PLANNING SNAPSHOT 11:
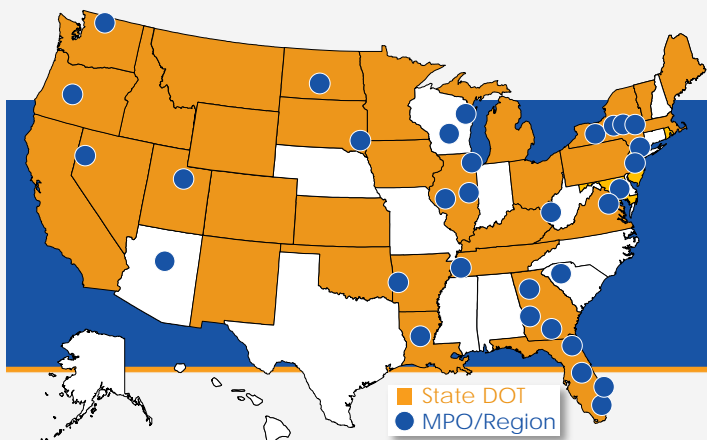## CONNECTED AND AUTONOMOUS VEHICLES

Funded through the NCHRP 8-36 Research Series, these snapshots are designed to tell you a little about the current state of a specific planning practice of interest today.

Addressing Emerging Technologies

How are agencies planning for connected and autonomous vehicles? This survey was distributed on behalf of AASHTO's SCOP, AMPO, and NARC. Over 80 responses were received from State DOTs, MPOs, and other regional agencies. Some agencies submitted multiple responses. All responses are reported here.

■ State DOT
● MPO/Region

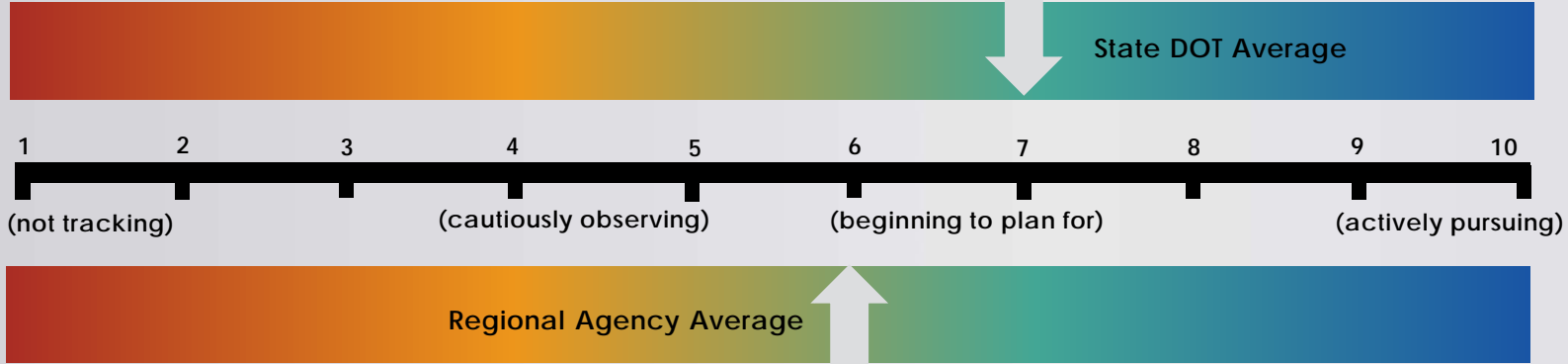## CURRENT LEVEL OF ENGAGEMENT

As technology advances, state and regional agencies are increasingly engaging in policy and planning to respond to the challenges and opportunities presented by Connected and Autonomous Vehicles (CAV). This snapshot summarizes high level results from a 2017 survey. For more information contact Matt Hardy of AASHTO.

How would you best describe your agency's level of engagement in policy and planning for connected and autonomous vehicles?

