vehicles, enact and enforce traffic laws and regulate insurance and liability.

On Oct. 4, 2018, the U.S. Department of Transportation released _Preparing for the Future of Transportation: Automated Vehicles 3.0_, which issues voluntary guidance for government and industry. The federal guidance addresses all modes of transportation, including how automation impacts pedestrians, cyclists, commercial carriers, freight and port authorities. In guidance to states, the USDOT recommends considering minimum requirements for test drivers operating AVs and that states may want to coordinate broadly with diverse stakeholders to develop guidelines for the safe testing and deployment of AVs.

Figure 2 below identifies some of the different roles the federal government, states and local governments have in the safe testing and deployment of CAV. However some of these roles could become less clear as the traditional human driving task is taken over more by automation. Private industry is heavily involved in the development of state and federal policy in these areas to promote more national uniformity.

Figure 2. Federal, State and Local Roles for Safe Testing and Deployment of CAVs

FEDERAL, STATE & LOCAL ROLES	FEDERAL	STATE	LOCAL
Motor vehicle safety standards	■		
Regulate interstate commerce	■		
Traffic control standards (i.e. uniformity in road markings, signing, and other devices)	■		
Contribute to the development of cyber security standards and protocols	■	■	
Develop testing and deployment programs	■	■	■
Driver licensing and vehicle registration	■	■	
Commercial motor vehicle operations, driver training, and licensing	■	■	
Insurance regulations		■	
Public safety and law enforcement		■	■
Assess infrastructure for CAV readiness		■	■
Workforce training and public outreach	■	■	■
Environmental and health standards	■	■	

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NATIONAL TRENDS & CURRENT STATUS OF MINNESOTA

CAV testing and deployment is rapidly advancing across the country. Currently 29 states have passed legislation allowing for testing or full deployment of CAVs. Nevada was the first state to enact legislation in 2011. To-date, 10 states have issued executive orders to prepare for or authorize CAV testing.

SECTION V
NATIONAL TRENDS & CURRENT STATUS OF MINNESOTA

CAV TESTING & DEPLOYMENT

Figure 3 - State that Allow AV Testing/Deployment

CAV testing and deployment is rapidly advancing across the country. Currently 29 states have passed legislation allowing for testing or full deployment of CAVs, Figure 3. Nevada was the first state to enact legislation in 2011. To-date, 10 states have issued executive orders to prepare for or authorize CAV testing.

LEGEND   Enacted Legislation   Executive Order   Both   None
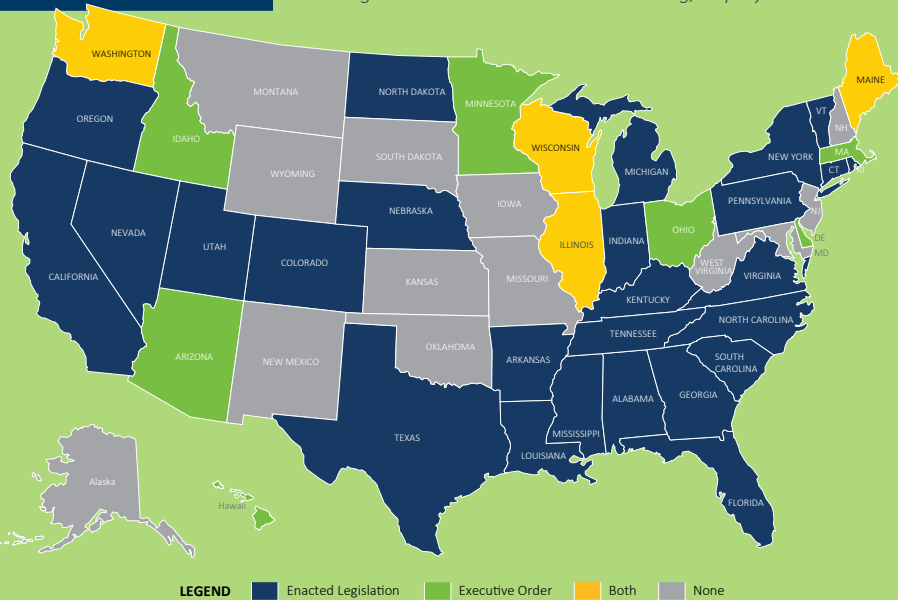
TRUCK PLATOONING

Figure 4 - States Which Allow Truck Platooning

Currently 23 states allow truck platooning on public roads. Platooning laws typically allow vehicles with truck platooning technology to follow closer than the minimum following distance allowed in law.

LEGEND   Platooning Allowed   Limited Commercial Deployment   Platooning Testing Allowed   Legislation Pending   None
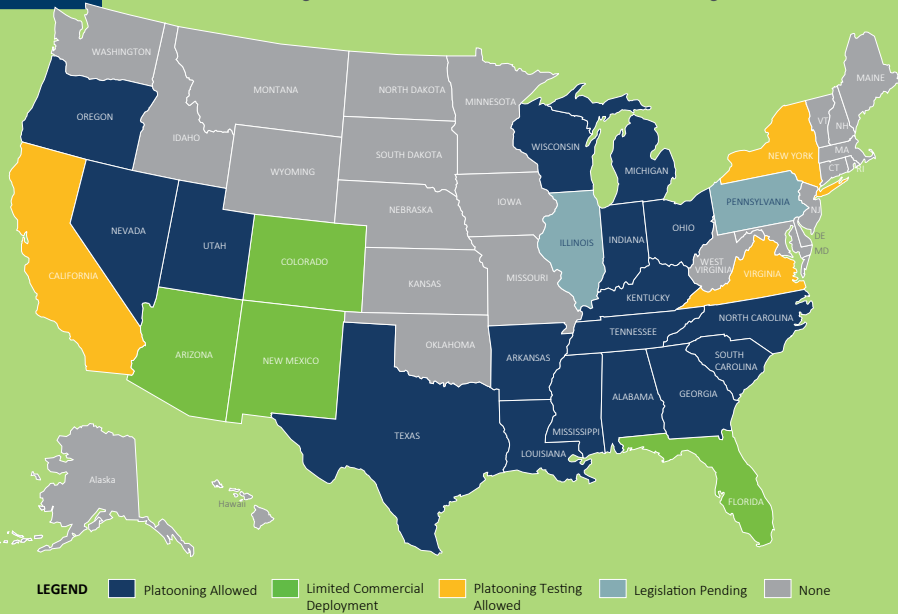
BELOW IS A SUMMARY OF WHAT SOME STATES ARE DOING TO SAFELY TEST AND DEPLOY CAV TECHNOLOGY.

MINNESOTA

Current law is unclear whether automated vehicles and truck platoons may operate in Minnesota. While MnDOT oversees the construction and operation of trunk highways, the Department of Public Safety regulates the individuals who use the public roadways by overseeing vehicle registration, driver training and licensing, public safety, criminal apprehension and state patrol. When drafted, Minnesota law never contemplated machines operating vehicles. Industry has requested clarity from states on whether AVs or truck platoons are allowed.

ARIZONA

Arizona issued an executive order in 2015 authorizing AV testing. This year the governor signed an executive order allowing Level 4 and 5 fully automated vehicles to test on public roads, resulting more than 600 vehicles operating on Arizona roads.

STATE HIGHLIGHTS

Michigan allows automated vehicles to operate on roadways with or without human drivers present.

California requires vehicles to be tested in controlled conditions before public roads.

Minnesota laws are unclear whether automated vehicles and truck platoons can operate on public roads.

North Carolina established an autonomous vehicle committee to collaborate and share information.

CALIFORNIA

With the large presence of technology firms in Silicon Valley, California developed rules in 2014 to permit AV testing. Testing is allowed on public roads, by permit, to auto manufacturer's employees, contractors or designees. Manufacturers can apply for a permit to test vehicles with or without human drivers. Vehicles must first be tested in controlled conditions before testing on public roads. Human operators must meet certain minimum qualifications and complete a test driver training program. For those vehicles without operators present in the vehicle, a constant communication link is required between the vehicle and a remote operator. Recently the California Department of Motor Vehicles approved testing without human drivers. This has allowed the testing of slow-speed (35 miles per hour or less) Level 4 vehicles in limited locations.

MICHIGAN

Home of the U.S. auto industry, Michigan law allows AVs to operate on streets and high- ways, with or without a human operator present. A human operator must be an employee, contractor or designee of an auto manufacturer or company that created the automated driving system, and otherwise be able to lawfully operate a vehicle. Michigan created the council on Future Mobility so Michigan continues to be a world leader in CAV technology, fostering partnerships with private industry, the Michigan DOT and the University of Michigan to create the MCity testing facility in Ann Arbor.

NEBRASKA

In 2018 Nebraska passed a law allowing driverless and automated vehicles to operate on public roads without a human driver present. The law requires that the AV meet certain requirements, such as complying with traffic laws, proof of financial responsibility or self-insurance and the assurance that any reporting procedures are followed in the event of a collision.

COLORADO

Colorado requires automated vehicles to comply with all state and federal laws, or alternatively receive approval from the Colorado State Patrol and Colorado Department of Transportation to operate if current standards cannot be met. This safety self-certification has resulted in two requests to test automated vehicles.

NORTH CAROLINA

North Carolina passed several laws in 2018 allowing automated vehicles to operate on public roads if the vehicles meet federal safety standards and comply with North Carolina traffic laws. The vehicles must be pro-grammed with a fail-safe emergency stop in case the "automated driving system fails" and be properly insured and registered. There are no requirements for the operator to be licensed or that a human be present when operating in fully automated mode, but requires unsupervised persons to be at least 12-years-old. North Carolina also established an autonomous vehicle committee to collaborate and share informa-tion and educational tools to make recommendations to the state's general assembly related to CAV.

FUTURE OF MOBILITY

Collaboration and information sharing amongst states is critical to help understand CAV, share best practices and prepare for the future of mobility.

MINNESOTA'S CURRENT CAV INITIATIVES

To promote innovation and the safe testing and deployment of CAV technology, the state is collaborating with industry, public safety, state agencies and local governments on CAV activities across Minnesota. Currently, Minnesota's efforts are focused on public outreach, research and testing and innovative industry partnerships.

MINNESOTA

SECTION VI
MINNESOTA'S CURRENT CAV INITIATIVES

To promote innovation and the safe testing and deployment of CAV technology, the state is collaborating with industry, public safety, state agencies and local governments on CAV activities across Minnesota. Currently, Minnesota's efforts are focused on public outreach, research and testing and innovative industry partnerships.

PUBLIC OUTREACH

Several public demonstrations were held allowing Minnesotans to see, touch and better understand CAV technology. Pilot projects were conducted to help Minnesotans, policymakers and industry understand how AVs adapt to Minnesota's cold weather climate, because currently a vast majority of the nation's testing is done in warm weather climates.

OVER 1,300 PEOPLE RODE AN AUTOMATED SHUTTLE DURING THE 2018 SUPER BOWL IN MINNEAPOLIS TO LEARN ABOUT CAV AND PROVIDE FEEDBACK ON FUTURE POLICY.

Additional demonstrations were held on the Midtown Greenway in coordination with Hennepin County, on the University of Minnesota campus in Minneapolis, 3M campus in Maplewood and in downtown Rochester in a partnership with Rochester Public Transit and Destination Medical Center economic development agency.

