Key Themes

- The timeline for deployment of CAV technology is uncertain, but accelerating
- Impacts and benefits to the transportation system are uncertain
- Three models will influence these impacts:
  1. Connected vs. Automated vs. Connected and Automated
  2. Electric vs. internal combustion engine
  3. Personal vs. shared
- These factors make it difficult to plan for an uncertain future
CAV technology is here

Source: SAE International
Differences between connected and automated vehicles

**Connected Vehicle**
Communicates with nearby vehicles and infrastructure; Not automated

**Connected Automated Vehicle**
Leverages autonomous automated and connected vehicles

**Autonomous Vehicle**
Operates in isolation from other vehicles using internal sensors

Data Sources: U.S. Department of Transportation ITS Joint Program Office
AVs: personal vs. shared

“By 2030, within 10 years of regulatory approval of autonomous vehicles (AVs), 95% of U.S. passenger miles traveled will be served by on-demand autonomous electric vehicles owned by fleets, not individuals, in a new business model we call “transport-as-a-service”.

RethinkX, “Rethinking Transportation 2020-2030”, May 2017

• Rapid development of AV technology has started to shift business models
• Some developers are focusing on shared fleets in lieu of individual ownership
• This model can drastically change how consumers interact with the technology
• Policymakers need to consider both models in planning for and regulating AVs
What’s happening in D.C.?

• Both Congress and the USDOT are engaging in the issue.

• The House passed their SELF DRIVE bill by a unanimously.

• The Senate’s bill is likely to be completed this fall. The hang up is what to do about AV trucks, which the House bill does not address -- expect a final resolution before the election next fall.

• USDOT released new, shorter AV Policy Guidance

Key Takeaways:

✓ The prevailing theme: create a policy framework that allows the private sector remain creative and productive.

✓ Concerns remain over whether to allow loopholes into the federal/state relationship (federal “preemption”)

✓ Feds are unclear how to integrate massive amounts of data generated from CAVs
“Automated Driving Systems 2.0: A Vision for Safety”
The New Federal Automated Vehicles Policy

• Key Takeaways:
  • This is a “guidance” and not an Executive Order or Rule – this is not mandatory yet
  • It replaces the Obama-era “Federal Automated Vehicles Policy”
  • Focus on Levels 3-5 (originally Levels 2-5)
  • “Technical Assistance to States” includes:
    • Division of Federal and State Regulatory Roles
    • Best Practices for Legislatures
    • Best practices for state highway safety officials
    • Permission for testing on public roads
    • Registration
    • Working with public safety officials
    • Liability and insurance
Current policy and legislation status in the U.S.

Source: National Conference of State Legislatures
Operational challenges to deploying CAVs

- **Insurance, liability and licensing**
  - Concerns regarding liability and issuing insurance and licenses for AVs

- **Infrastructure and funding**
  - Existing infrastructure will need to be updated and maintained to accommodate CAVs
  - Investments need to be made in “state of good repair” programs — a significant funding barrier for cities and states
Operational challenges to deploying CAVs

- **Communications**
  - Lack of standards for V2I and V2V wireless communications

- **Interoperability**
  - Disparate technologies and liability concerns from automakers preventing data transfer between vehicles

- **Data and Cybersecurity**
  - Lack of security standards
CAV and Connectivity

The Nevada Experience
Nevada is leading the way...a state of FIRSTS

- **First** to issue the first AV restricted driver’s license
- **First** to create AV regulations for testing and consumer deployment
- **First** to create an AV testing program
- **First** to license a company (Google) for AV testing
- **First** to license a commercial vehicle for testing
- One of the **first 6** states identified for UAV testing
Nevada AV licensing requirements for Driver’s License endorsement

Requires DMV “G” endorsement with driver acknowledging that they are:

• The AV operator whether or not they are physically in the vehicle or not

• The responsible party who must read and understand the manual provided for their AV

• Required to operate their AV within the capabilities and limitations outlined in the manual
Nevada AV licensing requirements for Commercial Company Testing License

A surety bond cash deposit, insurance or proof of self-insurance in the amount of $5,000,000

Proof that one or more of the applicant’s AVs have been driven for a combined minimum of 10,000 miles in autonomous mode, under varying types of roads, weather conditions and times of day and night

Safety plan for testing on public roadways

Plan for hiring and training the test vehicle operators
Nevada Successful Collaboration

- Nevada’s Center for Advanced Mobility (CAM)
- Nevada Governor’s Office of Economic Development (GOED)
- RTC Washoe
- Nevada Department of Motor Vehicles
- RTC Southern Nevada
- Nevada Department of Transportation
  - Full collaboration
  - Political support and buy-in across all state levels
  - Flexibility and willingness to work with private sector partners
  - Strong relationships with university partners
Autonomous People Movers

• This self-driving shuttle began operation on East Fremont Street within the City of Las Vegas Innovation District.