*"Autonomous vehicles will **significantly affect our transportation system**. It seems to be too early to tell whether it will advance existing objectives or just **reshape dynamics.** "*

*"We are aware of possible impacts of CAV but to date, **we haven't included it in any of our processes.** "*

*We have **reoriented staff, hired global leaders, started private sector and military partnerships** and we are developing a strategic plan.*

*"Agency **executives are supportive and engaging** other partners in the CAV dialogue at our agency"*

- Leader 15%
- Early Adopter 6%
- Actively Engaged 34%
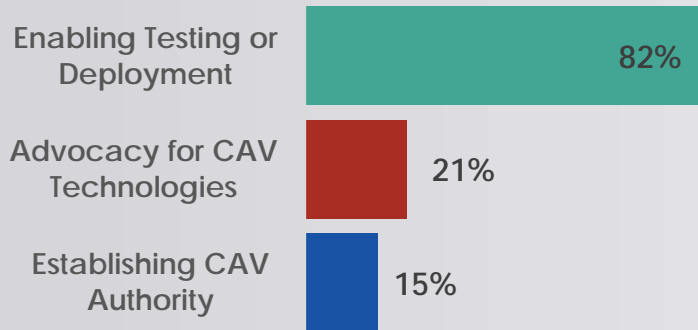- Passively Engaged 38%
- Not Engaged 6%

AGENCY ENGAGEMENT

From a scale of 1 (not tracking CAV) to 10 (actively pursuing CAV), what is the general awareness and level of interest in CAV concepts and operations within your agency?

State DOT Average

1	2	3	4	5	6	7	8	9	10

(not tracking)   (cautiously observing)   (beginning to plan for)   (actively pursuing)

Regional Agency Average

AGENCY POLICIES AND GUIDANCE

Has your state legislature or governing body implemented any type of CAV legislation or policy? What is the intent of these policies?

Enabling Testing or Deployment — **82%**

Advocacy for CAV Technologies — **21%**

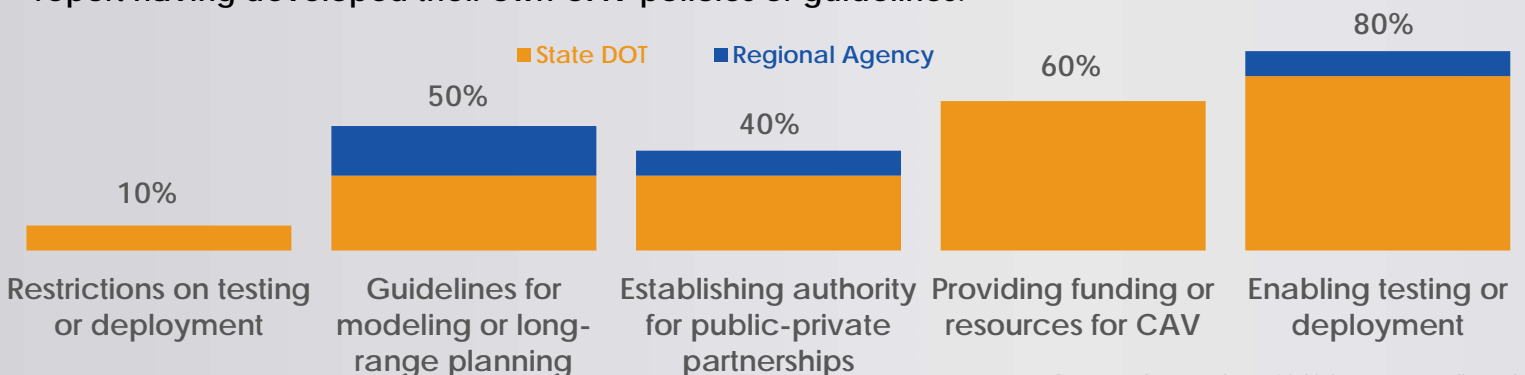Establishing CAV Authority — **15%**

Percent of respondents. Multiple responses allowed.

How have elected officials, decision makers or agency executives responded to CAV issues in your state or region?

- Too Early to Tell — **28%**
- Uninformed but Curious — **19%**
- Supportive — **53%**
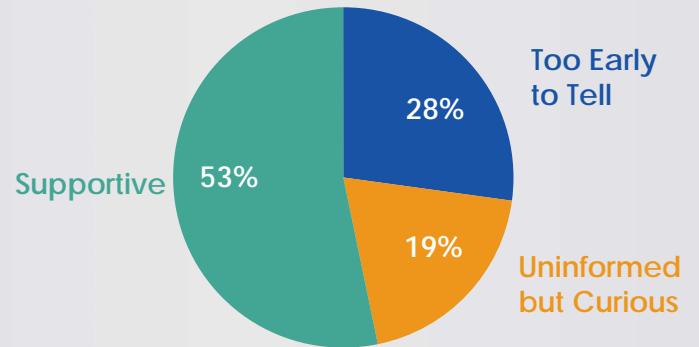
Percent of respondents.

