Our Mobility Future

Autonomous Vehicle Policy & Practice

October 8, 2015
About Parsons Brinckerhoff

- WSP and Parsons Brinckerhoff have combined strengths and formed one of the world's leading engineering and professional services consulting firms.
- This global organization provides services designed to transform the built environment and restore the natural one.
- Approximately 31,000 employees, including engineers, technicians, scientists, architects, planners, surveyors, program and construction management professionals, as well as various environmental experts, work for this dynamic organization in more than 500 offices across 39 countries worldwide.
The Contra Costa Transportation Authority (CCTA) is a public agency formed by Contra Costa voters in 1988 to manage the county’s transportation sales tax program and to lead the county’s transportation planning efforts.

CCTA is responsible for maintaining and improving the county’s transportation system by planning, funding, and delivering critical transportation infrastructure projects and programs that connect our communities, foster a strong economy, increase sustainability, and safely and efficiently get people where they need to go.
MEASURE C

• Passed by voters in 1988, Measure C provided for a half-cent on the dollar sales tax for twenty years (through March 2009) to pay for an ambitious list of transportation projects and programs.

• Measure C was estimated to generate $1 billion over 20 years for a BART extension, freeway improvements, better bus service, enhanced bicycle facilities and more transportation options for senior citizens and people with disabilities.
In November 2004, 71% of Contra Costa voters approved Measure J. The measure provided for the continuation of our county’s half-cent transportation sales tax until 2034, and will provide approximately $2.7 billion for countywide and local transportation projects and programs for the life of the measure.
What We Do

- **BUSES** Invest in a reliable, comfortable and convenient bus network
- **LOCAL STREETS** Smooth traffic flow on major roads and invest in neighborhood improvements such as repairing potholes and road surfaces
- **PEDESTRIAN** Make improvements to sidewalks, crosswalks, trails, and paths
- **SAFE ROUTES TO SCHOOLS** Focus on programs and projects aimed at bicycle and pedestrian safety for K-12 students
- **FERRIES** Expand the Bay Area ferry system by looking to ferries as an alternate commute method between West County and San Francisco
- **BICYCLE** Invest in safe routes and infrastructure improvements for bicyclists
- **BART** Make improvements to BART service and stations, such as extensions to new routes and parking at stations
- **HIGHWAYS** Complete Contra Costa’s highway system, and improve air quality and noise protection along these corridors
- **CARPOOL/RIDESHARE** Implement programs aimed at reducing traffic congestion by encouraging carpooling and ridesharing
- **PROGRAMS FOR SENIORS AND PEOPLE WITH DISABILITIES** Enhance transit options to improve mobility for seniors and people with disabilities
Our Cities’ Evolution...
City 1.0
City 2.0 Interstate Highways
City 3.0
City 5.0

Data Driven Mobility

Sensible & Digital City

Intermodal Innovations
Discussion Topics

• Autonomous Vehicles (AV) 101
• Historic Perspective on Mobility
• Current Status of Government with AV
• Introduction to GoMentum Station
• Proposed Actions for State and Local Governments Regarding AV
Autonomous Vehicles (AV) 101
NHTSA defines “Full Self-Driving Automation” as:

“designed to perform all safety-critical driving functions and monitor roadway conditions for an entire trip. Such a design anticipates that the driver will provide destination or navigation input, but is not expected to be available for control at any time during the trip.”

Source: http://www.internationaltransportforum.org/Pub/pdf/15CPB_AutonomousDriving.pdf
NHTSA’s Definition of Vehicle Automation

Level 0 (Non-Automation)
The driver is in complete and sole control of the primary vehicle controls – brake, steering, throttle, and motive power – at all times.

Level 1 (Function-Specific Automation)
Automation at this level involves one or more specific control functions.

Level 2 (Combined Function Automation)
Automation of at least two primary control functions designed to work in unison to relieve the driver of control of those functions.

Level 3 (Limited Self-Driving Automation)
Automation enable the driver to cede full control of all safety-critical functions under certain traffic or environmental conditions. The driver is expected to be available for occasional control, but with sufficiently comfortable transition time.