Automated shuttle demonstration in Minneapolis during 2018 Super Bowl

Automated vehicle exhibit at 2018 Minnesota State Fair

Automated Shuttle Demonstrations – MnDOT hosted a series of public demonstrations in the winter of 2017-2018 with an automated shuttle. Demonstrations were held at the MnROAD testing facility near Albertville, Minnesota, at the State Capitol and in downtown Minneapolis during Super Bowl week. More than 1,300 people rode the shuttle during the three-day demonstration in Minneapolis.

State Fair – In partnership with Polaris and AutonomouStuff, MnDOT debuted the first AV exhibit at the Minnesota State Fair on Aug. 27, 2018. The exhibit included a Level 4 AV videos, educational materials and surveys to help the public learn about the technology and share feedback and concerns on CAV with the State.

CAV Strategic Plan – MnDOT is partnering with local agencies and stakeholders throughout the state to understand how the agency needs to prepare for a connected and automated future. In addition, Hennepin County is also developing a similar plan.

RESEARCH AND TESTING

Minnesota is one of the pioneers in cold weather testing for CAV. Given Minnesota's extreme weather conditions, this testing is critical to understand how vehicles operate in this environment and communicate with other vehicles and infrastructure to support this evolving technology.

MINNESOTA IS ONE OF THE PIONEERS IN COLD WEATHER TESTING FOR CAV.

Automated shuttle cold weather research at MnROAD

Cold Weather Testing in Greater Minnesota – MnDOT tested an automated low speed shuttle at the MnROAD facility. The testing facility's 2.5 mile closed loop allowed industry and MnDOT professionals to assess how automated vehicles operate in extreme cold weather conditions, including snow, ice and salt. This information helps the industry adapt its technology to operate in these environments.

Connected Corridor in Minneapolis - MnDOT is currently working on the Trunk Highway 55 Connected Corridor from Interstate 494 to Minneapolis. Using connected vehicle technology, signal systems will communicate with vehicles, improve snow plow efficiency and improve pedestrian safety.

USING CONNECTED VEHICLE TECHNOLOGY, SIGNAL SYSTEMS WILL COMMUNICATE WITH VEHICLES, IMPROVE SNOW PLOW EFFICIENCY AND IMPROVE PEDESTRIAN SAFETY.

Connecting Minnesota – Understanding that rural Minnesota has an important role, MnDOT is planning an 85-mile connected corridor on Trunk Highway 52 from St. Paul to Rochester. This corridor will include fiber optic communications and road side technology capable of communicating with vehicles and support work zone safety and incident management.

University Research – Research institutions across the state are looking into how CAV impacts our land use and zoning, how humans will be impacted and use this technology and innovative ways to harness and develop CAV technology.

Legislators, MnDOT and the University of Minnesota at CTS CAV Visioning Workshop

Private Industry Research and Development – Several Minnesota companies are rapidly advancing CAV technology through research and testing. For example, 3M's Connected Roads division is researching how to improve road safety by developing technologies both humans and machines can use. VSI Labs collaborates with the auto industry to research and test how to integrate technology into vehicles. Polaris is also developing CAV technology that supports their entire fleet of products, both in recreation, commercial and military use. In addition, many Minnesota engineering

and consulting firms are working with state and local government on the safe testing and deployment of CAV.

SEVERAL MINNESOTA COMPANIES ARE RAPIDLY ADVANCING CAV TECHNOLOGY THROUGH RESEARCH AND TESTING.

INNOVATIVE PARTNERSHIPS

Minnesota recognizes that the public-private sector must work closely together to build a safe and reliable CAV system.

Strategic Visioning – The University of Minnesota partnered with MnDOT, Hennepin County, Metropolitan Council and the McKnight Foundation to host a strategic visioning workshop on automated vehicles in June 2018. Participants in this two-day workshop developed action plans for advancing automated vehicles for people mobility, freight mobility, traffic operations and safety, planning, environment and economic development.

Information Sharing – Several groups around the state, such as the Minnesota County Engineers Association, Minnesota Guidestar and ITS Minnesota formed groups to guide policy and provide technical expertise on emerging technology trends.

Regional and National Research and Collaboration – MnDOT and other state agencies serve on several Midwest and national policy and technical committees to advance CAV technology and ensure Minnesota's voice is represented. In addition, MnDOT and other state and local agencies are collaborating with other states in "pooled fund" studies to research CAV technology. These studies include setting uniform standards and testing CAV technology to improve safety.

MNDOT AND OTHER STATE AGENCIES SERVE ON SEVERAL MIDWEST AND NATIONAL POLICY AND TECHNICAL COMMITTEES TO ADVANCE CAV TECHNOLOGY AND ENSURE MINNESOTA'S VOICE IS REPRESENTED.

Innovative Procurement and Ideas – Recognizing that private industry can be more innovative than government, MnDOT partnered with the Department of Administration to develop a new contracting method – the "_Minnesota CAV Challenge_." This challenge will improve the quality of life for Minnesotans by allowing industry and academia to propose innovative CAV ideas.

Automated vehicle demonstration at Polaris Headquarters on November 27, 2018

ADVISORY COUNCIL KEY RECOMMENDATIONS

The advisory council consulted with governmental entities, communities experiencing transportation barriers, transportation stakeholders, the automotive industry, business, labor, technology companies, advocacy groups, and educational institutions. Input consisted of public meetings, public events, online surveys, consultation with Minnesota tribal nations, stakeholder meetings, and feedback from Minnesotans and individuals across the country.

SECTION VII

ADVISORY COUNCIL KEY RECOMMENDATIONS

KEY THEMES

The advisory council consulted with governmental entities, communities experiencing transportation barriers, transportation stakeholders, the automotive industry, business, labor, technology companies, advocacy groups, and educational institutions. Input consisted of public meetings, public events, online surveys, consultation with Minnesota tribal nations, stakeholder meetings, and feedback from Minnesotans and individuals across the country.

In developing the recommendations below, the advisory council identified six key themes:

Modernize Policy – Current statutes and policies never contemplated automated or connected vehicle technology. State statutes and policies need to reflect changing technologies. The state must proactively engage in modernizing state law and policy. Statues and policy need to be clear, concise, and allow the state to adapt to rapidly evolving technology. The legislature should authorize the safe testing and deployment of automated vehicles and truck platooning.

Equity – The State must prioritize mobility strategies that address accessibility, equity, environmental sustainability, and public health. Minnesota can be a leader in reducing disparities for communities disproportionately impacted by limited access to transportation and opportunities. State and local government CAV policies and initiatives must prioritize people and communities first in developing a multimodal transportation system.

Proactive Leadership and Public Engagement – State leadership and collaboration will be critical for promoting CAV benefits for Minnesotans. The continuation of the advisory council, the Interagency Connected and Automated Vehicles Team (I-CAV), stakeholder groups and public engagement are critical to guiding statewide CAV policy. Input from industry, academia, government and the public ensures all Minnesotans have an equal voice in advancing CAV.

Public Education and Outreach – Most Minnesotans have limited experience with this rapidly developing technology. To better understand the benefits and limitations of CAV, there should be statewide educational opportunities for the public to experience the technology through demonstrations and offer feedback.

Funding and Revenue – To ensure the technology is safely and effectively deployed, the state must: modernize infrastructure to adapt to emerging technology; conduct pilot projects to engage the public; research CAV to support unique Minnesota needs; train drivers on how to safely use the technology; and prepare our future work force. The State will need to collaborate with local governments and invest in research and pilots to prepare for emerging CAV technologies. The current transportation revenue structure does not meet current demand, and options for diversifying and supplementing existing revenues will be needed.

Partnerships – Public-private partnerships are crucial in promoting collaboration amongst government, academia, and private industry to shape standards and policy, share best practices, identify infrastructure needs, address data and cyber security concerns, promote accessibility and equity, ensure environmental and health benefits, and enact licensing requirements to safely operate CAV. The state will also need to address private industry's future use of public rights-of-way for CAV.

ADVISORY COUNCIL RECOMMENDATIONS

The advisory council conducted extensive public engagement and gathered feedback to guide future CAV policy. Dozens of public meetings involving hundreds of participants formulated recommendations on transportation infrastructure, vehicle registration, driver training and licensing, accessibility, equity, revenue, traffic regulations and safety, economic development, business opportunity, workforce preparation, insurance and liability, cyber security and data privacy, and land use and planning. In addition, hundreds of online public surveys were submitted on these policy areas.

Based on the themes and input obtained from the public engagement process, below is a summary of the advisory council recommended changes to statutes and policies to prepare Minnesota for CAV.

The full list of recommendations can be found in Section VII (Advisory Council Recommendations) and Appendix C (Policy Subcommittee Recommendations).

SAFE AUTOMATED VEHICLE TESTING

- Authorize in statute the commissioners of public safety and transportation to safely test automated vehicles on public roadways.

  - Authorize testing without human drivers present in non-commercial vehicles to advance mobility options for persons with disabilities. Only authorize testing without humans present in closed conditions in limited areas prior to testing on public roads to minimize safety risk.

  - Require human drivers to be present at all times when testing commercial vehicles.

  - Require the commissioner of transportation to submit an annual report on automated vehicle testing, applications to test, and automated vehicle activities authorized by the State of Minnesota.

- Modify the definition of driver and operator to include automated vehicle technology.

- Define automated vehicles per the International Society of Automotive Engineers levels 4 and 5 definitions.

- Allow automated vehicles that are approved by the federal government to operate on Minnesota public roadways.

CAV Advisory Council meeting on November 27, 2018

- Designate MnDOT as the lead agency and single point of contact.

- Require the commissioners of public safety and transportation to coordinate with adjacent roadway authorities, if applicable.

- Require automated vehicles to carry insurance, license and registration.

- Automated vehicles must comply with all traffic laws unless an exemption is approved by the commissioner of public safety and transportation.

- Exempt automated vehicles from drivers licensing requirements if the automated vehicle technology cannot be operated by a human driver.

- Exempt the commissioners of public safety and transportation from developing rules in order to maintain flexibility and adapt to rapidly evolving technology and allow the commissioner of transportation to use its commissioner's order authority to enact testing program requirements.

- Allow the commissioner of transportation to revoke authorization of automated vehicle testing if the testing poses a risk to public safety or if the tester fails to comply with the requirements of the authorization.

- Require the commissioner of transportation to submit an annual report on automated vehicle

testing, applications to test, and automated vehicle activities authorized by the State of Minnesota.

- For public safety and consistency, allow only the state to regulate the testing and deployment of automated vehicles and to ensure uniformity and reciprocity.

- In addition to testing, develop a future plan to safely deploy these vehicles for personal, public and commercial use.

TRUCK PLATOONING

- Allow in statue the department of transportation and public safety to authorize truck platooning, in collaboration with the applicable public authority with jurisdiction of the roadway.

LEADERSHIP AND COLLABORATION

- Establish a future transportation mobility executive committee in 2019 to continue the work of Governor Dayton's Connected and Automated Vehicle advisory council to guide statewide policy, and report annually on CAV activities.

- Continue stakeholder subcommittees and create a public engagement plan to ensure Minnesotans have a strong voice in creating statewide CAV policy.

