R.12-12-011 - CPUC Workshop on Autonomous Vehicle Pilot Programs

California Public Utilities Commission

October 22, 2019
10am – 4:30pm
Emergency Instructions

Evacuation Assembly Location

CPUC

War Memorial Herbst Theater

City Hall

War Memorial Opera House

SF Superior Court
Housekeeping

Remote Participation:
- WebEx Link: https://cpuc.webex.com/cpuc/j.php?MTID=mba8ce58ea1d4102ff41b898405f59363
- WebEx Meeting Number: 968 950 893
- WebEx Password: AVpilots
- Dial-In Number: 1-415-655-0002
- Dial-In Access Code: 968 950 893

WiFi:
- Network: cpucguest
- Username: guest
- Password: cpuc93019

WebEx:
- If you are signed into WebEx, your webcam is enabled by default. Please disable the webcam, otherwise you may be visible to all participants.

Materials and Process:
- The audio will be recorded.
- Slides will be made available online after the workshop at https://www.cpuc.ca.gov/avcpilotinfo/.
OPENING REMARKS
Comment Process

• **Phone lines:**
  - Listen-only.
  - Email transportationprograms@cpuc.ca.gov with comment to be read during discussion periods.
  - If you have issues with the phone bridge, email eh1@cpuc.ca.gov.

• **Comments:**
  - Please hold questions until discussion slides, with exception of short clarifications.
  - At beginning of comment period, staff will ask participants whether they want to speak. After that, staff will call on speakers in order.
  - Speakers should state their name and affiliation at the beginning of their comment.
  - Speakers who are attending in person should the microphone while speaking.
Goals for Today

• Provide overview of autonomous vehicle (AV) pilot activity to date.
• Discuss methods to evaluate current state and measure progress.
• Discuss next steps both from policy and procedural perspectives.
<table>
<thead>
<tr>
<th>Est. Time</th>
<th>Presenter</th>
<th>Agenda Item and Discussion Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00am – 10:10am</td>
<td>Commissioner Shiroma</td>
<td>● Opening Remarks</td>
</tr>
</tbody>
</table>
| 10:10am – 10:30am | CPUC Staff | ● Background of Pilots  
  ○ Discuss the origin of pilot, its goals and scope, and the requirements for participation in the pilot. |
| 10:30am – 11:00am | CPUC and DMV Staff | ● AV Activity to Date  
  ○ Participation in California Public Utilities Commission’s (CPUC) pilots and application Department of Motor Vehicles’ (DMV) permitting processes.  
  ○ Data gathered to date by CPUC and DMV. |
| 11:00am – 11:45am | Pilot Participants | ● Updates from Pilot Participants  
  ○ Overview of qualitative and quantitative results of pilots.  
  ○ Engagement with accessibility advocates. |
| 11:45am – 12:30pm | - | ● Lunch |
| 12:30pm – 2:00pm | Open Discussion | ● Data & Metrics  
  ○ What are the appropriate metrics for the CPUC to evaluate progress toward the pilots’ goals?  
  ○ What data sources are available and useful? For example, what is the value of experiences and data points from activities outside the state?  
  ○ Are the data identified above sufficient for the CPUC to evaluate the pilots’ progress? If not, what type and volume of data are necessary for a robust evaluation? |
| 2:00pm – 2:10pm | - | ● Break |
| 2:10pm – 3:00pm | Open Discussion | ● Deployment  
  ○ For metrics identified above, what are the appropriate milestones (if any) to measure progress?  
  ○ What are the necessary adjustments to the current regulatory approaches to AVs? For example, consider (a) the requirements placed on test operators or (b) whether the current TCP carrier rules are an appropriate fit for AV operators. |
| 3:00pm – 3:10pm | CPUC Staff | ● Next Steps  
  ○ Identify outstanding issues.  
  ○ Procedural next steps. |
| 3:10pm – 3:25pm | Open Discussion | ● Public Comment |
| 3:25pm – 3:30pm | CPUC Staff | ● Closing Remarks |
BACKGROUND
Origin of CPUC Pilots

• Autonomous Vehicle-related issues are part of proceeding R.12-12-011.
• R.12-12-011 addresses AVs and Transportation Network Companies (TNCs) more broadly.
• On May 31, 2018, the CPUC issued Decision D.18-05-043 authorizing two autonomous vehicle (AV) pilot programs, one “Drivered” and one “Driverless.”
• Decision required formation of an AV Accessibility Working Group to discuss accessibility as it applies to AV passenger service.
Goals of Testing Period

• Gather real-world data that informs Commission’s current and future regulation of AVs, including fare collection and deployment frameworks.
  – Pilot participants report data on vehicle miles traveled (VMTs), including electric VMTs, “deadheading,” idling/dwell time, vehicle occupancy, accessible ride requests fulfilled/unfulfilled/declined.

