A SAMPLE OF AUTOMATED DRIVING SYSTEM ACTIVITIES:

UNITED STATES OF AMERICA

SIP-ADUS

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KYOTO, JAPAN

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CONTENTS

- USA legislative and regulatory authorities
- USDOT programs
- States take different approaches: Two examples
  - California
  - Arizona
- Summary

DIFFERENT VEHICLE, DRIVER, AND ROADWAY AUTHORITIES
(SOMETIMES IN CONFLICT)

- **Congress legislates**
  - Senate (100 members); House of Representatives (435 voting members)
  - Both Houses must agree for legislation to the President and signature into law
- **NHTSA** regulates vehicle equipment, operating safety, and emissions
- **FMCSA** regulates the safety of trucks, buses, and commercial drivers in interstate commerce
- **FHWA** regulates matters related to surface transportation infrastructure and operations, including roadway safety
- **States**
  - Legislates (in the absence of Federal pre-emption)
  - Regulates drivers, liability, insurance, speed limits, street design, emissions
  - Executive orders
- **Cities**
  - Street design, zoning, curbsides, speed limits, traffic rules

NOTE: In contrast to other regions, in the US, anything that isn't explicitly illegal is legal.

Infrastructure Investment and Jobs Act (2021) – total $550b

New automated vehicles-related authorizations for the U.S. DOT

- **Updates to Manual on Uniform Traffic Control Devices:** "safe testing of automated vehicle technology and any preparation necessary for the safe integration of automated vehicles onto public streets."
- **Emerging Technology Research Pilot Program:** $5 million/year for 5 years, "regarding the impacts of connected, autonomous, and platooned vehicles on pavement and infrastructure performance."
- **Research and Technology Development and Deployment:** A new Center of Excellence on New Mobility and Automated Vehicles on the "impacts of new mobility and highly automated vehicles."
- **Strengthening Mobility And Revolutionizing Transportation Grant Program:** $100 million/year for 5 years, including "[t]he use of automated transportation and autonomous vehicles..."

On January 6, 2022, USDOT Secretary Pete Buttigieg called for federal AV regulations during his keynote address at the Consumer Electrics Show in Las Vegas. “[C]onsider autonomous vehicles. For all their potential, they’ve also raised complicated—even philosophical—questions about safety, equity, and our workforce. It’s why, last year, we at *DOT announced a standing general order that requires crash reports and information from testers, operators, and manufacturers of those vehicles*, so that we can identify safety concerns and collaborate to address them early.”

← LAWS & REGULATIONS

Standing General Order on Crash Reporting

For incidents involving ADS and Level 2 ADAS

NHTSA issued the General Order in June 2021 to obtain timely notice of incidents that may provide information regarding potential safety defects in ADS, in Level 2 ADAS or in vehicles equipped with these technologies, and that can assist in evaluating the safety of these vehicles.