Transportation Infrastructure subcommittee meeting on September 10, 2018

- Continue the Interagency Connected and Automated Vehicle Team designated in the executive order, and continue with the Minnesota Department of Transportation as the lead agency in this effort. The I-CAV team should be expanded to include other state agencies, local government and Tribal governments.

TRANSPORTATION INFRASTRUCTURE

- Invest now in fiber optic communications, signal system modernization, improved pavement markings, telecommunications, smart signage, traffic management data, and encourage investment in vehicle electrification to support emerging CAV technologies that also support human drivers.

- Prioritize safety needs for all road users (e.g. pedestrians, cyclists, persons with disabilities, transit, and railroads) when making infrastructure investments for CAV.

- Update state procurement processes to adopt rapidly developing technologies, provide more flexibility to allow innovation, and encourage private investments in infrastructure technologies.

- Fund testing on existing publically owned infrastructure, assessment of infrastructure to support automated vehicles and truck platooning, and operational needs to maintain CAV infrastructure.

VEHICLE REGISTRATION, DRIVER TRAINING AND LICENSING

- Develop standards for test drivers of automated vehicles and create a statewide curriculum for driver/user training on the limitations and benefits of the technology.

- As the technology develops, reconsider and update driver licensing requirements to allow people with disabilities, veterans, aging, and others who may not have driver's licenses the ability to independently utilize automated vehicles.

- Fund research on how users interact with and operate these vehicles in a multi-modal transportation system.

ACCESSIBILITY AND EQUITY

- The state must ensure that CAV pilot projects are conducted in urban, suburban and rural Minnesota to allow the public equal opportunities to learn about the technology and help guide policy decisions.

- Conduct pilot projects in areas with aging populations, persons with disabilities, low-income communities, in communities of color, and tribal nations.

Automated shuttle demonstration during 2018 Super Bowl in downtown Minneapolis with the National Federation of the Blind of Minnesota

- Solicit public feedback on how to shape future deployment policy, including how to make the design more accessible for people with disabilities.

- Recognize tribal regulatory sovereignty and the need for state-tribal uniformity when enacting CAV regulation through continued consultation and coordination.

- Invest in CAV training and workforce development opportunities and ensure existing workforce has access to retraining opportunities.

- Ensure that rural Minnesota is prepared for changing technologies and CAV by investing in broadband and other infrastructure that connects Minnesota.

- Create grants or vouchers for aging populations, persons with disabilities, low-income communities, in communities of color, tribal nations and other populations experiencing transportation challenges to promote independent and affordable access to jobs, health care, and other basic human needs using automated vehicles.

REVENUE

- Create a public-private working group to conduct a comprehensive review of current and future revenue options for transportation funding and make recommendations on how to diversify and supplement transportation funding to reflect emerging technologies.

TRAFFIC REGULATIONS AND SAFETY

- Determine what data needs to be collected specific to CAVs and vehicle collisions.

- Enact policies that support human and automated driving, while also protecting vulnerable road users such as cyclists, pedestrians, aging populations and transit users.

- Traffic records coordinating committees should determine what CAV data needs to be integrated into the state crash reporting system.

ECONOMIC DEVELOPMENT, BUSINESS OPPORTUNITY AND WORKFORCE PREPARATION

- Allow automated vehicle testing to promote Minnesota as a center to educate the public and attract industry.

- Allocate financial incentives, such as tax benefits and grants, to support emerging CAV technology and deployment.

- Modernize workforce and apprenticeship opportunities to ensure that our future workforce is prepared for CAV.

- Develop training programs and establish a training fund for state educational institutions to develop training for drivers, operators, mechanics and other organizations that may be impacted by CAV.

Economic Development, Business Opportunity and Workforce Preparation Subcommittee meeting on August 21, 2018

INSURANCE AND LIABILITY

- Adopt consistent definitions of driver, operator, owner and automated vehicle in state statute to address CAV.

- Require proof of minimum financial liability for automated vehicle testing consistent with other states.

CYBER SECURITY AND DATA PRIVACY

- Dedicate a portion of on-going funding for modernization and maintenance of state-managed information technology and operational technology. Delayed maintenance incurs extra safety and security risk and can increase overall cost when maintenance and modernization is needed.

- Provide funding for annual third-party assessment of state0managed infrastructure, industry-provided technologies and the interaction between the two.

- Update the Minnesota Data Practice Act to expand the definition of private data to address what government collects about humans who travel in automated vehicles and protect personal data by anonymizing, aggregating and summarizing private data.

- Revise the definition of "personally identifiable information" to align with federal standards, to address what private data about individuals is shared and with whom the data can be shared, including requiring opt-in disclosures for consumer data.

- Adopt and develop security protocols early in application development to significantly minimize cost and address cyber security risk.

LAND USE AND PLANNING

- Maintain current delegation of powers for transportation infrastructure planning at all levels of government, and the authority for land use planning largely remain with local and regional government.

- Assist local government, transit providers and metropolitan organizations in funding CAV pilot projects, training, and research. Ensure best practices and information is shared with all communities throughout the state.

- Address private industry's future use of public rights-of-way for CAV.
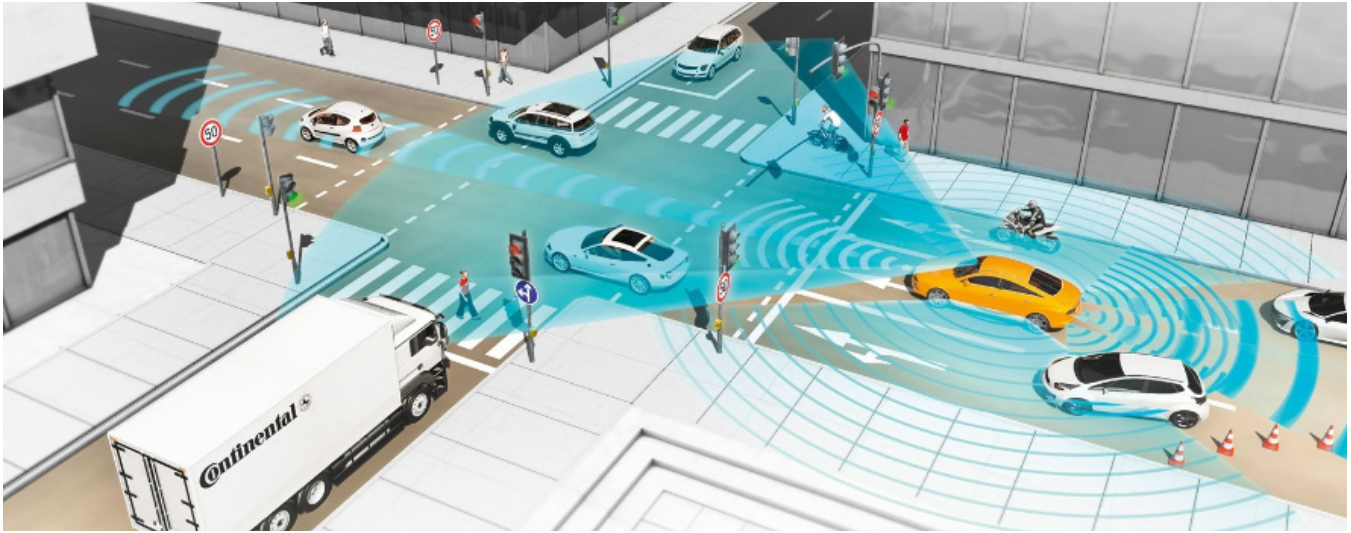
SUPPORTING RECOMMENDATIONS

Appendix C (Subcommittee Recommendations) includes recommendations to help guide future policy conversations and support the advisory council recommendations. These recommendations were formulated directly from ten subcommittees on the following topics:

1. Transportation infrastructure

2. Vehicle registration, driver training and licensing

3. Accessibility

4. Equity

5. Revenue

6. Traffic regulations and safety

7. Economic development, business opportunity and workforce preparation

8. Insurance and liability

9. Cyber security and data privacy

10. Land use and planning

STAKEHOLDER ENGAGEMENT & PUBLIC FEEDBACK

The council realizes the need to understand the public's feedback on shaping CAV policy. This required broad, diverse public engagement, including reaching out to communities experiencing transportation barriers and communities across Minnesota. The MnDOT Connected and Automated Vehicles Office, also known as CAV-X, along with the advisory council convened ten subcommittees to study, assess and prepare recommendations focusing on ten policy areas.

SECTION VIII
STAKEHOLDER ENGAGEMENT & PUBLIC FEEDBACK

OVERVIEW

The council realizes the need to listen to public feedback on shaping CAV policy. This requires broad, diverse public engagement, including reaching out to communities experiencing transportation barriers and communities across Minnesota. The MnDOT Connected and Automated Vehicles Office, also known as CAV-X, along with the advisory council convened ten subcommittees to study, assess and prepare recommendations focusing on ten policy areas, including:

- Transportation infrastructure
- Vehicle registration, driver training and licensing
- Accessibility
- Equity for all Minnesotans including rural Minnesota, the elderly, people with disabilities, low-income communities, communities of color and inter-governmental discussions with American Indian tribal governments
- Revenue
- Traffic regulations and safety
- Economic development, business opportunity and workforce preparation
- Insurance and liability
- Cyber security and data privacy
- Land use and planning

thoughts and concerns. Connected and automated technology is not just a transportation issue; it is a broad issue that cuts across all sectors and communities, from data privacy and insurance, to revenue and economic development. By collaborating with colleagues in other Minnesota agencies, MnDOT leveraged its relationships to reach out broadly across Minnesota to meet stakeholders with whom MnDOT had not traditionally included.

Through public meetings, online surveys, public events and meetings in homes and community centers, MnDOT connected with Minnesotans across the state to gather feedback on CAV policy.

THE COUNCIL ENGAGED MINNESOTANS IN CONVERSATIONS THROUGHOUT THE STATE TO ALLOW OPPORTUNITIES TO PROVIDE FEEDBACK AND GUIDE FUTURE POLICY.

STAKEHOLDER ENGAGEMENT & PUBLIC FEEDBACK PROCESS

The council and MnDOT were tasked with gathering broad public feedback in less than six months after the Executive Order was signed. This was a challenging task accomplished through dedication and collaboration with facilitators, state agency staff, by listening to the public and meeting with communities individually to hear their

MINNESOTA STAKEHOLDERS

Minnesota is the only state in the U.S. that conducted months of broad stakeholder engagement, held public meetings with non-traditional transportation stakeholders and met with groups that transportation departments rarely have the opportunity to meet. From aging associations, to civil rights groups, community elders to tribal executive directors, extensive efforts were undertaken to hear the voices of all Minnesotans, including holding a demonstration at the Minnesota State Fair.

Participant response surveys indicated more than 85 percent of respondents thought the events and information were successful and many requested more opportunities for feedback long into the future. In addition, MnDOT is working with other state agency staff to understand how to improve the public engagement, public relations and community involvement processes to promote policy decisions that reflect the needs of Minnesota's diverse communities, including accessibility and equity for all Minnesotans.

The goal of these conversations was to: (1) create an opportunity for experts, interested parties and the public to share their ideas and feedback on CAV;

and (2) build relationships and create a foundation for stakeholder engagement beyond the executive order. By building relationships, the state is building a stakeholder base that could be built upon as CAV policy is developed and provides a variety of avenues for the public to participate.