• Evaluate AV passenger service including its impacts to:
  – Safety;
  – Accessibility;
  – Impacts on environment, traffic, and other road uses; and
  – Discovering the “unknown unknowns” – deploying AVs is new territory.
# CPUC Pilots

<table>
<thead>
<tr>
<th></th>
<th>Drivered Pilot</th>
<th>Driverless Pilot</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Test Driver Location</strong></td>
<td>In car</td>
<td>Remote, but always accessible by communication link</td>
</tr>
<tr>
<td><strong>DMV Permits Required</strong></td>
<td>Drivered Test Permit</td>
<td>Driverless Test Permit</td>
</tr>
<tr>
<td><strong>Requirements for TestDrivers</strong></td>
<td>Drug testing, monitoring of driving record</td>
<td>Drug testing, monitoring of driving record; identical to in-car drivers</td>
</tr>
<tr>
<td><strong>Can charge for rides?</strong></td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Can offer shared rides?</strong></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Data Sharing</strong></td>
<td>Detail later in deck Basics: miles driven, trips taken, and accessibility of trips</td>
<td>Detail later in deck Basics: miles driven, trips taken, and accessibility of trips</td>
</tr>
<tr>
<td><strong>Location Restrictions</strong></td>
<td>Operational Design Domain (ODD) defined by company, 30 days of testing in ODD required</td>
<td>Indefinite</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>Indefinite</td>
<td>Indefinite</td>
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</tbody>
</table>
Questions & Discussion
AV ACTIVITY TO DATE
Pilot Activity to Date

• CPUC pilot participation has been relatively low compared to number of DMV permits issued.

<table>
<thead>
<tr>
<th></th>
<th>Drivered</th>
<th>Driverless</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMV Test Permits issued</td>
<td>63</td>
<td>1</td>
</tr>
<tr>
<td>CPUC Pilot Permits issued</td>
<td>4 (three granted in last 5 months)</td>
<td>0</td>
</tr>
<tr>
<td>DMV Deployment permits issued</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
On Sep 1, 2019, CPUC received pilot data reports from all four pilot participants. That data is summarized below.

<table>
<thead>
<tr>
<th>Data Point</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total VMT</td>
<td>60,328</td>
</tr>
<tr>
<td>Total eVMT</td>
<td>0</td>
</tr>
<tr>
<td>Total Period 1 (&quot;Deadhead&quot;) miles</td>
<td>48,137</td>
</tr>
<tr>
<td>Total idle time between rides</td>
<td>4,083</td>
</tr>
<tr>
<td>Vehicle occupancy per trip</td>
<td>n/a</td>
</tr>
<tr>
<td>Fulfilled accessible rides</td>
<td>38</td>
</tr>
<tr>
<td>Unfulfilled accessible rides</td>
<td>0</td>
</tr>
<tr>
<td>Declined accessible rides</td>
<td>0</td>
</tr>
<tr>
<td>Total number of passengers transported</td>
<td>6,299</td>
</tr>
</tbody>
</table>
Questions & Discussion
PRESENTATIONS FROM PILOT PARTICIPANTS
Presentations from Pilot Participants

• All four pilot participants were asked to present their data and respond to the following questions:
  – What we can learn from the data regarding as it ties back to the pilot goals of safety, accessibility, impacts on environment, traffic, and other road uses, and identifying new issues that merit consideration; and, passenger experiences?
  – What accessibility options have you provided both in terms of vehicle design and operations?
  – How have you engaged with disability advocates?
  – What other key takeaways are important to highlight?
Participants’ Presentations

- This slide intentionally blank – participants’ presentations displayed separately.
Questions & Discussion

• First:
  – Questions and comments regarding participants’ presentations of pilot data.

• Second:
  – Why is participation in each program relatively low?
  – What would encourage higher participation?
LUNCH
METRICS & DATA
**Metrics**

- Metrics help identify issues and evaluate progress.
- Can be qualitative or quantitative and forward-looking or past-looking (i.e., 30 days’ testing vs collision reports).