For recent and pending legislation, see examples from PA, NV, CA, D.C., FL, GA, MI, AR, and others. For a complete listing, visit NCSL's legislative tracker at: www.ncsl.org/research/transportation/autonomous-vehicles-self-driving-vehicles-enacted-legislation.aspx

Has your agency developed any type of CAV policies or guidance? Of 80 responding agencies, 12 report having developed their own CAV policies or guidelines.

Legend: ■ State DOT ■ Regional Agency

- Restrictions on testing or deployment — **10%**
- Guidelines for modeling or long-range planning — **50%**
- Establishing authority for public-private partnerships — **40%**
- Providing funding or resources for CAV — **60%**
- Enabling testing or deployment — **80%**

Percent of respondents. Multiple responses allowed.

AGENCY POLICIES AND GUIDANCE

Of responding agencies with CAV specific policies or guidance in place, most agencies are attempting to standardize performance, roadway designations or operating networks, as well as the myriad of issues related to licensing, technology, vehicle, and safety standards.

What standards does your agency's guidance cover?

System performance standards 50%

Operating network (geographic area or roadways where CAV can be operated) 50%

Licensing or registration 33%

Infrastructure standards 33%

Equipment or technology standards 33%

Vehicle standards 25%

Roadway classification standards 25%

Safety standards 17%

Percent of respondents. Multiple responses allowed.

"We have established a 'voluntary testing notification' process for companies that wish to conduct AV testing in our state. Companies that choose to provide us with information about their testing plans, intended routes, etc. issue a notification to the agency, and we review the route for any issues or atypical conditions and inform the state and local law enforcement about testing plans."

How is your agency establishing or participating in multi-agency working groups or programs to plan for CAVs?

➢ AASHTO committees and pooled funds studies
➢ Local governments and university sponsored research
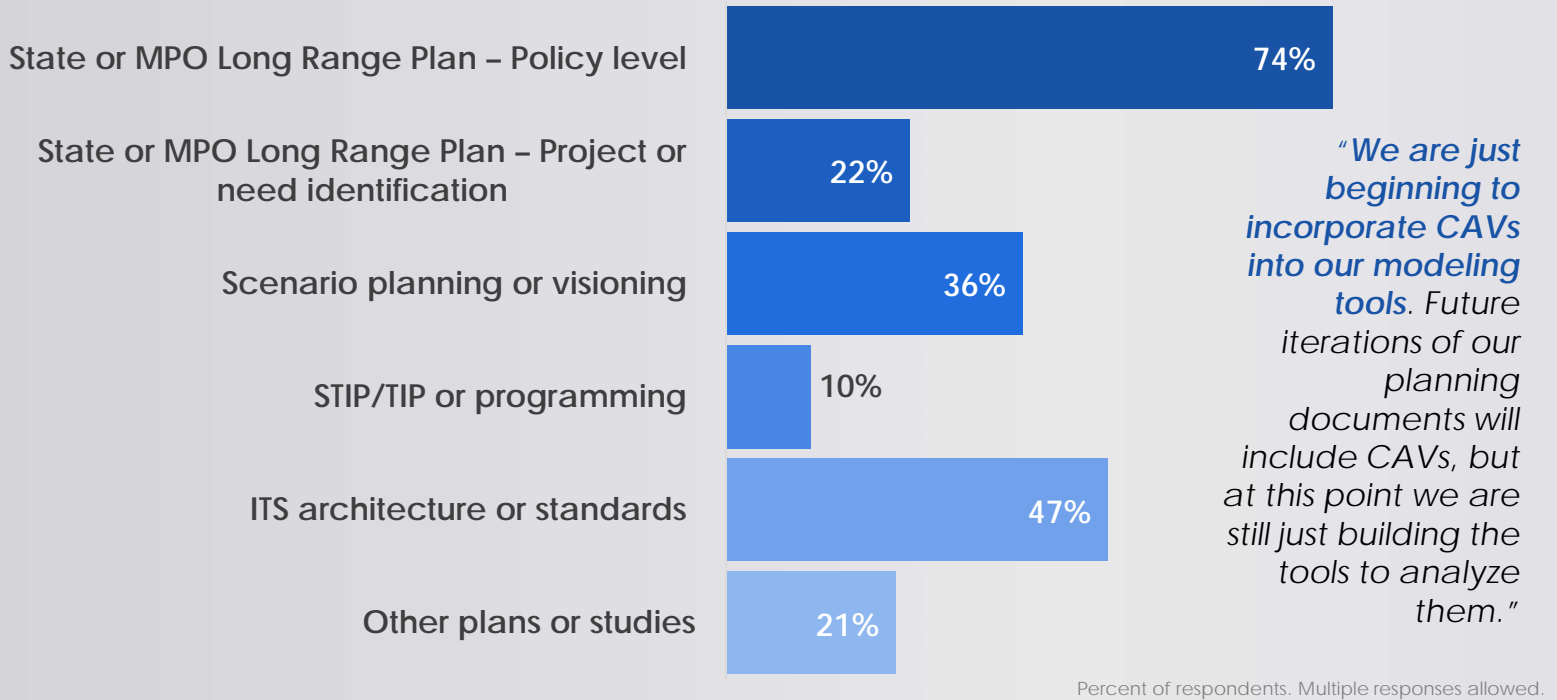➢ Interagency working groups led by state DOTs and MPOs