Figure 5 below, is a list of the public meetings and events held to listen to public feedback and guide CAV policy development. Meetings were held in various Twin Cities locations and greater Minnesota. Each meeting included remote participation and online meeting options for attendees across the state to provide feedback.

Figure 5: Public Meetings and Events on CAV Policy Development

MEETING DATE	POLICY TOPIC	MEETING DATE	POLICY TOPIC
JULY 12, 2018	Equity and Tribal Government-to-Government Relations	SEPTEMBER 18, 2018	Economic Development, Business Opportunity and Workforce Preparation
AUGUST 17, 2018	Cyber Security and Data Privacy	SEPTEMBER 18, 2018	Equity and Aging Impacts
AUGUST 21, 2018	Economic Development, Business Opportunity and Workforce Preparation	SEPTEMBER 20, 2018	Traffic Regulations and Safety
AUGUST 27, 2018	State Fair Exhibit and Demonstration	SEPTEMBER 24, 2018	Vehicle Registration, Driver Training and Licensing
AUGUST 27, 2018	Insurance and Liability	SEPTEMBER 24, 2018	Insurance and Liability
AUGUST 29, 3019	Vehicle Registration, Driver Training and Licensing	SEPTEMBER 24, 2018	Land Use and Planning
AUGUST 31, 2018	Cyber Security and Data Privacy	SEPTEMBER 25, 2018	Accessibility
SEPTEMBER 7, 2018	Equity	SEPTEMBER 29, 2018	Equity
SEPTEMBER 10, 2018	Transportation Infrastructure	OCTOBER 1, 2018	Accessibility
SEPTEMBER 12, 2018	Land Use and Planning	OCTOBER 3, 2018	Equity
SEPTEMBER 14, 2018	Equity and Tribal Government-to-Government Relations	OCTOBER 8, 2018	Accessibility
SEPTEMBER 14, 2018	Cyber Security and Data Privacy	OCTOBER 9, 2018	Land Use and Planning with Metropolitan Planning Organizations
		OCTOBER 12, 2018	Transportation Infrastructure
		OCTOBER 18, 2018	Revenue

MINNESOTA

POLICY SUBCOMMITTEES STRUCTURE

The council and MnDOT convened ten policy subcommittees combining technical experts, stakeholders, and members of the public. In addition, MnDOT met with tribal leaders in formal government-to-government relations to address the concerns of Minnesota's tribal communities. Below is a summary of each subcommittee's work.

The goal is to help guide future policy conversations. More information on these policy subcommittee recommendations is found in Appendix C: Policy Subcommittee Recommendations. For detailed information on the stakeholder subcommittees, please review *Stakeholder Engagement Report* available online at the MnDOT CAV-X website at _www.dot.state. mn.us/automated_.

MORE INFORMATION ABOUT THE STAKEHOLDER ENGAGEMENT AND TRIBAL CONSULTATION PROCESS IS AVAILABLE ONLINE AT WWW.DOT.STATE.MN.US/ AUTOMATED.

Each subcommittee was asked to think about the council's vision, mission, goals and values and was provided a brief introduction on CAV. In meetings, participants were encouraged to create recommendations by consensus. If ideas and feedback were shared but not agreed-upon by the group, they were recorded and kept as records for the Council to be published on the CAV-X website.

Meetings were led by liaisons who had technical expertise in the policy area; public sector and governmental liaisons were partnered with private sector individuals to promote public-private partnership and transparency. In order to promote broad participation, the state sent out invitations to attend through press releases, social media, presentations and conferences, public events, and by consulting with other state agency equity and diversity leaders.

Each meeting included remote participation. In addition to the public meetings, individuals could participate online, by survey, or share their feedback directly with the CAV-X office. To ensure transparency for the process, MnDOT placed all materials on its public website, including dates and times for each meeting. MnDOT conducted additional outreach activities for those unable to attend meetings, including individual meetings and calls, public events, presentations at various conferences and events, and a demonstration at the Minnesota State Fair. MnDOT also participated in intergovernmental consultation with tribal governments through the Advocacy Council on Tribal Transportation, the Minnesota Indian Affairs Council, and individual meetings with tribal executives. The final recommendations considered input from all of these outreach efforts.

Over 30 sectors were involved in the formulation of these recommendations. Organizations that participated included:

- State, county and local governments
- Non-profit advocacy groups, people with disabilities, and mobility advocates
- Auto manufacturers, technology companies and IT specialists, businesses, workforce centers, driver training institutions
- Construction companies
- Railroads, commercial freight, transit operators, suppliers, and supply chain companies
- Transit users, cyclists, planners
- Tax and revenue experts
- Lawyers, policy makers, consultants
- Researchers
- Law enforcement and public safety professionals

THE GOAL IS TO HELP GUIDE FUTURE POLICY CONVERSATIONS.

OVERVIEW OF POLICY SUBCOMMITTEES

Transportation Infrastructure

Led by MnDOT and Dakota County, this subcommittee focused on the infrastructure needs to accommodate current CAV technology, prepare our infrastructure for emerging CAV technologies, identify needs to support electrification and to identify impacts associated with shared mobility. This subcommittee also recommended policy and legislation changes to support CAV testing and deployment, CAV research and partnering opportunities.

Vehicle Registration, Driver Training and Licensing

Led by experts at the Department of Public Safety and in close coordination with Minnesota driving schools, industry, and the council on Disability, this subcommittee recommended a partnership with MnDOT and DPS to oversee the safe CAV testing and deployment in Minnesota. The group emphasized that CAV testing in Minnesota should include communities with disabilities, aging populations, and other communities experiencing transportation barriers to ensure the equitable use of this transformative technology. The subcommittee was unanimous in its recommendation that in Level 4 and 5 vehicles, where there is no ability for human operation, that there is no requirement for a driver license. In addition, participants recommended that the state partner with private industry to update a statewide driver training program that emphasizes decision-making and the safe operation of CAV technology so the public understands the benefits and limitations of current CAV technology.

Accessibility

The Executive Order asked the council to address accessibility for all Minnesotans including people with disabilities. With leadership from the Minnesota Council on Disability and Mobility Mania, this subcommittee obtained feedback from people with disabilities, aging populations, veterans with disabilities, low income communities and rural Minnesotans. The subcommittee developed many recommendations focusing on independent, affordable access to transportation by allowing communities with disabilities opportunities to participate in pilot projects, rethink the way we license drivers, and ensuring that grants or vouchers are available for access to CAV regardless of income level.

Equity

The council sought feedback from other communities experiencing transportation barriers, including rural Minnesota, the elderly, low- income, communities, communities of color and intergovernmental discussions with tribal governments. Additional meetings were held with individual communities. Conversations with leaders and elders in the Somali community and Hmong communities were held, as well as conversations with aging population advocates, low-income communities and other communities experiencing transportation challenges. MnDOT continues to reach out to various communities across the state. Many of these conversations voiced similar themes and recommendations, including funding for pilot projects in communities of color and rural Minnesota, training for workforce impacts related to CAV, connecting rural Minnesota with infrastructure investment and telecommunications, and ensuring that equity is a top priority for CAV policy.

In addition to these conversations, MnDOT tribal liaisons convened government-to-government relations with the Advocacy council on Tribal Transportation and the Minnesota Indian Affairs Council. Tribal leaders recommended that the state coordinate and consult with tribal governments to uphold tribal sovereignty and support state-tribal uniformity in policy, conduct testing and demonstrations in Indian Country, support workforce training programs related to CAV, and invest in
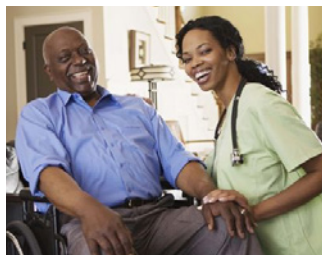
telecommunications infrastructure to connect the state and tribal lands.

Revenue

This subcommittee studied the implications of CAV and how it will shape the development of long-term tax policies to fund the transportation system. The subcommittee also developed a recommendation to create a public-private working group to comprehensively review current and future revenue structures to diversify and supplement Minnesota's transportation funding.

Traffic Regulations and Safety

This subcommittee met to address how CAV technology impacts traffic laws and enforcement. This subcommittee focused on data, including what CAV data needs to be available for law enforcement and how data can help educate Minnesotans and build public trust. The subcommittee recommended enacting policies that protect vulnerable road users and road situations, such as aging populations, truck and bus drivers, work zones, transit users, bicyclists and pedestrians.

Economic Development, Business Opportunities & Workforce Preparation

Led by the Department of Employment and Economic Development and the Minnesota Teamsters, this subcommittee focused on recommendations that support local innovation and business development and the need to balance innovation with workforce impacts.

Insurance and Liability

Led by the Department of Commerce and nationwide insurance industry experts, this subcommittee's goal was to ensure Minnesota insurance laws and regulations are responsive to CAV technology to promote innovative development of products and services while protecting Minnesota families and businesses. This group recommended that Minnesota adopt consistent AV terminology definitions, monitor data access management issues, develop consumer education partnerships and facilitate an insurance environment that anticipates the development of AVs.

Cyber Security and Data Privacy

Led by cyber security professionals, private attorneys, and IT experts, this subcommittee addressed how the state needs to proactively plan for security when designing programs (security by design). In addition, the subcommittee recommended changes to data privacy and consumer protection laws to protect personal data and promote responsible collection, storage and management of data.

Land Use and Planning

While not explicitly addressed in the executive order, a subcommittee was led by MnDOT, Department of Health, and the University of Minnesota's Humphrey School of Public Affairs to discuss future land use, community planning, transportation revenue and transportation funding to understand how CAV could affect public health, human behavior and environmental outcomes.

PUBLIC SURVEY

In August 2018, MnDOT launched a comprehensive public survey seeking Minnesotan's feedback on CAV and gauge the level of trust and understanding of CAV. More than 200 individuals filled out the survey as part of the CAV public engagement efforts. The respondents represented diverse groups, including millennials, generation x-ers, baby boomers and older adults. The average respondent was a 40-year-old Minnesotan with a college degree and a professional job who owns a personal vehicle and a bicycle.

MORE THAN 200 INDIVIDUALS FILLED OUT THE SURVEY AS PART OF THE CAV PUBLIC ENGAGEMENT EFFORTS.

Most Minnesotans surveyed, whether they were new to CAV or not, recognized the safety benefits of CAV technology and that it could expand access and opportunity, allowing people to move freely and independently. Respondents recognized the traffic efficiency and safety benefits and believe CAV could potentially free up land for better use. However a majority of the respondents had questions and concerns about CAV, including how these vehicles are designed and tested, whether it would lead to decreased transit use, whether it could impact the environment and how personal information could be compromised. Most respondents recognized that public education is critical.

As expected, a majority of the general public unfamiliar with CAV was hesitant to accept the technology, while stakeholders and technical experts who are more educated on how CAV technology works are generally more accepting of CAV's benefits and risks. However, even members of the public who were unfamiliar with and hesitant to accept CAV technology admitted to increased safety and mobility benefits of CAV.