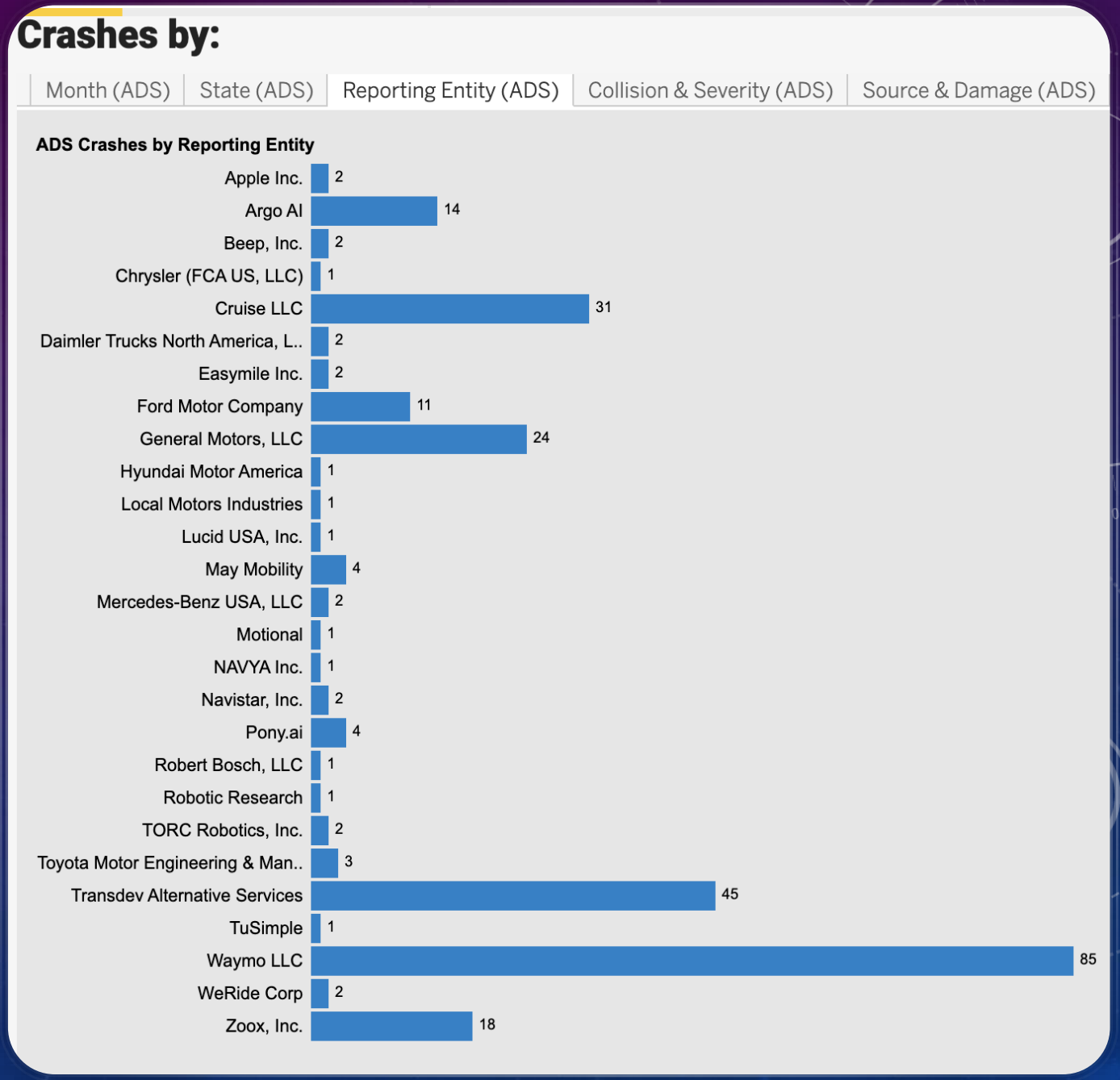
ADS: Entities must report a crash if ADS was in use at any time within 30 seconds of the crash and resulted in property damage or injury.

Level 2 ADAS: Entities must report a crash if Level 2 ADAS was in use at any time within 30 seconds of the crash and the crash involves a vulnerable road user or results in a fatality, a vehicle tow-away, an air bag deployment, or any individual being transported to a hospital for medical treatment.

ADS-Equipped Vehicle Crashes

- Reported through August 15, 2022
- ~264 crashes reported in ~12 months
- **Preliminary observation**: Many rear-end crashes by human drivers into ADS vehicle

Source: https://www.nhtsa.gov/laws-regulations/standing-general-order-crash-reporting#overview

