METROPOLITAN
TRANSPORTATION
COMMISSION

Agenda Item 5a
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Memorandum

TO:	Planning Committee	DATE:	October 27, 2017
FR:	Deputy Executive Director, Policy	W.I.	1121
RE:	Future Mobility Research Program – Update		

Background

In 2015, the four largest Metropolitan Planning Organizations (MPOs) in California — Metropolitan Transportation Commission (MTC), Southern California Association of Governments (SCAG), San Diego Association of Governments (SANDAG), and Sacramento Association of Governments (SACOG) — partnered to form the Future Mobility Research Program (FMRP). The FMRP pools resources to fund research assessing a range of emerging technologies, such as current on-demand ride-hail services — also referred to as Transportation Network Companies (TNCs) — as well as automated, driverless ("autonomous") vehicles. The primary goal of the research is to inform assumptions for our regions' respective Regional Transportation Plans and Sustainable Communities Strategies (RTP/SCS), which must achieve passenger vehicle greenhouse gas (GHG) emissions reduction targets and strive toward other performance targets related to health, equity, and access to jobs.

In 2016, the FMRP established a bench of qualified consultants to begin studying some of these common interests and questions. In 2017, a cooperative agreement was signed by the Executive Directors of each of the four MPOs. The agreement establishes a timeline, budget, and lays out the roles and responsibilities for the FMRP partners. MTC has assumed the project leadership role in this effort, including issuing joint procurements, and overall project management.

In establishing the consultant bench, expertise was requested in the following areas:

- Conducting research and technical or policy analysis of new travel options;
- Assessing observed or potential impacts of newly available travel data on planning and policy outcomes;
- Evaluating the potential impact of public policy interventions;
- Assessing travel patterns resulting from new technologies;
- Convening and facilitating thought leaders on the subject;
- Providing project-level technical oversight, guidance, and coordination; and,
- Providing communications and outreach.

To-date the FMRP has issued three procurements:

- Task 1: Roles for MPOs (Sam Schwartz)
- Task 2: Modeling Assumptions for Emerging Technologies (Arup)
- Task 3: On/Off-Model Analysis of Emerging Technologies (WSP USA)

Key Findings
Two key themes — *opportunity* and *uncertainty* — emerge from the completed tasks. These themes can help inform the regions as they work toward long range planning goals and near-term project and program delivery. These two themes emphasize that as the regional planning agencies charged with formally steering the future of transportation in our respective regions, we must consider:

- *What are the potential roles for MPOs and other public agencies?*
- *What are the outcomes we need and want to achieve?*
- *What are the changes that are here, and what is coming?*
- *How should planning adapt?*

Opportunity:
MPOs and other public agencies have an opportunity to be more proactive when it comes to emerging technologies. Task 1 identified potential additional roles to MPO's primary planning function, including: monitoring and/or influencing federal and state policy and programs; collecting, analyzing, and sharing data; research; funding; education; technical assistance; and pilots/demonstrations. MPOs need to support programs and projects that ensure wide benefits among all users of the transportation system.

Uncertainty:
To better understand the future of new transportation technologies, the study performed twenty-two (22) expert interviews, reviewed two recent surveys, and performed the Delphi survey method, where industry experts and researchers answered two-rounds of questionnaires, in an attempt to foresee how fully driverless vehicles might influence travel behavior in the Bay Area. Some of these findings are listed in **Attachment A**. While these findings suggest that fully driverless vehicles are likely to take hold within the horizon year of our next RTP/SCS, there is not unanimous agreement among the experts and researchers on these forecasts.

Next Steps
The FMRP is meant to inform the third and subsequent rounds of RTP/SCS development. The FMRP cooperative agreement established a completion timeline of June 30, 2021. To date, approximately 70 percent of the project budget has been committed to tasks one through three. The findings from tasks one through three will inform the FMRP partners to identify future projects for the remaining funds. In addition, MTC, SCAG, SANDAG, and the San Francisco County Transportation Authority (SFCTA) submitted a funding application to Caltrans for a Sustainable Communities' Planning Grant to collect and analyze data from on-demand ride-hail ("TNC") services'(e.g. Uber and Lyft) passengers and drivers. Grant awards will be announced in December 2017. The project, if awarded, would be managed under the umbrella of the FMRP.