<table>
<thead>
<tr>
<th>Category</th>
<th>Issue</th>
<th>Potential Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>• Incident data</td>
<td>• DMV Collision Reports</td>
</tr>
<tr>
<td></td>
<td>• Technology readiness</td>
<td>• 30 days’ testing within detailed ODD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pilot participation levels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Evaluations from other regulatory agencies, academics, industry</td>
</tr>
<tr>
<td>Accessibility</td>
<td>• Availability of wheelchair accessible vehicles</td>
<td>• Number of accessible rides</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Accessible requests fulfilled/unfulfilled/declined</td>
</tr>
<tr>
<td>Impacts on environment</td>
<td>• Carbon emissions</td>
<td>• Portion of miles from electric vehicles (%eVMT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Dwell time</td>
</tr>
<tr>
<td>Impacts on traffic and other road uses</td>
<td>• Congestion</td>
<td>• Idle time</td>
</tr>
<tr>
<td>Unknown unknowns</td>
<td>• Enough drive time to have experienced “edge cases.”</td>
<td>• Total time in pilot</td>
</tr>
<tr>
<td></td>
<td>• Passenger response in challenging scenarios</td>
<td>• Total miles traveled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Law-enforcement interaction plans</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Passenger feedback</td>
</tr>
</tbody>
</table>
Discussion

• What are the appropriate metrics?
• What should be the priority metrics for the CPUC to understand the current state of the pilots?
Outside activities can potentially supplement pilot data.

<table>
<thead>
<tr>
<th>Testing</th>
<th>Deployment</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPUC pilot data</td>
<td>Private property within CA</td>
<td>Studies</td>
</tr>
<tr>
<td>DMV reports</td>
<td>Outside of CA (other states, cities, countries)</td>
<td>Industry standards (UL, SAE)</td>
</tr>
<tr>
<td>Closed course testing</td>
<td></td>
<td>National standards</td>
</tr>
<tr>
<td>Simulations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry runs and drills (e.g., planning w/ CHP)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Discussion

• Of these data sources, which are available and useful?
  – For example, what is the value of experiences and data points from activities outside the state?
• What data sources are missing?
BREAK
DEPLOYMENT
Use of Terms

• For this discussion:
  – Testing (current state)
    • Prohibition on shared rides for driverless and fare collection for driverless and driverless
  – Limited deployment
    • Shared rides and/or fare collection
  – Deployment
    • Fare collection and shared rides
At Minimum
Participants must
- Carry $5m insurance, bond, or self-insurance
- Identify test vehicles
- Report any crash within 10 days
- Exclude from testing
  - Commercial vehicles >10,000 lbs GVW
  - Motorcycles

With a Driver
Test Driver Requirements
- No DUI
- No at-fault
- No more than 1 point
- Successful completion of training program
- Must be employee, contractor, or designee of manufacturer

Without a Driver
Manufacturer Requirements
- Communication link with remote operator
- Process to display/communicate vehicle owner/operator information to law enforcement
- Meet the description of Level 4 or 5 automated driving system
- Law Enforcement Interaction Plan
- No charging a fee or receiving compensation to provide rides to members of the public
California DMV Autonomous Vehicles Deployment (Public Use)

- Full description of ODD
  - Restrictions
  - How vehicle responds when outside ODD
    - Must comply with all CVC and local regulations
- Summary of technology testing in ODD
  - Number of vehicle test miles
  - Description of testing methods
  - Collision details while operating in Autonomous Mode
- Compliance with FMVSS
- Data Recorder
  - Cyber-security
- Certify consumer protections are in place
  - Recalls
  - Technology and mapping updates
  - End user manuals and education
- Law Enforcement Interaction Plan
Framework to Evaluate Pilot

- Should the commission’s framework be more prescriptive or holistic?
- What immediate next steps (fare collection?), if any, are justified by current status of pilots and broader AV activities?

### Prescriptive/Numeric
- Specific quantitative metrics with defined thresholds.
- e.g., X companies in pilot, each having driven Y miles with fewer than Z incidents/mile.

### Holistic
- Holistic consideration of all available data, quantitative and qualitative.
- e.g., Number companies in pilot; trends in various safety metrics; input from other agencies; engagement with accessibility advocates.
Discussion

• Should the commission’s framework be more prescriptive or holistic?
• What immediate next steps (fare collection?), if any, are justified by current status of pilots and broader AV activities?
NEXT STEPS
Outstanding Issues

- Multiple outstanding issues, including:
  - Requirements for test operators, both in-vehicle and remote;
  - Data collection and access;
  - Passenger protections (personal safety, individuals’ privacy);
  - Regulatory/permitting logistics (e.g., contractors as test drivers);
    and,
  - Vehicle maintenance and inspection.
Discussion

• What’s missing?
• What are the priority issues for the Commission to tackle?
PUBLIC COMMENT
CLOSING REMARKS