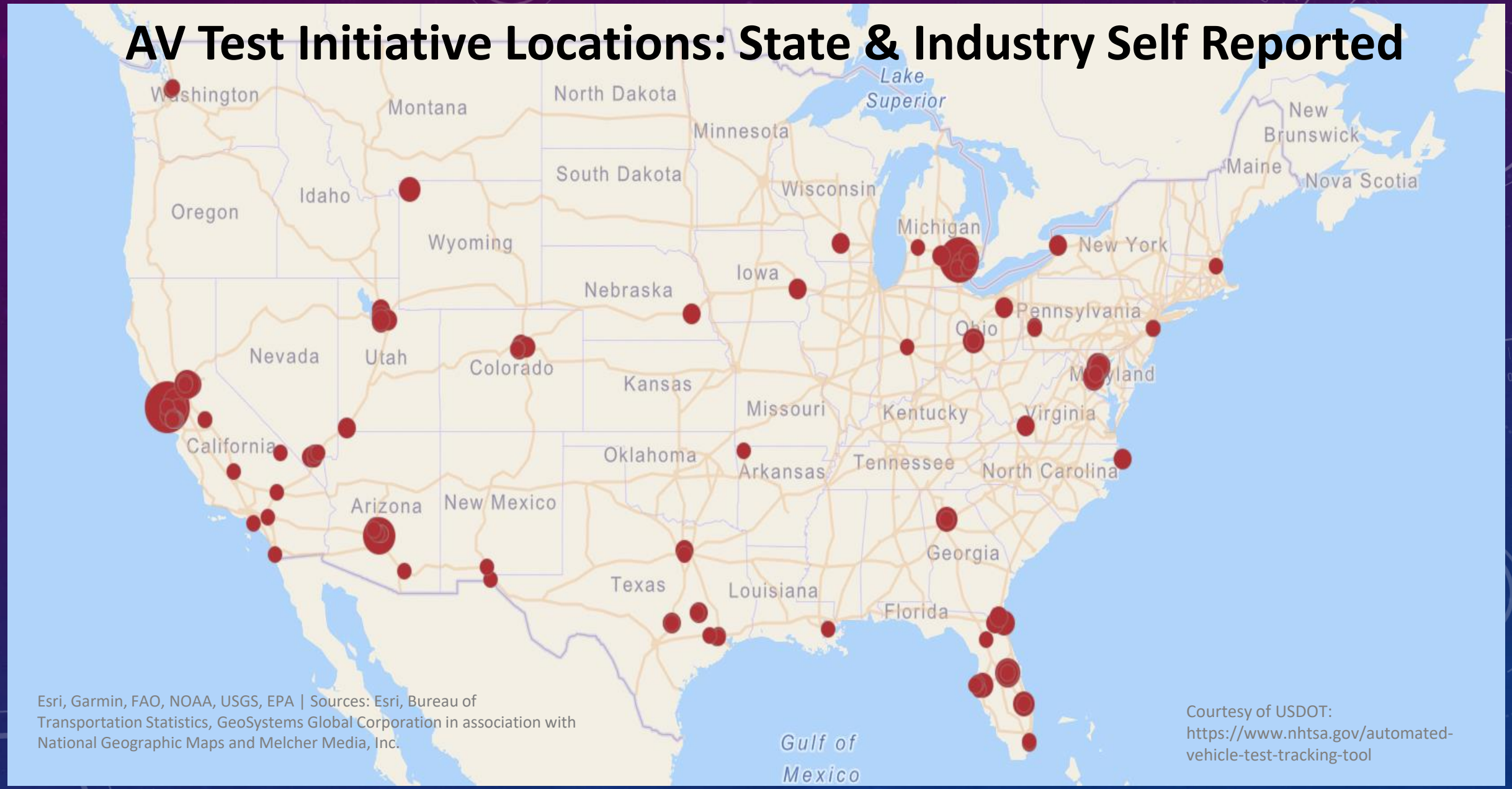


AV TEST Initiative

Automated Vehicle Transparency and Engagement for Safe Testing Initiative

- NHTSA launched the AV TEST Initiative in 2020 with states, local gov’ts, and the private-sector
- To provide the public with access to information about
  - Testing of ADS-equipped vehicles,
  - State and local activities, legislation, regulations, local involvement, and
  - On-road testing information provided by ADS companies
- To increase public awareness of on-road testing, safety precautions, and principles guiding the testing.

AV Test Initiative Locations: State & Industry Self Reported



Esri, Garmin, FAO, NOAA, USGS, EPA | Sources: Esri, Bureau of Transportation Statistics, GeoSystems Global Corporation in association with National Geographic Maps and Melcher Media, Inc.