UNIQUE SURVEY IDEAS

Some unique ideas shared in the survey that were not presented in the council subcommittees included:

- "Drivers before cars; people before computers"
- Investing in accessible communities
- Creating an independent CAV safety authority at the state level
- Work with auto manufacturers to create universal standards for quick-charging EV stations
- Establish carbon emissions fees
- Signage to identify when the public is in an area of CAV connectivity
- Develop curriculum that discusses CAVs and data science
- Concern that the state is prioritizing CAV when other issues are of concern
- Work with the Public Utilities Commission

THE FULL PUBLIC SURVEY REPORT WILL BE AVAILABLE ONLINE AT WWW.DOT.STATE.MN.US/ AUTOMATED.

PUBLIC ENGAGEMENT RECOMMENDATIONS

To continue public engagement efforts and provide opportunities for the public to assist in guiding CAV policy, the Council makes the following recommendations.

- One-third of the public meetings were held with the goal to gather feedback on accessibility and equity issues. These conversations were a good beginning. Ongoing conversations, outreach, and public demonstrations will be essential to develop trust and provide communities a voice as CAV policy develops.

- Many policy topics are overlapping. For example, CAV cyber security requires access to data that is also important for the insurance industry. Vehicle registration and licensing is an important issue for the accessibility and equity as CAVs progress towards designs wherein fewer of the driving tasks need a licensed driver. MnDOT CAV-X staff helped to share intersectional, cross-cutting issues with each policy subcommittee by attending all the meetings and providing information about the considerations amongst subcommittees. It is important that

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staff are designated to help support these policy conversations into the future.

- Policy subcommittee members from the private sector were at times hesitant to publicly share their thoughts due to concerns about preserving proprietary information or being taken out of context. It is important f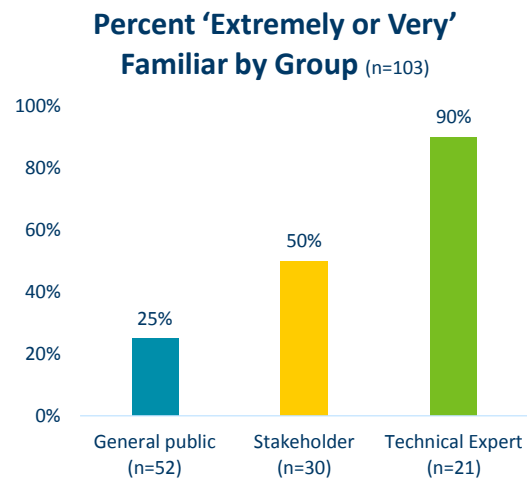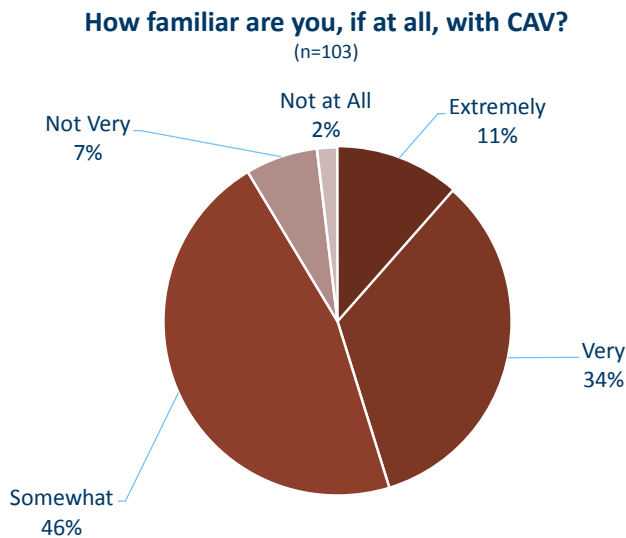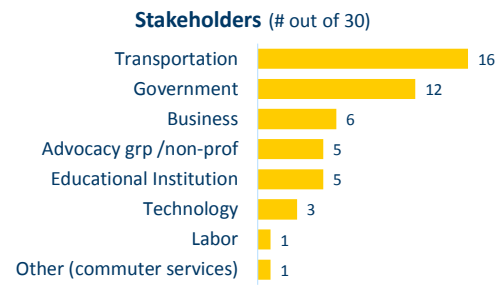or private industry and government to share information and collaborate to develop policy in a way that supports innovation

without publicly disclosing trade secret or proprietary information.

- There is an ongoing need for public education, engagement, surveys and demonstrations to help the public understand CAV and how it will impact the public. A CAV public engagement plan focusing on equity will be key to building trust and educating the public on the future of CAV.

How would you classify your primary relationship to CAV in MN (n=103)

General public 51%

Stakeholder 29%

Technical expert 20%

DEFINITIONS:
- General public (e.g., resident, person with interest in the topic, etc.)
- Stakeholder (e.g., vested interest due to role in a business, institution, organization or industry that will likely be impacted by CAV)
- Technical expert (e.g., experience/knowledge relevant to one or more aspects of understanding the impact of and successfully implementing CAV)

Stakeholders (# out of 30)

Transportation	16
Government	12
Business	6
Advocacy grp /non-prof	5
Educational Institution	5
Technology	3
Labor	1
Other (commuter services)	1

Expertise (# out of 21)

Infrastructure & Investment	14
Land Use & Planning	13
Safety	12
Accessibility	8
Equity	5
Traffic Regulations & Safety	11
Workforce Preparation	2
Economic Dev & Bus Opps	4
Cybersecurity & Data Priv	3
Environment	2
Some other area	5

How familiar are you, if at all, with CAV? (n=103)

Not at All 2%

Not Very 7%

Extremely 11%

Very 34%

Somewhat 46%

Percent 'Extremely or Very' Familiar by Group (n=103)

Group	Percent
General public (n=52)	25%
Stakeholder (n=30)	50%
Technical Expert (n=21)	90%

APPENDICES

APPENDIX A
EXECUTIVE ORDER

STATE OF MINNESOTA

EXECUTIVE DEPARTMENT

MARK DAYTON

GOVERNOR

Executive Order 18-04

Establishing the Governor's Advisory Council on Connected and Automated Vehicles

I, Mark Dayton, Governor of the State of Minnesota, by virtue of the authority vested in me by the Constitution and applicable statutes, do hereby issue this Executive Order:

Whereas, the State of Minnesota is a global center for innovation and opportunity with a highly educated and entrepreneurial workforce and welcoming business climate;

Whereas, the State of Minnesota is supportive of public-private collaborations for the research and development of the connected and automated vehicles;

Whereas, the widespread adoption of connected and automated vehicles will transform the future of transportation, commerce, mobility, workforce, land-use, and public safety;

Whereas, the widespread adoption of connected and automated vehicles will positively impact public health by reducing injuries, traffic congestion, and air pollution;

Whereas, there are approximately 400 vehicle crash fatalities in Minnesota each year and human error contributes to approximately 94 percent of all serious and fatal crashes;

Whereas, connected and automated vehicles technologies are evolving rapidly, developing new capabilities including the ability to communicate with infrastructure and with other vehicles, and drive safely without a human operator;

Whereas, the development of connected and automated vehicle technologies has the potential to support economic growth, create high-skilled jobs, and promote business opportunities;

Whereas, Minnesota's diverse weather conditions provides significant advantages for the testing of connected and automated vehicles;

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Whereas, the widespread adoption of connected and automated vehicles will dramatically change how public transportation infrastructure is utilized, how traffic regulations are structured, and how public investments in infrastructure are made;

Whereas, the development of connected and automated vehicles could help eliminate transportation barriers that leave individuals with disabilities, elderly, and low-income individuals in urban and rural areas disconnected from jobs and educational opportunities; and

Whereas, collaboration and coordination among cities, counties, states, businesses, educational institutions, and nonprofit organizations is needed to capture the opportunity presented by the widespread adoption of connected and automated vehicles.

Now, Therefore, I hereby order that:

1. The Governor's Advisory Council on Connected and Automated Vehicles ("Advisory Council") is established to study, assess, and prepare for the transformation and opportunities associated with the widespread adoption of automated and connected vehicles.

2. The Advisory Council will develop recommendations for changes in state law, rules, and policies to maximize the benefits and prepare for the widespread adoption of automated and connected vehicles.

3. Charles Zelle, the Commissioner of Transportation and Christopher Clark, President of Xcel Energy-Minnesota, North Dakota, and South Dakota shall serve as Co-Chairs of the Advisory Council.

4. The Advisory Council must consist of thirteen other members appointed by the Governor with relevant experience in finance, transit, higher education, workforce training, insurance, automotive industry, advocacy, freight, labor, public safety, technology, or local government.

5. The Advisory Council shall also include the following fourteen ex-officio members:
    a. Commissioner of Agriculture;
    b. Commissioner of Commerce;
    c. Commissioner of Employment and Economic Development;
    d. Commissioner of Health;
    e. Commissioner of Iron Range Resources and Rehabilitation Board;
    f. Commissioner of Minnesota Information Technology Services;
    g. Commissioner of Public Safety;
    h. Commissioner of Revenue;
    i. Chair of the Metropolitan Council;
    j. Executive Director of the Minnesota Council on Disability;
    k. One Member of the Majority Party in the Minnesota Senate;
    l. One Member of the Minority Party in the Minnesota Senate;
    m. One Member of the Majority Party in the Minnesota House of Representatives; and
    n. One Member of the Minority Party in the Minnesota House of Representatives.

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6. The Advisory Council has the following duties:
    a. Consult with governmental entities, communities experiencing transportation barriers, transportation stakeholders, the automotive industry, businesses, labor, technology companies, advocacy groups, and educational institutions.
    b. Prepare and submit a report to the Governor, the chairs and minority leads of the Minnesota House and Senate Transportation and Public Safety committees, and the Minnesota Legislature by December 1, 2018 that recommends changes to statutes, rules, and policies in the following areas:
        i. Transportation infrastructure and network;
        ii. Cyber security and data privacy standards;
        iii. Vehicle registration, driver training, licensing, insurance, and traffic regulations;
        iv. Promotion of economic development, business opportunities, and workforce preparation; and
        v. Accessibility and equity for all Minnesotans, with a particular focus on rural communities, elderly Minnesotans, Minnesotans with disabilities, low-income communities, communities of color, and American Indians.

    c. The Advisory Council will provide advice and support to the Governor, the Department of Transportation, the Department of Public Safety, and other governmental entities to support the testing and deployment of connected and automated vehicles.

7. The Commissioners of Transportation and Public Safety in coordination with other relevant state agencies will:
    a. Establish program and guidelines for development, testing, and deployment of connected and automated vehicle technologies;
    b. Support safe and effective testing and use of connected and automated vehicles, at every level of autonomy, including driverless technology, in real life situations as necessary to meet industry needs; and
    c. Protect individual and industry data as classified under the Minnesota Government Data Practices Act.

8. Minnesota Department of Transportation shall convene agency leadership to form the Interagency Connected and Automated Vehicle Team to implement this Executive Order, including the following steps:
    a. The Interagency Connected and Automated Vehicle Team shall consist of the designees of the Departments Agriculture, Commerce, Employment and Economic Development, Health, Iron Range Resources and Rehabilitation Board, Minnesota Information Technology Services, Public Safety, Revenue, Metropolitan Council, and Transportation;
    b. The Interagency Connected and Automated Vehicle Team will ensure interagency coordination and collaboration in developing cross agency policies and programs to strategically advance and prepare the State of Minnesota for adoption of connected and automated vehicles; and
    c. The Interagency Connected and Automated Team will provide operational support to the Advisory Committee.