Level 4 (Full Self-Driving Automation)
The vehicle is designed to perform all safety-critical driving functions and monitor roadway conditions for an entire trip. Such a design anticipates that the driver will provide destination or navigation input, but is not expected to be available for control at any time during the trip.
AV vs CV

Automated Vehicles

Connected Vehicles (CV)  Autonomous Vehicles (AV)

Best of Both Worlds!
Potential Impact of AVs on Society

• Positives
  • Safety improvements
  • Improved mobility for youth, elderly, and disabled
  • Improved traffic circulation
  • Reduced need for parking
  • Improved travel time reliability
  • Reduced GHG emissions
  • Reduced need for private car ownership and private auto insurance

• Negatives
  • Increased “VMT”
  • Insurance policy disruption
  • Increased urban sprawl
  • Job loss
• Technology development continues to be the main focus; however, other considerations are being researched as well.

• Governments around the world are developing partnerships and conducting research to determine how they should regulate the industry in order to ensure public safety.
A Little Bit of History...
Race to the Moon
Jetsons
Futurama

1964 World’s Fair Futurama

1939 World’s Fair Futurama

I HAVE SEEN THE FUTURE
GENERAL MOTORS Futurama

TOMORROW-LAND

High spot of the New York World’s Fair reopening this Spring—GM Futurama!
You can look over GM’s exciting “idea” cars—Freeway Titan with television, stereo, game table, refrigerator; GM/A with jet aircraft cockpit and controls—fascinating design and engineering innovations right out of tomorrow.
Tomorrowland
AHS Program, I-15

California PATH
2007 DARPA Urban Challenge

‘Boss’ CMU Tartan Racing, 60 miles urban, 4h:10m
2008 Levandowski’s PriBot

Delivered pizza across SF Bay bridge
2010 Audi ‘Pikes Peak’

12 mile hill climb, 156 turns, 27min (cf 11m48s)
2014 Google ‘mastering city street driving’

700k miles, cyclists signals, construction zones
2014-2017 Volvo ‘Drive Me’, Gothenburg

100 increasingly autonomous – 2020 Zero deaths
2015 Tesla ‘Autopilot’ (Autonomous 2023)

‘will go from on-ramp to off-ramp autonomously’
2015 Mercedes Benz F 015 Concept

“Innovative perspective into the future of mobility.”
2020-2025 Nissan Autonomous Drive

Range of Commercially viable AVs on road
Mercedes Benz Future Truck 2025

Many technological elements already available
A Look At What’s on the Horizon...
IBM vs. Microsoft

10 YEARS
Connectivity Emerging Faster

Third Most Connected Mobile Device

Source: http://www.internetlivestats.com/internet-users/#trend
AV Adoption Timeline

Phase 1 (now to 2016): 'Passive' autonomous driving

Phase 2 (2015 to 2019): Limited driver substitution

Phase 3 (2018 to 2022): Complete autonomous capability

Phase 4 (two decades): 100% autonomous penetration, utopian society

Source: Morgan Stanley
AV Future Scenarios

- The following graphic presents two extreme options for what our society could become: an autonomous nightmare or an autonomous utopia.

  **Scenario 1:**
  AV Nightmare

  **Scenario 2:**
  AV Utopia

- These extreme scenarios will, ultimately, allow for the ability to develop more clear planning activities and policy guidelines that support the preferred scenario. The reality will likely be a combination of the scenarios.
<table>
<thead>
<tr>
<th>Category</th>
<th>AV Nightmare</th>
<th>AV Utopia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>VMT</td>
<td>↑</td>
<td>↓</td>
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<tr>
<td>GHG Emissions</td>
<td>↓</td>
<td>↓</td>
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<tr>
<td>Urban Sprawl</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>Parking Req’ts</td>
<td>No Change</td>
<td>↓</td>
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<tr>
<td>Roadway Maintenance Req’ts</td>
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<tr>
<td>Low Income Mobility</td>
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Current Status of Government with AV
Current Role of U.S. Government

Federal
- Established classification system for various levels of automation of cars
- Research and funding focused on connected vehicles (minimal autonomous)
- Rule-making is delegated to state-level

State
- State roles vary significantly. Some have enacted legislation allowing testing and, in some cases, requiring licensing or safety guidance

Local
- Some cities, transit agencies, and other local government organizations are partnering with technology developers to support testing
Federal Goal & Private Response
U.S. States’ AV Legislative Update

As of October 2015, California, Michigan, Florida, Nevada, Tennessee, and Washington D.C. have enacted legislation allowing autonomous vehicle testing on public roadways.