Courtesy of USDOT: https://www.nhtsa.gov/automated-vehicle-test-tracking-tool

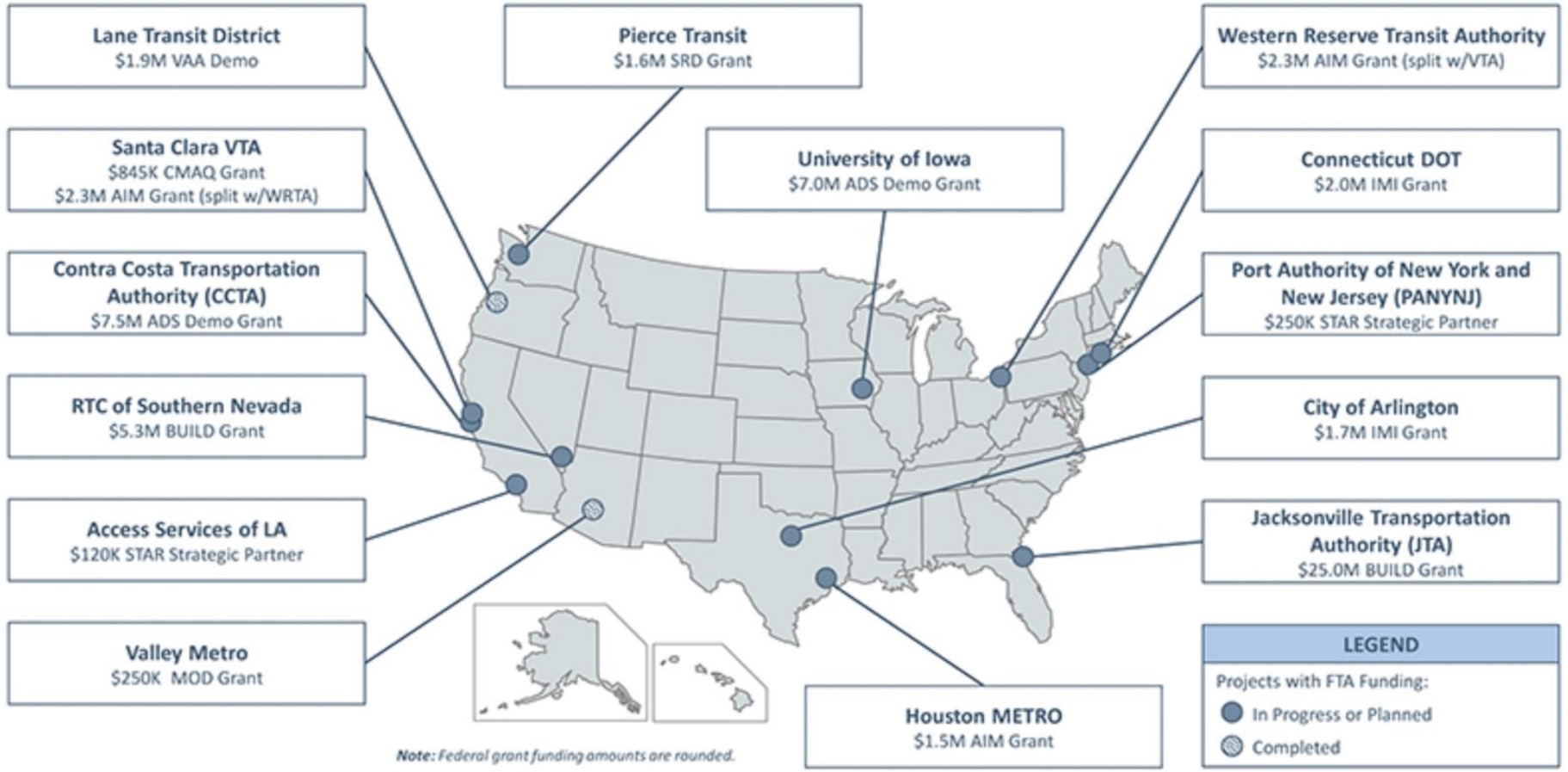
United States Department of Transportation

FMCSA
Federal Motor Carrier Safety Administration

Conducting ADS research with NHTSA and FHWA in the following areas:

- Human factors related to drivers of Commercial Motor Vehicles (CMVs)
- Components of ADS-equipped CMVs, such as brakes and sensors.
- Automatic emergency braking (AEB) to promote the adoption of this technology
- Cybersecurity for telematics and aftermarket electronic systems
- Data collection, sharing, and analysis—developing baseline safety performance recommendations for highly automated commercial vehicles and a data framework with voluntary data principles to accelerate the safe rollout of ADS.

