Connected and Automated Vehicles in Minnesota

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1. Leadership
State as Convener and Leader

Advisory Council
- Public-private partnership
- Vision and goal setting

Interagency CAV Team
- State agency collaboration
- Coordination amongst programs

Policy Subcommittees
- Technical and policy expertise
- Develop policy and programs
- Public and private involvement
### Other CAV Organizations

**CAV Advisory Council**

Leaders from the auto industry, tech, cybersecurity, business, transit, education, workforce development, insurance, mobility advocacy, labor, safety, active transportation, elder care and tort law set vision for how Minnesota should plan and prepare for CAV.

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**Interagency CAV Team**

State agencies, Met Council, universities, cities, counties and tribes share technical expertise to develop programs to prepare Minnesota for CAV, including testing and deploying CAV and shared mobility technologies.

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### Policy & Technical Advisory Committees

<table>
<thead>
<tr>
<th>Area</th>
<th>Chairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure</td>
<td>Chairs: DOT &amp; County Engineers</td>
</tr>
<tr>
<td>Vehicle Registration</td>
<td>Chairs: Public Safety &amp; Driving Schools</td>
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<td>Driver Training &amp; Licensing</td>
<td>Chairs: Public Safety &amp; Driving Schools</td>
</tr>
<tr>
<td>Equity</td>
<td>Chairs: Community Elders</td>
</tr>
<tr>
<td>Insurance &amp; Liability</td>
<td>Chairs: Commerce &amp; American Family Insurance</td>
</tr>
<tr>
<td>Traffic Regulations &amp; Safety</td>
<td>Chairs: Public Safety &amp; MN Safety Council</td>
</tr>
<tr>
<td>Economic &amp; Workforce</td>
<td>Chairs: Dept. of Economic Development &amp; Teamsters</td>
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<tr>
<td>Development</td>
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<tr>
<td>Accessibility</td>
<td>Chairs: Council on Disability &amp; Mobility Mania</td>
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<tr>
<td>Planning and Land Use</td>
<td>Chairs: DOT &amp; University of Minnesota</td>
</tr>
<tr>
<td>Cyber Security &amp; Data Privacy</td>
<td>Chairs: MnIT, Private Cyber Security/AI Firms</td>
</tr>
</tbody>
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**Guidestar Board of Directors**

**Twin Cities Shared Mobility Collaborative**

**University of Minnesota Center for Transportation Studies**

**County Engineer and League of Cities CAV Committees**
Statewide Vision

**Vision**

Collaboration that shapes the future of mobility and maximize the potential of transformative transportation technologies to ensure greater safety, access, equity and health for all.

**Mission**

Engage with government, communities, researchers, business and industry to advance policy that prepares the state for connected and automated vehicles and shared mobility.

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*To be reviewed by next Advisory Council*
CAV-X is in the Operations Division with our district offices.
State Leadership

CAV-X

Leads Minnesota’s CAV program – Destination CAV - and represents the state nationally.

MnDOT CAV Team

MnDOT’s internal working group includes all district and technical areas shown below.

Districts & Specialty Offices

- Transit, Bike & Ped
- Legal
- Freight & Rail
- Research
- Counties and Cities
- Radio
- Finance
- Admin
- HR
- Policy & Planning
- Bridge
- Project Management
- Construction
- Environment
- District Offices
- Right of Way
- Materials and Road Research
- Government Affairs
- Communications & Marketing
- Public Engagement
- Sustainability
- Equity and Diversity
**Mission**

To improve quality of life for Minnesotans and support a multimodal transportation system by successfully planning and preparing for emerging transportation technologies.