Alix A. Bockelman

Attachments:
- Attachment A: Key Findings, Task 2
- Presentation

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Key Findings, Task 2: Modeling Assumptions for Fully Driverless Vehicles[1]

A. Interview Findings[2]:

- **Consensus**: Driverless vehicles will likely induce trips, generate longer trips, increase capacity, and increase vehicle miles traveled/emissions (until electric vehicles dominate the market).
- **Uncertainty**: There is tremendous uncertainty related to timing and overall market penetration of driverless vehicles, the adoption of shared driverless vehicles compared to owned driverless vehicles, time sensitivity, per-mile operating costs, etc.
- **Impacts will differ across regions**: driverless vehicle impacts will differ significantly between higher density urban areas with a higher level of amenities and lower density, lower amenity urban areas.
- **Transit**: Public transit will change considerably with high utilization of driverless vehicles, but will still play a role. Driverless vehicles will compete with public transit services in areas with relatively low capacity and low frequency service. However, driverless vehicles could also be complementary to high capacity transit, as a first- and last-mile solution.
- **Vehicle miles traveled (VMT) increases**: Increased driverless vehicle usage will result in empty vehicle miles, which will contribute to VMT. However, greater efficiency with and higher vehicle occupancy in shared driverless vehicles could mitigate the aggregate increase in VMT.
- **Policy interventions**: VMT taxes, congestion charging, and subsidies and other regulatory responses, such as dedicated lanes for high-occupancy shared driverless vehicles, can help mitigate projected increases in VMT.

B. Literature Findings[2]:

- **Timing**: 3 to 13 years until fully driverless will be available for purchase
- **Safety**: +40% to +90% increase in safety
- **Capacity**: 0% to +45% increase in roadway capacity
- **Demand**: +5% to +40% increase in VMT
- **Energy/Emissions**: -50% to +100% change in greenhouse gas (GHG) emissions

C. Delphi Findings[2]:

Variable – Fully Driverless Vehicles	Average Response	Standard Deviation
Vehicles Available for Purchase	2026	6 years
Relative Cost to Legacy Vehicle (%)	↓ 14%	25%
Consist of 50% of Urban Trips	2036	5 years
Consist of 90% of Urban Trips	2049	7 years
Resulting Increase in Freeway Capacity (%)	↑ 44%	41%
Resulting increase in Urban Street Capacity (%)	↑ 23%	22%
Distance from Home to Work (%)	↑ 31%	27%
Time Spent in Vehicle (%)	↑ 31%	23%
Percent of Trips that are Shared (%)	61%	24%
Percent of Trips by Empty Vehicle Circulation (%)	26%	18%
Congestion (worse 1 - 10 better)	6	2

[1] Fully Driverless Vehicles = Level 5 "Full Automation." The Society of Automotive Engineers (SAE) describes Level 5 autonomy as "fully driverless under all conditions."

[2] *Task Order 2 – Task 3: Review of MTC's approach to simulating automated vehicles* (Arup, September 7, 2017)

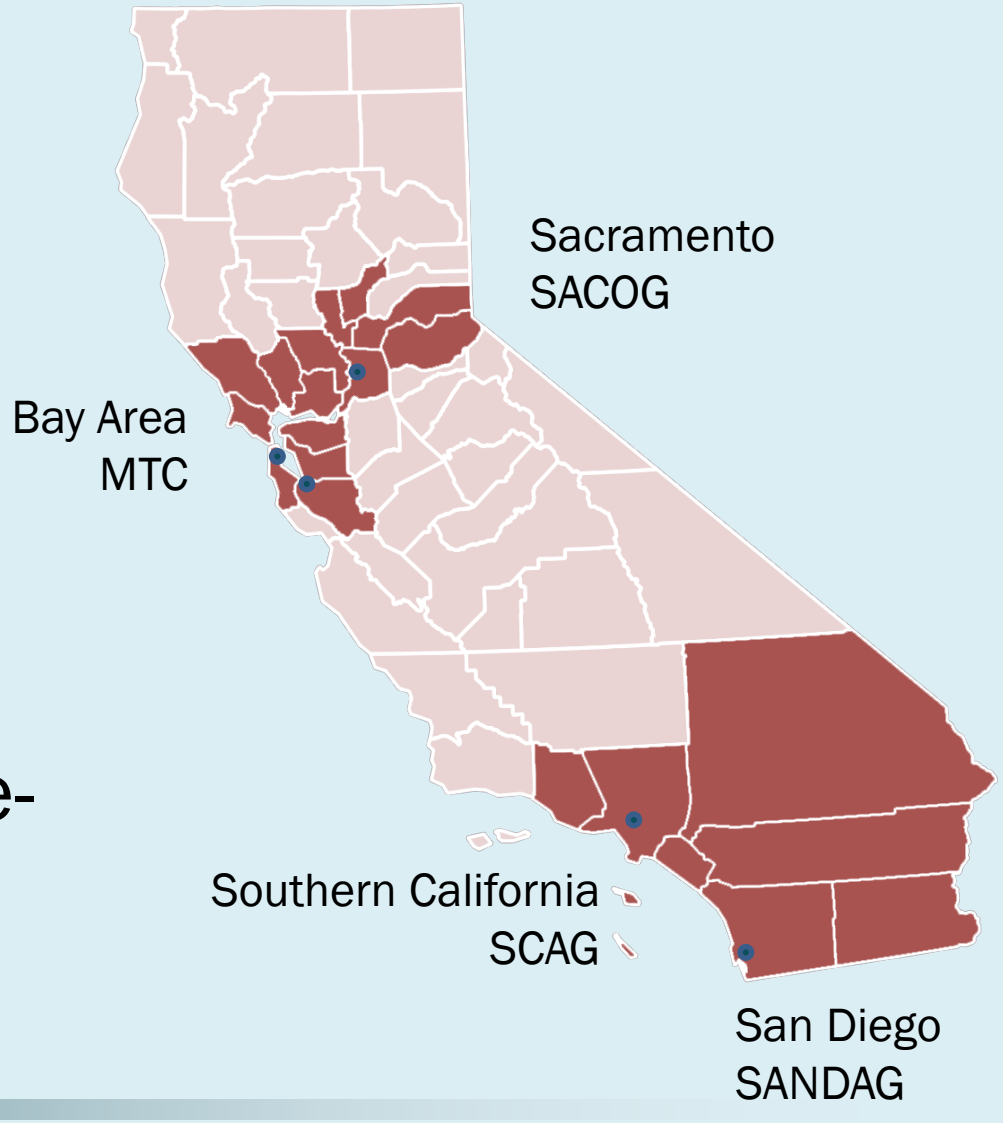
The Future Mobility Research Program Overview