Motor Vehicles
Motor Carriers
Transportation Agency
Public Safety
State Police
Regulatory Authorities
Economic Development
Information Technology
Insurance

Agencies Involved

How is your agency examining the future of CAV within freight planning or commercial vehicle operations?

➢ I-10 Connected Freight Corridor
➢ Partnerships and joint studies with universities, trucking associations, regional agencies, and private sector partners
➢ Truck platooning pilots and research
➢ High level policy discussions
➢ Statewide freight plans
➢ Long range transportation plan updates

PLANNING AND DEVELOPMENT

A majority of responding agencies (61%) are considering CAVs and potential impacts in state and regional planning processes – despite significant unknowns and challenges with estimating or modeling.

Does your agency's planning process consider CAV or possible future impacts?

Category	Percent
State or MPO Long Range Plan – Policy level	74%
State or MPO Long Range Plan – Project or need identification	22%
Scenario planning or visioning	36%
STIP/TIP or programming	10%
ITS architecture or standards	47%
Other plans or studies	21%

"We are just beginning to incorporate CAVs into our modeling tools. Future iterations of our planning documents will include CAVs, but at this point we are still just building the tools to analyze them."

Percent of respondents. Multiple responses allowed.

If you are considering CAV, what aspects are you looking at within your models or scenarios?

"We are looking at CAV impacts. We find modeling the VMT and mobility impacts most challenging."

"Our modeling tools will enable us to analyze mode switching that may occur between conventional vehicles, personal and shared automated vehicles, and transit ridership under different cost and trip assumptions."
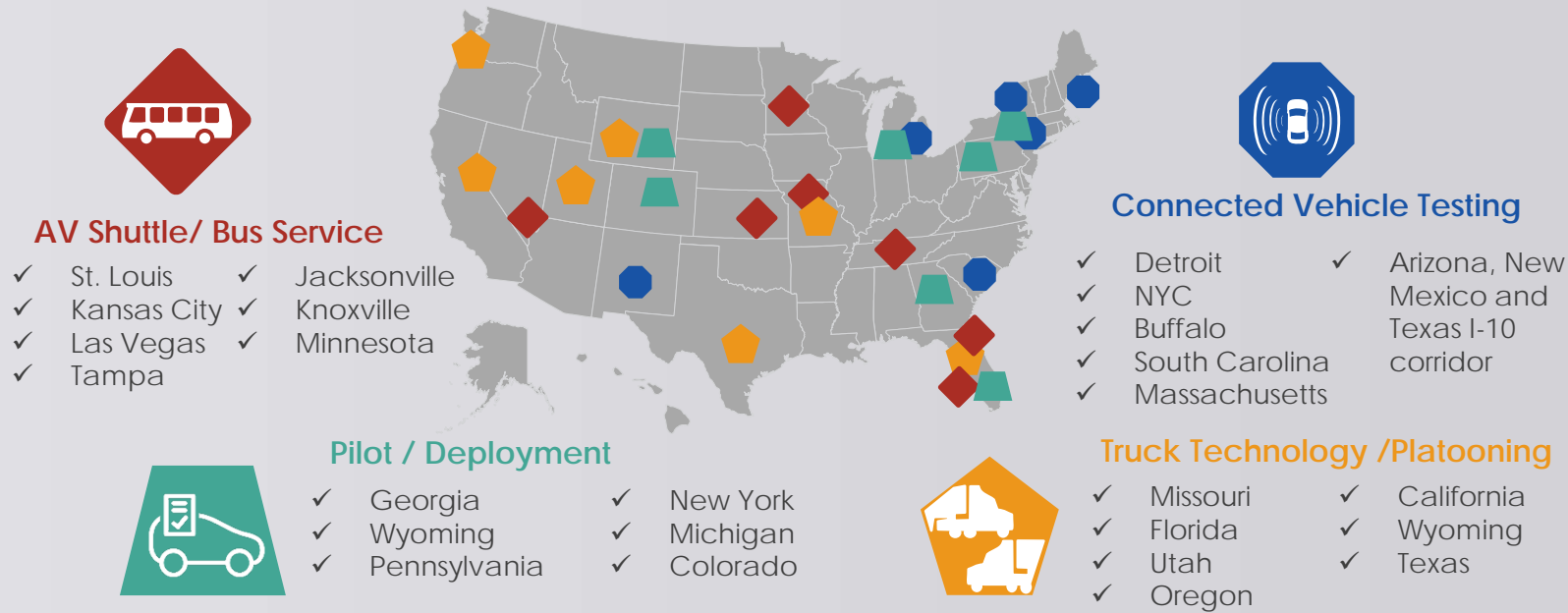
Safety