Map of FTA-Funded Transit Bus Automation Demonstrations & Pilots



United States Department of Transportation

U.S. Department of Transportation
Federal Highway Administration

In September 2019, U.S.DOT Secretary Elaine L. Chao awarded nearly $60 million in federal grant funding to test the safe integration of automated vehicles into America's transportation system.

Detroit, MI - $7,500,000
Implement the Cooperative Automation Research Mobility Applications (CARMA) Level 3 software platform for demonstration testing focused on mobility, safety, and endurance.

Contra Costa, CA - $7,500,000
Demonstrate Level 3 and Level 4 vehicles using shared on-demand, wheelchair accessible ADS-equipped vehicles.

Texas A&M - $7,063,787
Develop and test ADS for rural roads without high-definition maps and with no or low-quality road signs or markings.

DriveOhio - $7,500,000
Conduct a demonstration focused on rural environments, cooperative automation, and robust data collection to enable development of effective and informed ADS policies.

Pennsylvania DOT - $8,409,444
Explore safe integration of ADS into work zones by examining connectivity, visibility, and high-definition mapping technologies.

Virginia Polytechnic Institute and State University (VTTI) - $7,500,000
Develop and demonstrate a Fleet Concept of Operations to provide the trucking industry with guide to safely implement and benefit from ADS-equipped trucks.

University of Iowa - $7,026,769
Connect rural, transportation-challenged populations using a mobility-friendly ADS built on a commercially available platform.

Virginia Polytechnic Institute and State University (VTTI) - $7,500,000
Define, develop, and demonstrate dynamic scenarios and their potential solutions for safe interaction of ADS-equipped vehicles in a Northern Virginia corridor optimized for vehicle automation.

https://www.transportation.gov/av/grants

United States Department of Transportation

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IMPACTS ON ROADS FROM ADS

The study will discuss how ADS impacts the existing transportation infrastructure (e.g., signage/markings, traffic signals, and highway design), congestion, commercial traffic flows, the environment, and mobility. It will also consider potential infrastructure improvements that could support ADS and possible policy recommendations for FHWA in this area.

Outreach

The FHWA has led communication and outreach activities with highway stakeholders, including State department of transportation (DOT) partners and other public agencies and industry groups, to improve understanding of the issues and needs related to AV.