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This Executive Order is effective fifteen days after publication in the State Register and filing with the Secretary of State, and shall remain in effect until rescinded by proper authority or until it expires in accordance with Minnesota Statutes, section 4.035, subdivision 3.

In Testimony Whereof, I have set my hand on this 5th day of March, 2018.

Mark Dayton
Governor

Filed According to Law:

Steve Simon
Secretary of State

FILED
MAR 2018
(MN) SECRETARY OF STATE

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APPENDIX B

ADVISORY COUNCIL ON CONNECTED AND AUTOMATED VEHICLES

MEMBERSHIP AND LEADERSHIP

CO-CHAIR	ORGANIZATION
CHARLES A. ZELLE	Commissioner, Department of Transportation
CHRISTOPHER CLARK	President, Xcel Energy

ADVISORY COUNCIL MEMBERS	ORGANIZATION
CATHY CHAVERS	Chairwoman, Bois Forte Band of Chippewa
LEILI FATEHI	Apparatus
MICHAEL GORMAN	Split Rock Partners
MYRNA PETERSON	Mobility Mania
DAN CHEN (PROXY FOR JOHN RICCARDI)	3M
ARI SILKEY	Amazon
JOFFREY WILSON	Mortenson
RYAN DANIEL	St. Cloud Metropolitan Transit
JACOB FREY	Mayor, City of Minneapolis
SELENA MOON	Public Transit User
EDWARD REYNOSO	Teamsters
VICKY RIZZOLO	American Family Insurance
PATRICK WELDON	Polaris

EX-OFFICIO MEMBERS	ORGANIZATION
DAVID FREDERICKSON	Commissioner, Department of Agriculture
SHAWNTERA HARDY	Commissioner, Department Employment and Economic Development
MARK PHILLIPS	Commissioner, Iron Range Resources and Rehabilitation
RAMONA DOHMAN	Commissioner, Department of Public Safety
ALENE TCHOURUMOFF	Chair, Metropolitan Council
JAN MALCOLM	Commissioner, Department of Health
JESSICA LOOMAN	Commissioner, Department of Commerce
JOHANNA CLYBORNE	Commissioner, Information Technology Services
CYNTHIA BAUERLY	Commissioner, Department of Revenue
JOAN WILLSHIRE	Executive Director, Minnesota Council on Disability
SENATOR SCOTT NEWMAN	Chair, Minnesota Senate Transportation Committee
SENATOR SCOTT DIBBLE	Minnesota Senate Transportation Committee
REPRESENTATIVE PAUL TORKELSON	Chair, Minnesota House of Representatives Transportation Finance Committee
REPRESENTATIVE CONNIE BERNARDY	Minnesota House of Representatives Transportation Policy Committee

INTERAGENCY CONNECTED AND AUTOMATED VEHICLES (I-CAV) TEAM MEMBERS

I-CAV MEMBERS	
Department of Employment and Economic Development	Minnesota Information Technology Services
Department of Agriculture	Department of Public Safety
Department of Commerce	Department of Revenue
Department of Health	Metropolitan Council
Minnesota Pollution Control Agency	Department of Transportation
Iron Range Resources and Rehabilitation Board	

ADVISORY COUNCIL POLICY SUBCOMMITTEE LIAISONS

POLICY SUBCOMMITTEE	POLICY SUBCOMMITTEE LIAISONS
TRANSPORTATION INFRASTRUCTURE	Jay Hietpas, Department of Transportation Mark Krebsbach, Dakota County
VEHICLE REGISTRATION, DRIVER TRAINING AND LICENSING	Tom Henderson, Department of Public Safety Dawn Olson, Department of Public Safety
EQUITY	Heron Diana, Facilitator Charlene Eigen-Vasquez, Facilitator Aimee Gourlay, Facilitator
REVENUE	Cynthia Bauerly, Commissioner, Department of Revenue Randy Sanford, Department of Revenue
TRAFFIC REGULATIONS	Col. Matt Langer, Department of Public Safety
ACCESSIBILITY	Myrna Peterson, Mobility Mania Joan Willshire, Minnesota Council on Disability John Doan, Hennepin County Selena Moon, Public Transit User
TRIBAL GOVERNMENT-TO-GOVERNMENT RELATIONS	Hon. Cathy Chavers, Chairwoman, Bois Forte Band of Chippewa Levi Brown, Minnesota Department of Transportation Tribal Liaison Ed Fairbanks, Minnesota Department of Transportation Tribal Liaison
ECONOMIC DEVELOPMENT, BUSINESS OPPORTUNITIES AND WORKFORCE PREPARATION	Kevin McKinnon, Department of Employment and Economic Development Edward Reynoso, Teamsters
INSURANCE AND LIABILITY	Alison Groebner, Department of Commerce Vicky Rizzolo, American Family Insurance
CYBER SECURITY AND DATA PRIVACY	Damien Riehl, Stroz Friedberg Josh Root, Department of Transportation Craig Gustafson, Department of Transportation Aaron Call, Minnesota Information Technology Services William Leifheit, Minnesota Information Technology Services
LAND USE AND PLANNING	Frank Douma, University of Minnesota Mark Nelson, Department of Transportation Emily Smoak, Department of Health

APPENDIX C
POLICY SUBCOMMITTEE RECOMMENDATIONS

The advisory council and the MnDOT Connected and Automated Vehicles Office convened ten subcommittees to study, assess and prepare recommendations. The recommendations focused on ten policy areas stemming out of the Executive Order, including: (1) transportation infrastructure; (2) vehicle registration, driver training and licensing; (3) accessibility; (4) equity; (5) revenue; (6) traffic regulations and safety; (7) economic development, business opportunity and workforce preparation; (8) insurance and liability; (9) cyber security and data privacy; and (10) land use and planning.

Minnesota is unique in that it is the only state to-date that has conducted months of extensive stakeholder engagement and public meetings with non-traditional transportation stakeholders and met with groups that transportation departments rarely have the opportunity to meet. From aging associations, to civil rights groups, from community elders to tribal executive directors, exhaustive efforts were undertaken to hear the voices of all Minnesotans, including holding a demonstration at the Minnesota State Fair. By collaborating with colleagues in other Minnesota agencies, local governments, tribal leaders and rural Minnesota, the State was able to leverage its connections with stakeholders to reach out broadly across Minnesota to connect with individuals and organizations it had not traditionally worked with.

THE GOAL OF THESE RECOMMENDATIONS IS TO HELP GUIDE FUTURE POLICY CONVERSATIONS.

The following is an overview of the ideas shared in each of these policy subcommittees. For detailed information on the stakeholder subcommittees, including meeting minutes and discussion materials, please review *Stakeholder Engagement Report* available online at the MnDOT CAV-X website at *www.dot.state.mn.us/ automated*.

TRANSPORTATION INFRASTRUCTURE

- **Infrastructure Standards** – Engage in the development of infrastructure standards at the federal level, so national policy accounts for safety and Minnesota needs. Allow MnDOT to develop state standards in collaboration with local units of government.

- **Partnerships (Infrastructure Collaboration)** – Support partnerships between government, academia and private institutions to better understand the infrastructure needs for CAV testing and deploying, particularly in winter weather conditions and other situations relative to Minnesota. Update state procurement processes to allow more flexibility and encourage private investments in rapidly developing infrastructure technologies.

- **Infrastructure Investments** – Pursue public and private infrastructure investments now in fiber optics, signal system modernization, improved pavement markings, telecommunications (e.g 5G) and data collection to support emerging CAV technologies.

- **Funding** – Provide funding to support CAV infrastructure capital needs, operational needs, testing corridors and public educational/outreach efforts.

STAKEHOLDER ENGAGEMENT REPORT **AVAILABLE ONLINE AT THE MNDOT CAV-X WEBSITE AT WWW.DOT.STATE.MN.US/ AUTOMATED.**

- **Revenue** – Identify additional revenue streams to support CAV infrastructure needs beyond current sources, in particular the potential loss in gas tax due to electrification.

- **User Needs –** Prioritize safety needs for all road users (e.g. pedestrians, bicyclists, person with disabilities, transit and railroads) when making infrastructure investments for CAV.

- **Data Standards** – Develop data standards and centralized systems for sharing infrastructure data (e.g. work zone, traffic signal timing, and road conditions) with third parties.

- **Partnerships (General Deployment)** – Identify roles, responsibilities and liabilities for public and private partners involved with CAV deployment.

- **Testing and Priorities** – Support safe testing of CAV on existing publicly-owned infrastructure, capitalizing on technologies most readily available for deployment, such as truck platooning, based on Minnesota transportation needs and priorities.

- **Electric Vehicles** – Support efforts for electric vehicle deployment and associated infrastructure.

VEHICLE REGISTRATION, DRIVER TRAINING AND LICENSING

- There should be one "lead agency" responsible for approving testing in Minnesota. The process for testing needs to include considerations of public safety and support testing in Minnesota. It is recommended that the I-CAV work group consider how to strike this balance (permitting, statute, regulations, etc.). Restraint is urged in the regulation of testing and flexibility is preferred for pilot testing.

- Not enough is known about what level 4 – 5 vehicles will be like. This subcommittee recommends not creating regulation yet. It will be important to plan to incorporate users who may not currently have driver's licenses (children, elderly, people with disabilities).

- There is a need for funding to research how users will understand and use CAV technology.

- Develop a network for driver and user technology training (partners: private drivers' education/vehicle manufacturers/state of Minnesota). Develop a statewide curriculum as to what is being discussed in the training.

- There should be a specific registration component and branding on the license for highly automated vehicles, which are Level 3-5 automated vehicles.

- Disengagement needs to be tracked in incident report for testing. To avoid the unintended consequence of testers being reluctant to disengage, disengagement should not be assumed to be a negative.

- Develop standards for test driver quality: a higher standard than commercial drivers' license for trucking and a higher standard than a drivers' license for passenger vehicle test drivers. As technology develops, Minnesota can reconsider test driver requirements and require that testing of vehicles include people with disabilities, aging, veterans, and others who may not have drivers' licenses.

ACCESSIBILITY

Principles
Write a preamble about why CAV is important to under-served populations. Some CAV benefits include: employment opportunities by providing dependable, affordable transportation alternatives; improved quality of life by allowing Minnesotans to live, work and play where they choose; and provides more mobility options in the community of their choice. Communities with disabilities and rural Minnesota are a significantly untapped workforce.

Regulation
- No legal requirement for a driver license, wheel or pedals for Level 4 or 5 vehicles.

- Defined insurance requirements are needed for the development of CAV. Ride share safety incentives need to be granted by insurers to decrease financial insurance rates.

- Ensure that a sufficient number of vehicles are built using universal design and are fully accessible. This

includes physical and software accessibility for the consumer. Minnesota needs to pass this legislatively and push for its adaptation on the federal level. Universal design must include physical space for personal equipment (scooters, wheelchairs, walkers, companion animals, etc.) so consumers can enter and secure safety mechanisms independently within a vehicle. Universal design must also include accessible digital interfaces for all disabilities.

- Define the options for people under guardianship, liability issues, safety for all occupants or the ability to have companion travelers, who covers insurance, who decides safety and spell it out if an escort will be responsible.

- CAV systems will have to be designed to address individuals who do not have the ability to travel alone (e.g. person with intellectual disability, children) versus those who can ride independently/alone.