VMT

Mobility

Environment
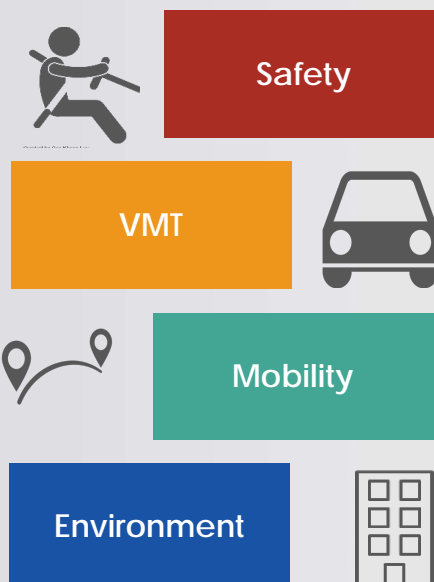
"Our main focus is safety. However, we also are looking at congestion mitigation, mobility, transit and other applications."

"We are looking at integration of modes to facilitate first and last mile connection for transit and the reduction of empty passenger mile vehicles in the network."

CURRENT CAV ACTIVITIES

Please describe the nature and location of CAV projects or pilots that are underway in your state or region.

More than half of respondents report that there is CAV activity already happening in their state or region (58%). Common activities included connected shuttles, pilot deployments, testing of vehicles or technologies, truck platooning pilots and ITS integration.
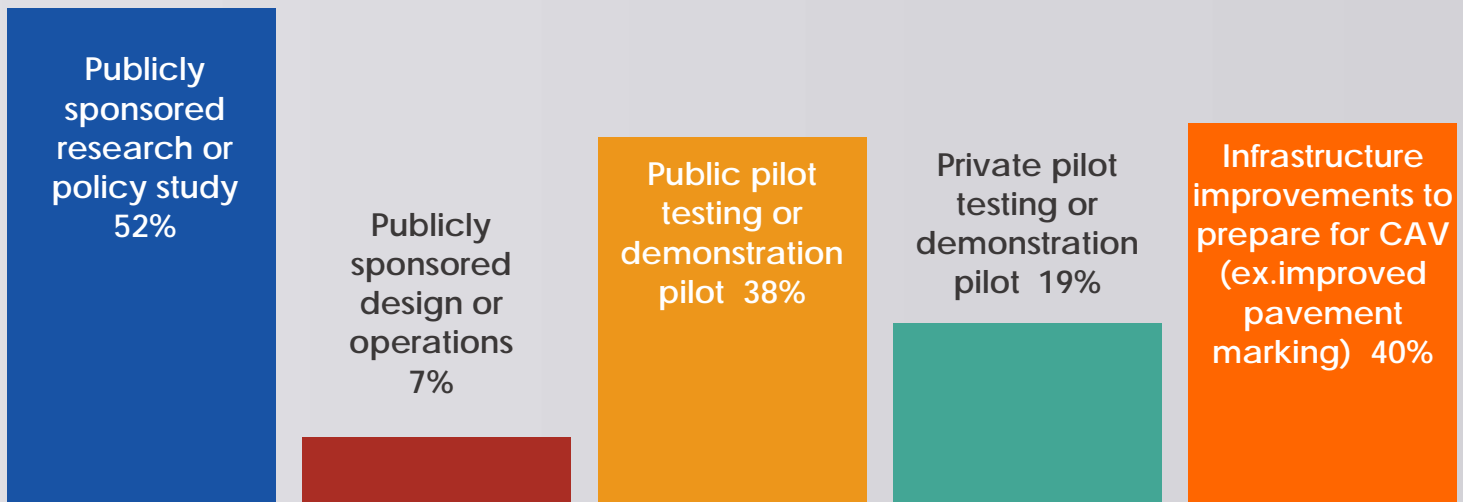
AV Shuttle/ Bus Service