**Goals**

1. Educate and engage Minnesota on emerging transportation technologies
2. Build relationships and partnerships with stakeholders
3. Accelerate policy, research, engineering and deployment of technologies that improve safety
4. Remain accountable to the public by effectively using state funds
2. Policy
Policy & Technical Committees

- Infrastructure
- Vehicle Registration, Licensing and Training
- Accessibility
- Cyber Security & Data Privacy
- Economic & Workforce Development
- Insurance & Liability
- Planning and Land Use
- Traffic Regulations
- Equity
CAV Executive Report Recommendations

- “Authorize testing without human drivers”
- “Invest in fiber, signals, pavement markings and smart signs”
- “Prioritize safety for all users: pedestrians, cyclists, people with disabilities, transit, and others”
- “Conduct pilot projects in urban, suburban, rural areas to public can see the tech and guide policy”
- “Create a public engagement plan”
A state task force wants self-driving cars on the road in Minnesota. Legislators aren’t so sure
Platooning Legislation

Automated ‘platoons’ of trucks might soon be driving on Minnesota roads
3. Planning
CAV Strategic Plan Focus Areas

- Capital Investment
- Research
- Partnerships
- Law and policy
- Operations & Maintenance
- Multimodal
- Strategic Staffing
- Communications
- Long-Range Planning
Planning Process

CAV Executive Report

Gap analysis

Visioning workshop

Statewide scenario planning workshops

DOT district & office meetings

CAV Strategic Plan
Scenario Planning

Possible Future #1
ADVANCING TECHNOLOGY

Possible Future #2
CONNECTED INFRASTRUCTURE

Possible Future #3
PRIVATE AUTOMATION

Possible Future #4
Integrated Mobility

These are possible futures. Any of these could happen. Or none.
## Key Traffic/ITS Assumptions

<table>
<thead>
<tr>
<th></th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CV</strong></td>
<td>15% vehicles</td>
<td>75% of vehicles</td>
<td>50% of vehicles</td>
<td>75% of vehicles</td>
</tr>
<tr>
<td><strong>AV</strong></td>
<td>15% Level 3</td>
<td>50% Level 3</td>
<td>75% Level 4+</td>
<td>75% Level 4+</td>
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<tr>
<td><strong>MaaS</strong></td>
<td>5-10% of travel (up to 20% in cities)</td>
<td>5-10% of travel (up to 20% in cities)</td>
<td>50% of travel</td>
<td>75% of travel</td>
</tr>
</tbody>
</table>

Truck platooning common in all. Freight services highly automated in all but Scenario 1.
Scenario Planning Workshop Details

- 12 workshops throughout Minnesota
- Primary audience
  - Local agency staff
  - MPO/RDO staff
  - Elected officials
  - Business
  - Advocates
  - Freight & logistics companies
  - Public
Potential Impacts and Responses

**Impacts**
- People Movement
- Goods Movement
- Land Use
- Environmental
- Social
- Political
- Economic
- Equity

**Responses**
- **Type**
  - Incentives
  - Restrictions
  - Investments
- **Timing**
  - Short/medium/long
- **Responsibility**
  - Public, Private, Other
Select Findings

• Opportunities
  • Safety
  • Equity

• Challenges
  • Equity
  • Implementation

• Comments similar across geographies

• Generally support continuing existing policies and strategies
• Use robust and targeted strategies to reach different audiences when planning for CAV (geographic, ability, etc.), because issues related to CAV may be broadly shared, but many are context sensitive.

• Address equity explicitly, but be cautious to promise benefits without having the tools to ensure they’re realized.

• Work to clarify potential costs and identify who would be responsible.
MnDOT’s 3-Pronged Approach to CAV