Partners:

MTC, SACOG, SCAG, SANDAG

Purpose:

Jointly fund research on the potential impacts of emerging transportation technologies, such as on-demand, ride-hail services and driverless vehicles.



Emerging Technologies and Trends

- Expanded consumer mobility services
- Transportation system management technologies
- Data
- Vehicle technologies
- Freight

Current Research Efforts

- **Task One:** Roles for MPOs
- **Task Two:** Modeling Assumptions for Emerging Technologies
- **Task Three:** On/Off-Model Analysis of Emerging Technologies

What is the Industry's Vision of the Future?

Source: Qualcomm 2017

A unique opportunity...

New travel choices
Ridesharing
Reduced car ownership

Repurposed parking
Space for Housing
Public space

Safer streets
Improved user experience
Efficient network management

Higher efficiency transit
Lower operating costs

... but not without risks

Increased VMT
Empty vehicle circulation
Fight for the market

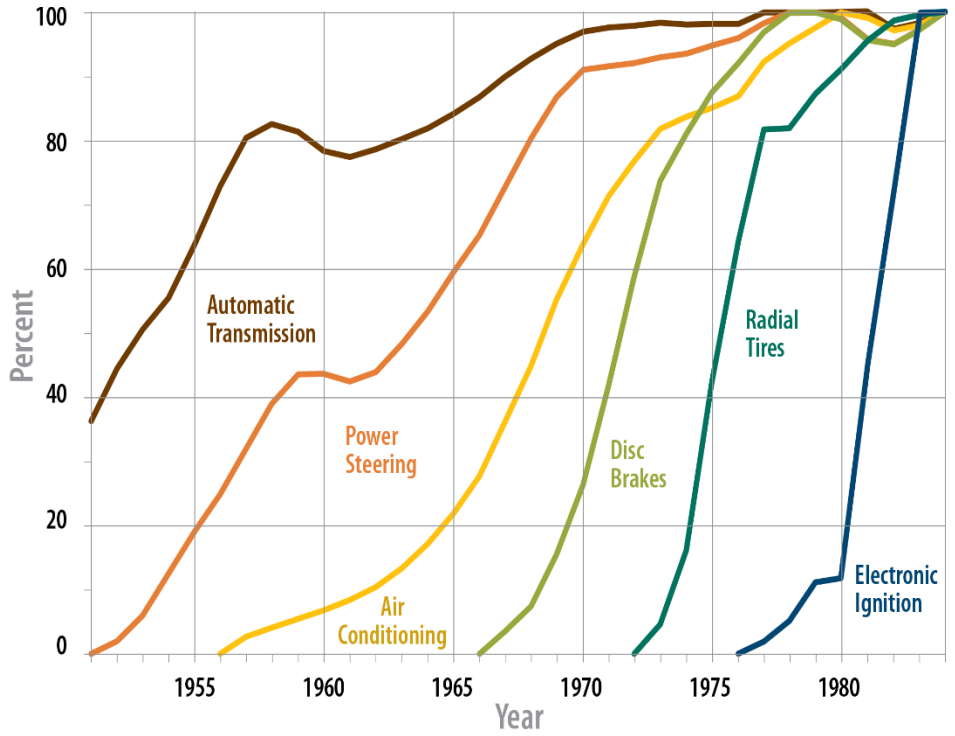
Urban sprawl
Higher congestion
Longer travel times