Funding and Incentivizing Equity

- Create a voucher system for easier access to these vehicles funded through legislation via grants/innovative methods.

- Create a variety of financing arrangements to be available for low income populations for public and personal use.

- The cost for transportation must be the same for consumers with or without a disability.

- Use public utility/electricity's coop system to ensure that transportation costs do not increase in rural and suburban Minnesota.

Testing

- Pilot projects must include both urban and rural Minnesota.

- Ensure full accessibility for all disabilities (blind, hearing impaired, developmental, cognitive) and that all abilities can participate in testing of CAV to provide feedback on the design, no matter where they live in the state.

Shared Mobility

- Create systems for shared mobility equal to a Lyft/Uber, especially in rural Minnesota. Use an on-demand model.

- Promote ride sharing, alternative fuel use, and group ownership of a vehicle. Match insurance incentives to be based on group ownership rather than individual use.

- Instead of promoting individual ownership, the state should promote auto dealerships lease shares.

- Increase the number of transit trips. Public transportation needs density of use to support rural service; fixed routes are no longer needed; less infrastructure is needed, should increase the number of trips. Expand trips beyond city limits and include evenings and weekends.

Public Education

- These concepts are so futuristic that a robust education system for users and non-users to increase better interactions is needed.

- Funding for training and education on how to interact with and operate CAV with direction on what to do in emergencies.

Connectivity

- Rural Minnesota needs access to Wi-Fi, or an alternative where Wi-Fi is non-existent.

Engagement

- Association peers can work together to suggest equity rules for their population's health, safety and access services, employers and churches with a wider public participation.

Public Safety & Emergencies

- The ability to call for help by users within the CAV.

- The ability for CAV occupants to stop a vehicle from within and public safety authorities (police, fire, 911) to over-ride CAV instructions.

- Communication is needed to alert CAVs when they need to move out of the way for emergency vehicles and other pedestrian boarding/on-boarding. CAVs needs to program priority decision trees before moving/stopping or on/off-boarding consumers.

Commerce

- Promote the ability to call and order online with CAV (e.g. shop on-line, delivery of medication, grocery, etc. such as Amazon and Walmart). This creates accessibility for all.

EQUITY

Aging

- Education and public engagement are critical for aging populations with the understanding that baby boomers of today will be the aging population of tomorrow. Educate the younger populations now so that they can understand/use CAV technology in the future.

- Connectivity for rural Minnesota is critical; invest in fiber optic.

- Do not enact policies that promote the urban/rural divide.

- Understand that access to technology is limited with aging populations and that shared mobility is critical for communities who cannot drive.

- Promote accessibility by design in coordination with auto industry.

- Continue conversations with older adults and caregivers. Recognize that elderly and aging populations have limited income, so must incentivize the use of CAV/shared mobility in these communities to ensure equal access.

Communities of Color

- Enact policies for equitable pricing of CAV and transportation network companies; if pricing is not accessible to low-income populations it could lead to theft, incarceration and social injustice.

- Do not enact policies that create a social/class divide; enact policies that promote equal access.

- Electric charging stations must be installed in rural areas to avoid equity gaps and to avoid creating an urban/rural divide.

- Need testing and demonstrations in communities of color and online classes, recognizing that some communities need to see, feel, and touch the technology to understand its importance.

- Continue conversations with elders in communities of color to build public trust and understand what other states are doing.

- Need CAV demonstrations and testing in communities of color.

- Promote policies that address non-English speakers and related language barriers and accessibility challenges.

- Invest in workforce and job training for a community that heavily relies on driving and operating vehicles as a career (e.g. truck driving; Uber, etc.).

- Don't forsake safety to promote innovation.

Tribal Governments

- Recognize tribal regulatory sovereignty and the need for state-tribal uniformity.

- Promote testing and demonstrations on tribal lands and in Indian Country.

- Invest in infrastructure and connectivity in rural Minnesota.

- Invest in training and workforce development.

- Continued consultation and coordination with tribal governments.

REVENUE

With the robust conversations in the Land Use and Planning and Transportation Infrastructure subcommittees, participants and leadership recognize the need to draft recommendations focusing specifically on future transportation funding.

Create public-private working group to conduct a comprehensive review of current and future revenue options for transportation and make recommendation about how to diversify and supplement transportation funding for Minnesota. The CAV Revenue working group may consider:

- CAV infrastructure needs and assets including timelines for CAV adoption and deployment

- Current revenue available to the state and local systems including: gas tax, sales tax on motor vehicles, motor vehicle registration tax, 0.5 percent county transportation sales tax, dedication of sales tax on motor vehicle repair parts, car rental tax and constitutional review of dedicating other "motor fuel."

- Options for diversifying and supplementing existing revenues with attention to administrative efficiency including mileage based user fees and options being deployed in other states.

- Opportunities for future revenue options to create accessibility and equity across Minnesota.

- Greater Minnesota opportunities for CAV around transit and costs impacts for local governments.

- Data available and needed to understand the transition from current revenue options to new structures; pilots with fleets to collect data on distance-based fees.

TRAFFIC REGULATIONS AND SAFETY

- Determinate what, if any, data needs to be collected specific to CAVs and vehicle collisions. Data can help educate the public and build public trust.

- Assess whether any training for CAV technology is needed, as auto manufacturers currently do not train on vehicle systems.

- Build public trust of CAV by educating the public.

- Enact policies to support vulnerable road users and situations, e.g. aging populations, truck and bus drivers, work zones, transit users, bicyclists, pedestrians. Enact policies that support technologies that assist both human and machine vision.

ECONOMIC DEVELOPMENT, BUSINESS OPPORTUNITY AND WORKFORCE PREPARATION

Economic Development
- Conduct a gap analysis of the CAV industries not currently present in Minnesota to identify and capitalize on the state's unique strengths.

- Develop partnerships to share information with industry and business to promote economic development.

- Fund initiatives to support the CAV industry, including financial incentives such as tax benefits to support emerging CAV technology and related industry.

Business Opportunity
Make it clear that CAVs can test in Minnesota, support testing and demonstration areas and promote centers to educate the public and bring in industry.

Workforce Preparation
- Require drivers in commercial vehicles until CAV technology is proven safe; need back-up operators.

- Develop Minnesota-based industry-accredited training programs.

- Rebrand workforce and apprenticeship opportunities to promote CAV and develop STEM talent early (high schools) and broadly (vocational schools).

- Collaborate with federal and state educational institutions to coordinate funding for training programs.

- Develop a training fund for drivers, operators, mechanics and other organizations that may have their own training programs (e.g. Teamsters, trucking industry).

INSURANCE AND LIABILITY

Adopt Consistent AV Definitions

- Consistent with other subcommittees, the Insurance and Liability subcommittee recommends consistent statutory definitions for key CAV terms like:
  - Driver
  - Operator
  - Owner
  - Automated vehicle

- Minnesota should look to adopt definitions established by the National Highway Traffic Safety Administration to ensure uniformity among neighboring states.

Continue the Insurance and Liability Subcommittee

- The Insurance and Liability subcommittee does not recommend insurance or liability statute changes for the 2019 Session.

- Current Minnesota automobile insurance and liability laws provide the necessary protection for Minnesotans based on current levels of automated vehicle technology.

- Minnesota should continue the Insurance and Liability subcommittee to study these issues as automated vehicle technology develops and deployment of fully automated vehicles in Minnesota becomes a reality.

Adopt Insurance Minimums for Testing of AVs

- If Minnesota approves the testing of connected and automated vehicles, the legislature should adopt a mandatory minimum liability limit applicable only

for the testing (versus deployment) of automated vehicles. The entity conducting the testing should be required to provide proof of financial responsibility in a manner specified by the Department of Commerce.

- Minnesota should consider adopting a minimum financial liability limit of $5 million per occurrence. $5 million per occurrence is in line with seven other states (Colorado, California, Nevada, New York, Massachusetts, Connecticut and Tennessee) that explicitly allow for the testing of automated vehicles.

Monitor Data Access Management Issues

- The Insurance and Liability subcommittee recommends Minnesota monitor data access, data ownership, consent around the use of data and the cost and responsibility of data preservation going forward.

- Minnesota will also need to determine the applicability of the Minnesota Government Data Practices Act including necessary disclosures and consumer consent.

Encourage Consumer Education Partnerships

- As AV technology develops, consumers will need access to information relating to insurance, liability, driving safety and other issues.

- Minnesota should encourage partnerships among stakeholders, including vehicle manufacturers, insurers, the Department of Commerce and other government agencies to prepare and educate consumers on the impact of automated vehicle technologies.

Facilitate an Insurance Environment that Anticipates the Development of AVs

- Minnesota will work in partnership with the insurance industry as AV and other technology evolves.

- Minnesota remains open to new insurance products and services that will develop as automated technology develops. These insurance products will be needed to protect Minnesota families and businesses.

CYBER SECURITY AND DATA PRIVACY

Definitions
- Revise the definition of "personally identifiable information" to align with federal standards and public expectations and address what private data about individuals is shared and with whom the data can be shared.
- Expand the definition of "private data" to address what the government collects about humans who travel in CAVs.

Classification
- Update Chapter 13, the Minnesota Government Data Practices Act, to make private data anonymous, summarize or aggregate data to protect personally identifiable information and address the financial value CAV personal data may have.
- Clarify and set policies around data to create both a uniform roadway user experience and simplify data.

Uniformity
- Adopt other state, federal, and international best practices for uniform data storage, collection and use.

Security
- Adopt security-by-design to integrate security protocols early in applications, which significantly minimizes costs.
- Partner with industry to adopt common security standards and avoid adopting specific technologies.
- Ensure that when designing security systems, the state uses industry standards for trust and integrity of data, to confirm the data cannot be changed and the data can be trusted.

Mapping
- Partner with industry to address road conditions and barriers (e.g. construction zones, detours) that could impact CAV performance; staff and resource a system that assesses the reliability of mapping data. Additional research is required to understand the proper state role in this effort.

Protecting Against Data Breaches
- Clarify how the government responds in a breach situation.
- Clarify in law if consumers have a public right of action in breach situations or provide a regulated response to a data breach.
- Update the Consumer Protection Act to enhance requirements for consumer notice and protection when breaches occur.
- Require consumer disclosures to address what data the CAV is collecting on consumers and why.
- Provide consumers with the option to opt-in to allow CAVs to collect, use or sell their data. If they choose to opt-out of data collection, CAV service should not be impacted.

LAND USE AND PLANNING

Subcommittee Considerations
- Recognizing that while transportation infrastructure planning occurs at all levels of government, the authority for land use planning largely resides with local and regional government.
- Consequently, these recommendations are offered as overall values and principles to guide local land use and planning discussions.

Education
- Education: Encourage greater stakeholder engagement by providing the public with information of the benefits and risks regarding CAV, beginning the installation of CAV infrastructure that can offer current benefits for connected vehicles and successful public demonstrations of CAV.

Equity
- Standardize quality of service for all users. Require a certain percentage of ADA compliant vehicles. Provide infrastructure and service in all areas of Minnesota.

Role of the State and Local Government
- Maintain current delegation of powers between the state and local governments regarding land-use and other local planning powers.

- Local innovation should be allowed and encouraged, so long as traditional public interests (health, safety, welfare, choice) are protected.