• Provides “last-mile” autonomous transit from bus drop-off locations

• Improved mobility options for disabled and underserved communities

• Integrates with ITS, data analytics, transit CAD/AVL and commercial ride-share (Uber, Lyft) systems for full multi-modal trip planning and “Mobility On Demand”
Integrated Mobile Observation Project – Connected Snowplows

- Improve safety and reduce incidents from adverse weather conditions
- Outfit snowplows with GPS, sensing involving Radar, Light Direction and Ranging (LiDAR), Forward-looking Infrared-based (FLIR) and DSRC/5G radios
CAV helps fuel the next tech job revolution!

• Genivi Pilot
  – Genivi Alliance and Nevada Center for Advanced Mobility are kicking off year-long transportation pilot to help reduce vehicle-to-pedestrian accidents and congestion in Las Vegas

• Audi launches Connected Signals, the first Vehicle-to-Infrastructure technology in the U.S.
  – Audi, in partnership with RTCSNV, is the first manufacturer to launch V2I technology in the U.S. in select 2017 Audi A4, Q7 and allroad® models in Las Vegas. Connected Signals has developed an app to report signal information to travelers.
Mobility for disabled residents

- CAV will help the disabled become more connected to work, school, medical, and more!
- Collaborate with OEMs and aftermarket AV technology companies
- License and insure disabled drivers
Robust asset management

- Collect pavement, bridge and fleet asset information from AV/CV sensors
  - Vehicle speed and congestion
  - Weight-in-Motion
  - Striping reflectivity
  - Roadway slope
  - Pavement depth and pothole conditions
- Transmit data to NDOT’s Transportation Asset Management (TAM) system
- Conduct predictive analytics based on AV/CV, ITS and weather data to accurately predict asset deterioration
- Support more accurate capital planning and maintenance projects
- Efficiently deploy maintenance personnel to address high-priority projects
Enhanced work zone safety

Work zone attenuator and roadside assistance vehicles with sensors, DSRC/5G/WiFi radios and other ICT

Communicate maintenance locations to Dynamic Message Signs, TMCs and AV/CV HUDs

Maintenance workers with V2P sensors to integrate worker location data with AV/CV collision avoidance systems

Establish automated speed reduction and lane avoidance in maintenance zones

Automatically reroute traffic from areas of maintenance
CAV and Connectivity

What’s Happening Internationally?
Overview

- Regulations, insurance, security
- Strategic Network Operators (SNOs) vs advancements by motor vehicle industry

• UK
  - Transport System Catapult
  - Centre for Connected and Autonomous Vehicles (DfT)
  - Innovate UK
  - Various trials
  - Code of Practise
  - Law changes
CH2M International Team’s Current Initiatives

- Connected Autonomous Vehicle impacts
- Connectivity Improvements on the Road Network
- Project Alloyed – V2I connectivity
- CAV trials in UK
Connected Autonomous Vehicle Impacts and Timeline

- Impacts on road space and how this could be managed both operationally and by the use of roadside infrastructure
- Congestion and current management of the network
- Innovatively investigated practical solutions on a motorway link, highlighting the issues on the merge and diverges and the impact to other road uses
Connected Autonomous Vehicle Impacts and Timeline

- Multiple scenarios with CAVs including the different levels of CAV from assisted to full automation and Platooning
- Highways England is looking at their infrastructure and any interventions that could improve the integration of CAVs including road markings and ramp metering
Connectivity on the Road Network: A14 and A9 4G Coverage

1. Investigating the current coverage and how this service could be improved.

2. Determining the business case to take it forward.
Connectivity on the Road Network: A14 and A9 4G Coverage

- Investigating how our Clients can encourage mobile service providers to provide better connectivity by using assets such as ducting, power supplies and fibre optic capacity
Project Alloved

An InnovateUK funded scheme to investigate requirements for vehicle to infrastructure technology including:

- Enable uninterrupted access to the networks, regardless of the location
- Provide valuable data from within the car and its immediate surrounding
- Allow consumers to enjoy their favorite Apps and new services
CAV Trials

Several trails across the UK and Europe. UK trials are in:

• Milton Keynes (Catapult)
• Greenwich (MOVE-UK)
• Bristol (VENTURE)
• A2,M2 (Highways England)
• London to Oxford “Driverless Cars” Trial
• Platooning
CAV Trials in Europe

SCOOP@F is a Cooperative ITS pilot deployment project that intends to connect approximately 3000 vehicles with 2000 kilometres of roads.

Belgium to Austria Connected Trials
Thank You!

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