Cyber attack
Privacy concerns

Decline in transit use
Inequity

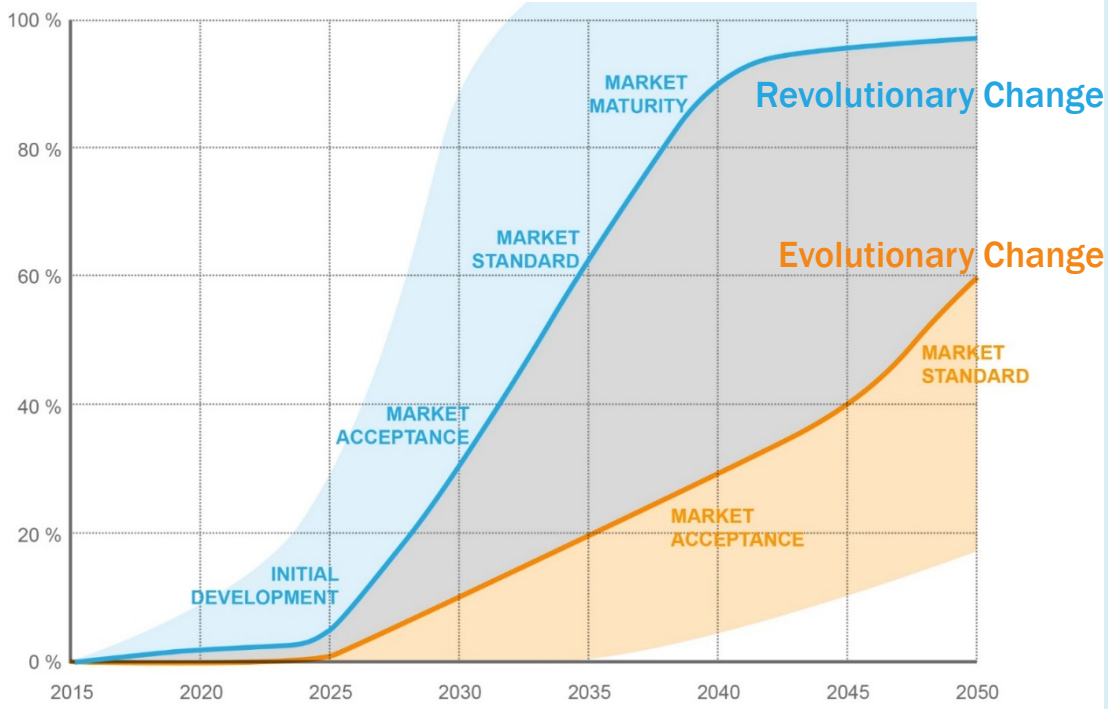
When will driverless vehicles become common?

Adoption of Past Automotive Technologies in the US Car Industry
(in % of output)



(Source: Jutila and Jutila, 1986.)

Adoption Forecasts of Fully Driverless Vehicle Technologies
(in % of output)



ARUP

Expert Interviews

Phone and in-person interviews with 26 experts

Researchers

- Berkeley Lab
- Griffith University
- Texas – The University of Texas at Austin
- NREL – National Renewable Energy Laboratory
- UCL
- Monash University
- TU Delft
- UC Davis – University of California

Practitioners

- Frost & Sullivan
- Department for Transport
- MT
- VTA
- Victoria State Government
- San Francisco County Transportation Authority
- NJ Transit – The Way To Go.
- morpc – Mid-Ohio Regional Planning Commission
- Puget Sound Regional Council – PSRC

Industry

- Uber
- Volkswagen
- Lyft
- Toyota

Partial list

Interview Findings on Fully Driverless Vehicles

Consensus: induce trips, generate longer trips, increase capacity, and increase VMT/emissions (until EVs dominate the market).

Uncertainty: tremendous uncertainty related to timing and overall market penetration of fully driverless vehicles, the adoption of shared vs owned, time sensitivity, per-mile operating costs, etc.

Other Areas:

- **Impacts will differ across regions**
- **Transit**
- **VMT increases**
- **Policy interventions**

Literature Review Ranges for Key Variables

Timing	**3 to 13** years until fully driverless vehicles available for purchase
Safety	**+40% to +90%** increase in safety
Capacity	**0% to +45%** increase in roadway capacity
Demand	**+5% to +40%** increase in vehicle miles traveled (VMT)
Energy/Emissions	**-50% to + 100%** change in greenhouse gas (GHGs) emissions

Delphi Survey Results

Conducted a two-round Delphi survey with the experts

Variable – Fully Driverless Vehicles	Average Response	Standard Deviation
Available	2026	6 years
Relative Cost to Legacy Vehicle (%)	↓ 14%	25%
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**Capacity increase when fully driverless vehicles consist of 90% of urban traffic.*

Next Steps

- Future Topics
- SB 1 Sustainable Communities Planning Grant