- ✓ St. Louis
- ✓ Kansas City
- ✓ Las Vegas
- ✓ Tampa
- ✓ Jacksonville
- ✓ Knoxville
- ✓ Minnesota

Connected Vehicle Testing

- ✓ Detroit
- ✓ NYC
- ✓ Buffalo
- ✓ South Carolina
- ✓ Massachusetts
- ✓ Arizona, New Mexico and Texas I-10 corridor

Pilot / Deployment

- ✓ Georgia
- ✓ Wyoming
- ✓ Pennsylvania
- ✓ New York
- ✓ Michigan
- ✓ Colorado

Truck Technology /Platooning

- ✓ Missouri
- ✓ Florida
- ✓ Utah
- ✓ Oregon
- ✓ California
- ✓ Wyoming
- ✓ Texas

U.S. DOT Automated Vehicle Proving Grounds

- ✓ City of Pittsburgh and Pennsylvania Transportation Institute
- ✓ Texas AV Proving Grounds Partnership
- ✓ U.S. Army Aberdeen Test Center
- ✓ American Center for Mobility (ACM) at Willow Run
- ✓ Contra Costa Transportation Authority (CCTA) & GoMentum Station
- ✓ San Diego Association of Governments
- ✓ Iowa City Area Development Group
- ✓ University of Wisconsin-Madison
- ✓ Central Florida Automated Vehicle Partners
- ✓ North Carolina Turnpike Authority

Map displays information from survey respondents and represents only a sample of national activities.

What best describes the extent of your agency's CAV initiatives?

- Publicly sponsored research or policy study 52%
- Publicly sponsored design or operations 7%
- Public pilot testing or demonstration pilot 38%
- Private pilot testing or demonstration pilot 19%
- Infrastructure improvements to prepare for CAV (ex.improved pavement marking) 40%

Percent of respondents. Multiple responses allowed.

CHALLENGES AND BARRIERS

Among the long list of challenges facing CAV integration, responding agencies suggest that funding and evaluation issues with the planning process are the most significant barriers today.

Funding and Capacity

➤ "There are large discrepancies in timeline and cost estimations"
➤ "Our in-house capacity is very limited and reliant upon existing subject matter experts."
➤ "Too much going on to keep track of in the CAV world."

Planning Process

➤ "How can we plan for something that we don't fully understand at this point?
➤ "It's difficult to evaluate impacts from technologies that are evolving every day."
➤ "We are struggling to model for VMT, safety, and GHG impacts."

Operations and Maintenance

➤ "It may be especially challenging to maintain roadway infrastructure in the condition required for new technology."
➤ Understanding operational needs and solutions is unclear when the future issues are uncertain."

Public Acceptance

➤ "In general decision makers and the public may be misinformed and/or don't have the comprehensive understanding necessary to provide informed input.""

Deployment or Testing

➤ "There are limited AV vehicles available for piloting and testing across the U.S."
➤ "Over regulation of pilot testing in some states could hinder innovations."

Design or Engineering Phases

➤ "Technological requirements are uncertain. If we are building a bridge that will last for 75 years, its not clear what elements we would need to install to make it readily adaptable to CAV?"