Source: http://cyberlaw.stanford.edu/wiki/index.php/Automated_Driving:_Legislative_and_Regulatory_Action
AV Test Sites Involving Local Gov’t (Sampling)

- GOMENTUM STATION
- The University of Texas at Austin
- Virginia Tech
- Mobility Transformation Center, University of Michigan
- Florida Automated Vehicles
Connected Vehicle and Autonomous Vehicle (CV/AV) Program and Test Facility
GoMentum Station Program Vision

Create a hub for CV/AV transportation innovation in Contra Costa - called the GoMentum Station Program - where technology, innovation and commercialization converge.
CV/AV Program Overarching Goals

- Economic Growth & Job Creation
- Efficient Mobility
- Enhanced Safety
- Healthier Environment

21st Century Transportation
Economic Growth & Job Creation
Efficient Mobility
Enhanced Safety
Healthier Environment

www.sceeri.com
Partner Ecosystem

- OEMs & Automakers
- Tier-1 Suppliers
- REVs
- Public Sector
- Technology & Communications
- Insurance Carriers
- Analytics
- Research Institutes
- Associated Test Beds
- Other Entities
Proposed Actions for State and Local Governments Regarding AV
Proposed Government Role in AV

Federal Role

Update, Establish, and Enforce Policies and Regulations
- Safety
- Privacy/Data Sharing
- Cyber Security

Establish and Enforce Standards
- Manufacturing
- Vehicle Design
- Infrastructure
- Data/Communications

State and Local Role

Update, Establish, and Enforce Policies and Plans
- Mobility
- Infrastructure
- Transit
- Financial
Local Government Recommendations

- What can be done now?

- Establish policies and plans with consideration for the future
- Support testing activities
- Stay educated on AV progress
- Establish communications and/or coalition with AV stakeholders
- Encourage open data sharing
Local Government Recommendations

• Medium (1-2 years) to Long-Term (3-5 years) Recommendations:

**Planning**
- Update travel demand model
- Evaluate road capacity needs
- Assess transit requirements
- Forecast financial implications

**Infrastructure Modifications**
- Update traffic signs and markings
- Reduce lane width
- Alter speed limits
- Adjust traffic signal locations and timing
- Eliminate/reduce parking and add more “drop-off/pick-up” locations
- Develop new predictive models for pavement maintenance
- Certify roads for AV usage

**Miscellaneous**
- Update enforcement function within the government
- Update incident management function within the government
- Update government workforce to match needs
Local Government Policy Influencers

- Update roadway policies and infrastructure to manage the VMT impact
- Adjust land use policies to reduce urban sprawl
- Adjust the tax/fee structure to discourage car ownership and/or parking
- Alter parking policies to reduce the need for private parking
- Change transit pricing
Question 1

- Which of the following is the reason most commonly cited as a positive attribute of an autonomous vehicle society?
  - A. Safety
  - B. Insurance policy disruption
  - C. Reduced traffic
  - D. Reduced VMT
Question 2

• How many states have currently enacted legislation allowing autonomous vehicle testing on public roadways?
  • A. 1
  • B. 6
  • C. 48
  • D. 50
Question 3

• Which of the following are **not** a CCTA stakeholder?
  • A. Research Institutes
  • B. Insurance Carriers
  • C. School Districts
  • D. OEMs and Automakers
Path to a Fully AV Society

- **100% of AV Penetration in Society**

**Timeline**

**Today**
- AVs on roads for testing purposes only

2020
- Mobility providers introduce AV
- Freight AVs are earliest adopters
- Public transit adopts AV for selected routes

2035
- Auto dealers selling AVs (mainstream)
- Public transit is mostly AV
- Roads are designated for manual cars

2040