Infrastructure Planning
- Increase public well-being through "people-focused" system design and investment that supports all users and all modes.

Values
- The state should establish a clear set of values and objectives to guide CAV policy development and investment priorities.

MPO RECOMMENDATIONS

- The legislature should proceed slowly with passing any new laws governing CAV development.

- Funding is the most important piece right now - for pilot projects or grants to communities and public transit providers to implement innovative programs related to shared mobility and CAV development.

- Bi-state MPO's will require coordination at the statewide level with neighboring state governments (Duluth/Superior, Grand Forks/East Grand Fork, Fargo/Moorhead, La Crosse/La Crescent).

- State and MPOs should collaborate on technical assistance, information sharing and best practices. Land use planning and implementation happens at the city/local level but most small cities will not have capacity and expertise to keep up with CAV and land use impacts. MPOs and the state need to be well-coordinated and have a structure in-place to provide technical assistance and share best practices.

MINNESOTANS TOOK PART IN CAV SUBCOMMITTEE CONVERSATIONS AND EVENTS THROUGHOUT THE STATE TO PROVIDE FEEDBACK AND HELP GUIDE FUTURE POLICY

APPENDIX D

PUBLIC SURVEY REPORT

THE FULL PUBLIC SURVEY REPORT IS AVAILABLE ON THE MNDOT CAV-X WEBSITE AT
www.dot.state.mn.us/automated

CONNECTED & AUTOMATED VEHICLES
ONLINE SURVEY RESULTS

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DEPARTMENT OF TRANSPORTATION
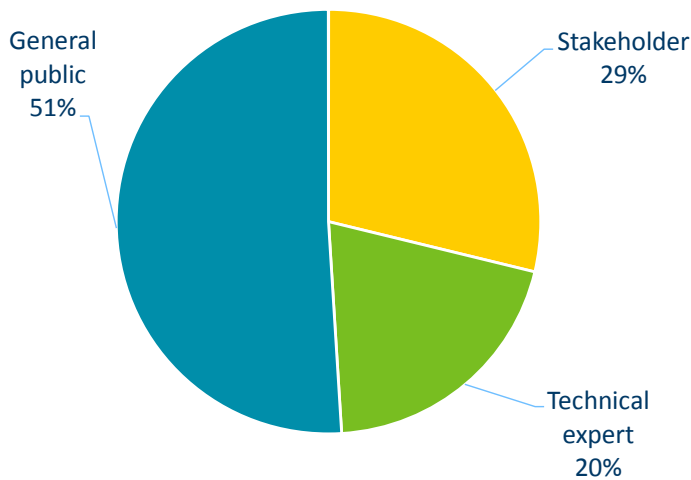
October 18, 2018

Purpose

- The CAV-X Office at MnDOT is wrapping up a series of in-person sessions to garner input from different segments of organizations and demographic groups:
    - A complete list of the sessions and insight gained from them is covered in a different summary report.

- An online survey was developed as a "stop gap" method to allow people who were unable to attend or not interested in attending an in-person session an opportunity to share insights, questions or concerns.

- Individuals invited to participate in the in-person sessions by email were provided a link to the online survey.

- In addition, this link was made available to others through a variety of other emails and outlets (e.g., Economic Development, Business Opportunity and Workforce Preparation Subcommittee meeting, the MN State Fair, etc.).
    - See appendix for the complete list.

- The online survey was completed by over 200 participants and this report summarizes their input.
    - The goal of this effort was to make sure no stone remained unturned.
    - Therefore, this report includes all the verbatim comments within the report and/or in the appendix, so the MnDOT CAV-X team can review the detail to ensure that all ideas and concerns are heard.
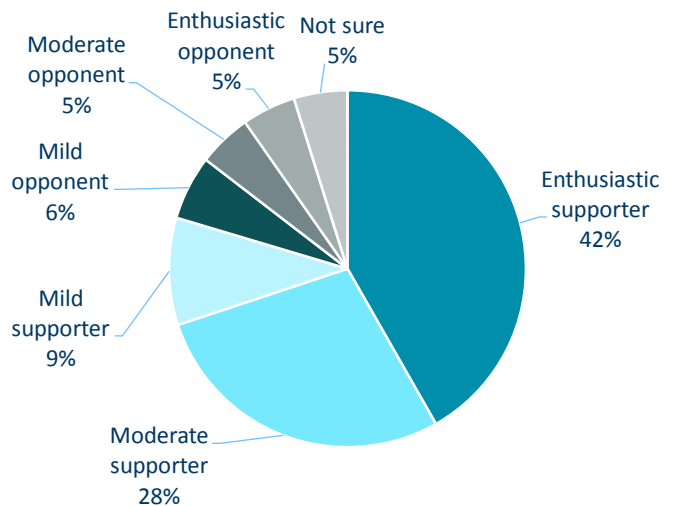
HALF OF THE RESPONDENTS CLASSIFIED THEMSELVES AS MEMBERS OF THE GENERAL PUBLIC AND THE REST WERE SPLIT BETWEEN STAKEHOLDERS AND TECHNICAL EXPERTS

TO READ THE FULL PUBLIC SURVEY REPORT, PLEASE VISIT THE MNDOT CAV-X WEBSITE AT
www.dot.state.mn.us/automated

How would you classify your primary relationship to CAV in MN

General public
51%

Stakeholder
29%

Technical expert
20%

At this point, how do you feel about allowing/using CAVs in MN?

Moderate opponent
5%

Enthusiastic opponent
5%

Not sure
5%

Mild opponent
6%

Mild supporter
9%

Moderate supporter
28%

Enthusiastic supporter
42%

DEFINITIONS:

- General public (e.g., resident, person with interest in the topic, etc.)
- Stakeholder (e.g., vested interest due to role in a business, institution, organization or industry that will likely be impacted by CAV)
- Technical expert (e.g., experience/knowledge relevant to one or more aspects of understanding the impact of and successfully implementing CAV)

mn MINNESOTA

HIGHLIGHTS FROM THE PUBLIC SURVEY REPORT

TO READ THE FULL PUBLIC SURVEY REPORT, PLEASE VISIT THE MNDOT CAV-X WEBSITE AT
www.dot.state.mn.us/automated

THERE WAS A RANGE OF FAMILIARITY WITH CAV WITHIN THIS SAMPLE:

- The general public group was not overly familiar, the technical experts were quite familiar and the stakeholders fell somewhere in between
- Regardless of the level of familiarity, there were a lot of common themes across the groups

THERE IS A LOT OF ENTHUSIASM FOR CAV WITHIN THIS BASE OF RESPONDENTS, REGARDLESS OF THEIR GROUP:

- Many see the potential for increased safety with the reduction in human involvement and error
- Many understand that more people could potentially get around with ease and realize increased independence, if they do not have to drive themselves
  - And, for some it could be a life changer
- Several feel traffic would flow more efficiently, which would lead to other positives:
  - Saving money and time (and a reduction in stress)
  - Environmental benefits
- A handful of respondents think it should also free up land for better use and could put MN at the forefront of innovation

HOWEVER, MANY OF THE COMMENTS COME WITH A CAVEAT OR A DOSE OF CAUTION AND THE MAJORITY HAVE AT LEAST ONE QUESTION OR CONCERN

- The underlying factors are about "how" CAV is designed, structured, tested, monitored and regulated and how widely it can be accessed (and if it's ready to be rolled out)

- The "how" will impact whether or not the potential benefits become concerns or even negatives:
  - CAV could increase safety issues, if it doesn't work well with traditional cars, pedestrians, bicyclist and those using mobility devices on the same streets
  - CAV could increase congestion if it motivates people to own their own CAV vehicles and/or take more solo trips
  - CAV could make fewer people feel the need to walk or ride a bicycle or use mass transit
  - CAV could result in equities if it doesn't work in all conditions or locations or for all demographic groups (and it limits funding for other forms of transportation)
  - CAV could have a negative impact on the environment if it leads to more energy use
  - Lack of security and data privacy could lead to a whole host of other issues

CONCLUSION

There is an ongoing need for public education, engagement, surveys and demonstrations to help the public understand CAV and how it will improve the lives of Minnesotans. Comprehensive CAV public engagement and communications plans focusing on equity will be key to building trust and education on the future of CAV. In addition, ongoing, regular public surveys should be conducted to continue to gauge Minnesotans' thoughts and feedback on CAV policy and technology. These tools could also help local government build trust and understanding within their communities.

SAMPLING OF COMMENTS

TO READ THE FULL PUBLIC SURVEY REPORT AND COMMENTS, PLEASE VISIT THE MNDOT CAV-X WEBSITE AT *www.dot.state.mn.us/automated*

GENERAL PUBLIC QUOTES

- Concerned about the status of bicycles on streets. Looking forward to safer streets.

- Work on it now so someday our roads will be safer and as I age the hope of keeping independence longer by not losing the ability to get around town.

- I have hopes that CAVs will control the too-frequently rushed, distracted auto drivers that routinely cause safety and frustration to those who chose not to (or limit) driving.

- As a person who is blind, not being able to drive is one of the most significant barriers to full equality; it affects employment, where I choose to live, how I shop, and where I go, or don't go on vacation.

- I think we need to keep up with other states in embracing this technology.

- I like to go places and am concerned about what that will look like, especially being more in a more rural area (no regular mass transit options more than once a week).

- Most media coverage presents CAV as a technology as an accomplished feat that is only waiting for a few technical improvements to be fully implemented. The MnDOT website lists speaks glowingly about the technology and 10 "Benefits of automated vehicle technology". NONE of these addresses the very real issues, problems and dangers of rushing to embrace this embryonic idea.

STAKEHOLDER QUOTES

- I am employed in Mass Transit and as such have a vested interest in moving people around now and in the future.

- I live car-free and ride my bike everywhere. I am concerned about how automated vehicles will interact with people riding bikes, walking, and rolling.

- I work in transportation planning in a rural area, and also focus on bicycle and pedestrian issues, so this is a topic that is of great interest to me. I'm both concerned and fascinated by the prospect of CAVs.

- I'm a transportation engineer interested to see how this new technology will improve our transportation system in safety and efficiency.

- It's the future. I like planning ahead. It could completely change where I live/work with the opportunities that automated driving would allow. e.g. Doing work on the way to work.

- I believe CAV has the potential to deliver vast safety benefits.

- I'm interested in how we move away from a world where the expectation is that every person should aspire to own a motor vehicle.

TECHNICAL EXPERT QUOTES

- CAVs are an opportunity to increase roadway safety, reduce congestion, reduce the number of vehicles on the roads, and reduce emissions.

- I am extremely concerned about the premature approval of fully automated vehicles.

- I've spent most of my engineering career evaluating the safety of complex systems such as automotives, aircrafts, ships, and process control equipment.

- I am a transportation planning researcher and I want to see CAVs POSITIVELY affect our land use and transportation infrastructure in the future. I am specifically interested in the consumer economics of CAVs. How can we build a system that increases accessibility without inducing longer, more frequent trips? A mileage-based fee and/or congestion pricing that builds off of the current ride-share framework would be well suited for curbing vehicle use as they become easier to access.

- I am involved in research at the University of Minnesota, and view CAVs as instrumental in moving Minnesota's transportation system forward.

QUESTION: By clicking into this survey, we assume this topic is of interest to you. Please explain why this is the case. A complete list of comments are included in the appendix.