Elected Officials Support

➤ "Our elected officials and others have somewhat of a 'wait and see' mentality about this."
➤ "Experience with the legislature suggests there is some interest but no sense of urgency to act."
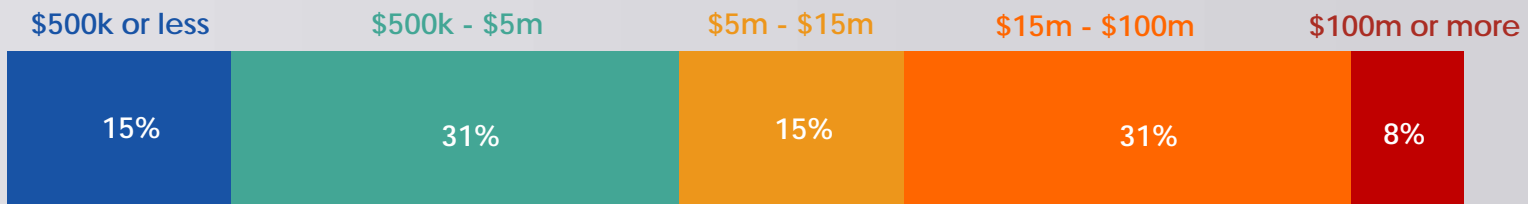
Too Many Unknowns

➤ "Our agency is taking a cautious approach and looking to see how others handle CAV policies."
➤ Some private technology providers are reluctant to indicate operations or infrastructure needs to support CAV because of competitive information."
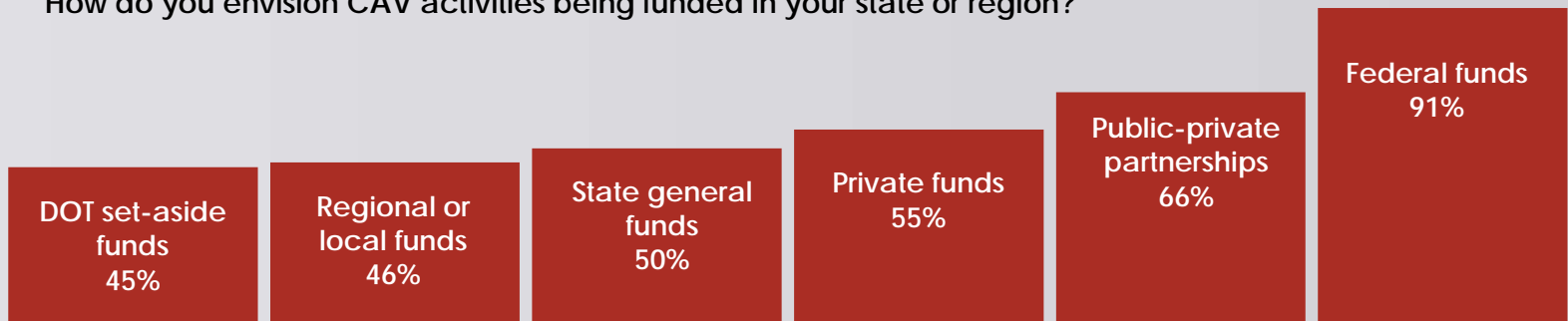
FUTURE FUNDING

Responding agencies suggest that funding sources and potential research and planning activities are wide ranging. Most agencies expect levels of investment between 5-100 million dollars coming from federal funds and public private sources.

What general level of investment do you anticipate public agencies and private partners making in your state or region?
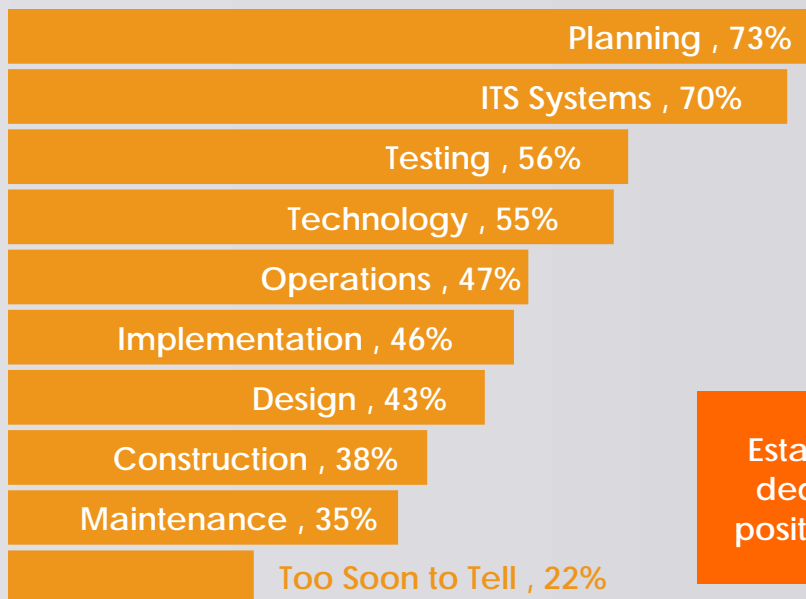
$500k or less	$500k - $5m	$5m - $15m	$15m - $100m	$100m or more
15%	31%	15%	31%	8%