Policy and Guidance

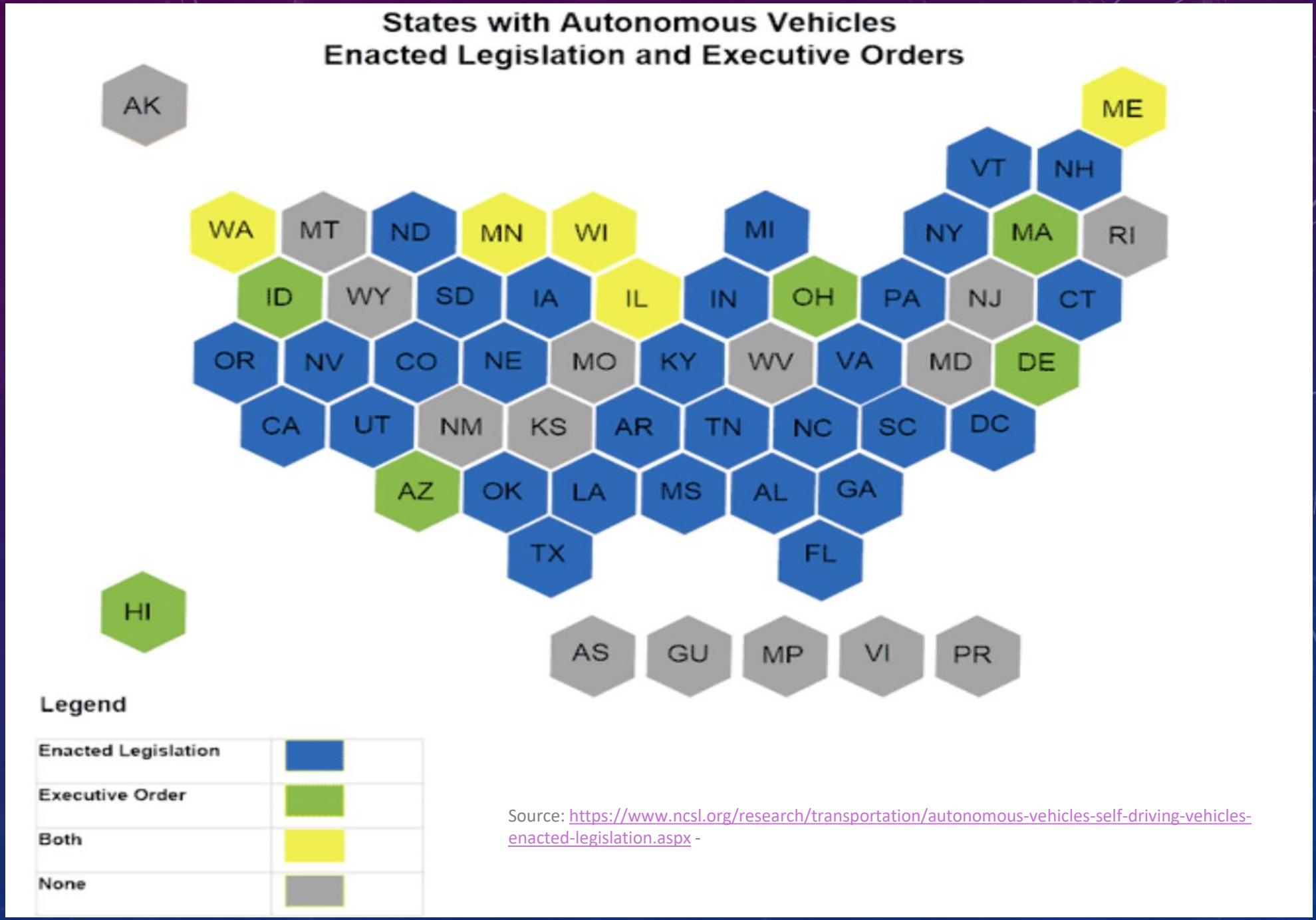
- Update of the *Manual on Uniform Traffic Control Devices* (MUTCD), to lay the groundwork preparing for supporting automated driving systems and the infrastructure of the future.
- Policy and Strategy Analysis to facilitate incorporating of CAV in transportation planning processes and products.
- Transportation Planning Capacity Building – CAV to help planners better understand CAV technologies and their potential impact on transportation planning.

40 STATES + D.C. ALLOW AV OPERATIONS.

LEGISLATION: 35 STATES

EXECUTIVE ORDER: 6 STATES

BOTH: 5 STATES



Source: https://www.ncsl.org/research/transportation/autonomous-vehicles-self-driving-vehicles-enacted-legislation.aspx -

Who's self-driving in CALIFORNIA?

As of September 9, 2022, CA DMV has issued 50 Autonomous Vehicle Testing Permits (with a driver); SIX Permits without a driver; THREE permits for driverless commercial operations:

- AIMOTIVE INC
- AMBARELLA CORPORATION
- APEX.AI
- APOLLO AUTONOMOUS DRIVING USA LLC
- APPLE INC
- ARGO AI, LLC
- AURORA OPERATIONS, INC
- AUTEL US INC
- AUTOX TECHNOLOGIES INC
- BLACK SESAME TECHNOLOGIES INC
- BLUESPACE.AI, INC
- BOSCH
- CONTINENTAL
- CRUISE LLC
- CYNGN INC
- DEEPROUTE.AI
- DiDi RESEARCH AMERICA, LLC
- GATIK AI INC
- HELM.AI INC
- GHOST AUTONOMY
- HONDA
- IMAGRY INC
- INTEL CORPORATION
- MANDO AMERICA CORP
- MERC BENZ
- MOTIONAL
- NIO USA INC.
- NISSAN
- NURO, INC
- NVIDIA CORPORATION
- PEGASUS TECH HOLDINGS INC
- PLUSAI, INC
- QCRAFT.ai
- QUALCOMM TECHNOLOGIES, INC
- RENOVO.AUTO
- RIDECELL INC
- TELENAV, INC.
- TESLA
- TOYOTA RESEARCH INSTITUTE
- UDACITY
- UDELV, Inc
- VALEO NORTH AMERICA, INC.
- VINGROUP USA LLC
- VOLKSWAGEN
- VUERON TECHNOLOGY USA, INC
- WAYMO LLC
- WERIDE Corp
- WOVEN PLANET N.A, INC
- XMOTORS.AI, INC
- ZOOX INC

Who's Self-driving in CALIFORNIA?

25 COMPANIES FILED DISENGAGEMENT REPORTS IN 2021 FOR THEIR FLEET

2 - AIMotive
5 - Apollo
37 - Apple
13 - Argo
7 - Aurora
34 - Autotox
137 - Cruise
2 - DeepRoute
12 - Didi
1 - EasyMile
3 - Gatik
23 - Lyft
5 - Nissan
17 - Merecedes
15 - Nuro
6 - Nvidia
41 - PonyAI
14 - WeRide
2 - Qcraft
3 - Qualcomm
4 - TRI
2 - Udelv
2 - Valeo
692 - Waymo
84 - Zoox

HOW MANY TEST VEHICLES WERE ON THE ROAD IN CALIFORNIA IN 2021?

1,163 AV TEST VEHICLES DROVE OVER 4 MILLION MILES ON PUBLIC ROADS IN CALIFORNIA

Who's Self-driving in ARIZONA?

"Testing or operation of self-driving vehicles equipped with an automated driving system on public roads are required to follow all federal laws, regulations and guidelines, Arizona State Statutes"

- **AURORA** –No information
- **BEEP** – Low speed L4 shuttle demonstration program
- **CRUISE** – Delivery from Walmart to customers in Scottsdale and Chandler
- **EMBARK** - Embark trucks and ADOT are sharing data to improve safe navigation of highway work zones
- **IMAGRY** – Start-up testing passenger vehicles on public roads
- **NURO** – Shutting down operations in Phoenix as of October 1; focused on Houston and Silicon Valley
- **PONY.AI** – Testing passenger vehicles in Tucson
- **TUSIMPLE** - Testing 11+ highly automated trucks with safety driver on Interstate 10 in commercial service
- **UDELV** – Operating electric L4 delivery vehicles capable of hauling 2,000 pounds
- **WAYMO One** - Approx. 300-400 passenger vehicles in commercial operation in Chandler and Phoenix
- **WAYMO Via** - Class 8 heavy duty trucks with safety driver in California, Arizona, Texas, and New Mexico.

Journalists estimate ~600 ADS in test, pilot, and commercial operations

IN SUMMARY

- There are no national laws or regulations in the USA governing the development, testing, and commercial operation of highly automated vehicles
- The USDOT is actively engaged
  - NHTSA - Monitoring ADS safety and collecting safety performance data
  - FTA - Piloting highly automated transit services
  - FHWA - Assessing the operations and infrastructure impact of ADS on existing roadways, researching future V2X, awarding R&D grants, providing planning leadership to states and metropolitan areas
  - FMCSA – Conducting research on ADS truck safety and driving and operational impacts
- The states have taken independent positions on regulation of ADS testing and operations, enabling a variety of private sector testing, pilots, and demonstrations across the country
- California, Michigan, Arizona, Texas, Florida, & Pennsylvania appear to have the largest number of ADS testing, commercial pilots, and operations.

THANK YOU