1. Strategic Investment
2. Innovation
3. Collaboration & Knowledge-Sharing
# Implementation

<table>
<thead>
<tr>
<th>MnDOT CAV Strategic Plan Focus Areas, Strategies and Recommendations</th>
<th>MnDOT Lead</th>
<th>Initiate</th>
<th>Capital</th>
<th>Staff Effort</th>
<th>Strategic Plan Themes</th>
<th>SOP Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FOCUS AREA 1: CAPITAL INVESTMENT</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>Strategy 1: Assess Connected Vehicle Infrastructure Needs</strong></td>
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</tr>
<tr>
<td>1. Assess Communications Infrastructure and Public-Private Partnership Feasibility Study to Support CV Technologies</td>
<td>CAV-X</td>
<td>1 Year</td>
<td>$$$</td>
<td>MED</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2. Build Traffic Signal Infrastructure for CV Readiness</td>
<td>Traffic Engineering</td>
<td>1 Year</td>
<td>$</td>
<td>LOW</td>
<td>X</td>
<td>X</td>
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<tr>
<td><strong>Strategy 2: Assess and Prepare Pavements and Bridges for CAV</strong></td>
<td></td>
<td></td>
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<tr>
<td>3. Continue Research Scan of Platooning Impact on Pavements and Bridges</td>
<td>Materials/Bridge</td>
<td>1 Year</td>
<td>$</td>
<td>LOW</td>
<td>X</td>
<td>X</td>
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<tr>
<td>4. Update Design Standards to Accommodate Platooning</td>
<td>Materials/Bridge</td>
<td>3-5 Years</td>
<td>$$$</td>
<td>MED</td>
<td>X</td>
<td>X</td>
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<tr>
<td>5. Develop Truck Platooning Network Plan</td>
<td>CAV-X</td>
<td>1-3 Years</td>
<td>$$$</td>
<td>MED</td>
<td>X</td>
<td>X</td>
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<tr>
<td><strong>Strategy 3: Develop and Implement Enhanced Pavement Marking and Signage Program</strong></td>
<td></td>
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<tr>
<td>6. Pilot Pavement Marking to Support Automated Vehicles and Human Drivers</td>
<td>Traffic Engineering</td>
<td>1-3 Years</td>
<td>$$</td>
<td>HIGH</td>
<td>X</td>
<td>X</td>
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<tr>
<td>7. Support Industry in Researching and Advancing Signage to Support CAV</td>
<td>CAV-X</td>
<td>1-3 Years</td>
<td>$</td>
<td>LOW</td>
<td>X</td>
<td>X</td>
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<tr>
<td><strong>Strategy 4: Develop and Implement Electric Vehicle (EV) Strategy</strong></td>
<td></td>
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<tr>
<td>8. Develop EV Infrastructure Deployment Strategy at State Facilities</td>
<td>Sustainability and Public Health</td>
<td>1-3 Years</td>
<td>$</td>
<td>MED</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>9. Implement EV Infrastructure Deployment Strategy at State Facilities</td>
<td>Maintenance</td>
<td>1-3 Years</td>
<td>$$$</td>
<td>MED</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>FOCUS AREA 2: RESEARCH AND DEVELOPMENT</strong></td>
<td></td>
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<tr>
<td><strong>Strategy 5: Lead National Research and Innovation</strong></td>
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<tr>
<td>10. Continue the Minnesota CAV Challenge</td>
<td>CAV-X</td>
<td>1 Year</td>
<td>$$$</td>
<td>MED</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>11. Leverage TRIG and LRRB to Research CAV Long-Term Impacts</td>
<td>CAV-X</td>
<td>1-3 Years</td>
<td>$</td>
<td>LOW</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>12. Seek Research Panel Assignments Aligned with MnDOT Interests</td>
<td>CAV-X</td>
<td>1-3 Years</td>
<td>$</td>
<td>LOW</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>13. Further Collaborative Research with Minnesota Academic Institutions</td>
<td>CAV-X</td>
<td>3-5 Years</td>
<td>$$</td>
<td>MED</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>14. Research Data Use and Models</td>
<td>CAV-X</td>
<td>1-3 Years</td>
<td>$$$</td>
<td>MED</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>15. Monitor Research on CAV Dedicated Lanes</td>
<td>RTMC</td>
<td>5+ Years</td>
<td>$</td>
<td>LOW</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
4. Programs
Infrastructure – Fiber, Markings, RSUs & Signs
Research – Platooning, Freight, Snow, Detection
Operations & Maintenance – Data, Work Zones & Crash Cushions
Multimodal – Transit, Freight, VRUs
Communications & Engagement
Surveys and Public Education

Are you afraid to drive in an automated vehicle?

- Americans (AAA survey):
  - Oppose 71%
  - Support 19%

- Minnesotans (MnDOT survey):
  - Support 79%
  - Oppose 21%
MAASTO Opportunities

1. Convene quarterly MAASTO calls
2. Convene annual MAASTO CAV summits
3. Develop regional MAASTO priorities
4. Participate in DOT-led TRB Annual Meeting & Automated Vehicle Symposium sessions
5. Create regional, uniform AV deployment laws and programs
6. Develop an inter-regional model for partnerships and grants
7. Develop a regional research gap analysis where each state can fill in gaps - and avoid redundancy - in research
Thank you!

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