Percent of respondents.

How do you envision CAV activities being funded in your state or region?

- DOT set-aside funds 45%
- Regional or local funds 46%
- State general funds 50%
- Private funds 55%
- Public-private partnerships 66%
- Federal funds 91%

Percent of respondents. Multiple responses allowed.

What scope of work do you expect any current or future funding will be made available for?

- Planning , 73%
- ITS Systems , 70%
- Testing , 56%
- Technology , 55%
- Operations , 47%
- Implementation , 46%
- Design , 43%
- Construction , 38%
- Maintenance , 35%
- Too Soon to Tell , 22%

Percent of respondents. Multiple responses allowed.

How is your agency setting aside resources to prepare for CAV?

- Working groups or task force 68%
- Establishing dedicated positions 22%
- Setting aside funds 37%
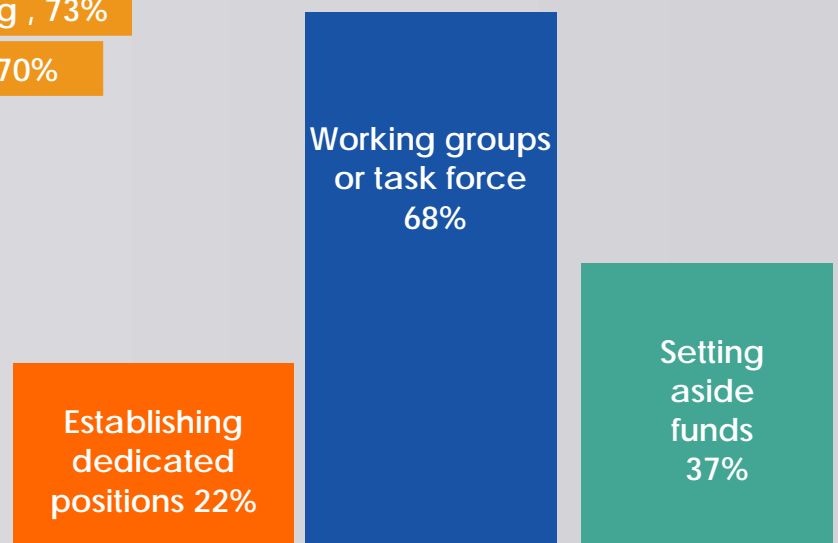
Percent of respondents. Multiple responses allowed.

WHAT'S NEXT FOR CAVS?

More than two thirds of respondents report not yet partnering with the private sector. For those that have began partnering, agencies generally report positive and supportive connections.

If your agency has engaged private sector partners, what is the response or feedback regarding the role of public agencies?

Collaborative   Contract management

Fewer restrictions   Eager

Rulemaking   Active engagement   Certainty

Positive feedback   Supportive   High interest

Partners   Policy and planning   Contract management

Asset sharing   Regulation

Is your agency attempting to communicate and educate decision makers and the public about CAV technologies?

| Yes, actively educating 56% | Not right now, need resources or information 36% | No plans to try 8% |

What resources would be helpful for future communications efforts?

- Consolidated and consistent messaging on impacts and benefits
- Shared results and data from pilot projects, tests, deployments, and demonstrations
- Realistic and defensible timeline estimates for CAV adoption and market penetration
- Consistent presentations, resources, overviews, infographics, and summary content
- Pool of national experts for speaking engagement and legislative testimony
- Data, guidelines, approaches and information on how to model CAVs and incorporate CAVs into scenario planning

JULY 2017