Estimating the Potential Impacts of AVs and TNCs using Activity-Based Travel Demand Model in MTP/SCS Scenario Development

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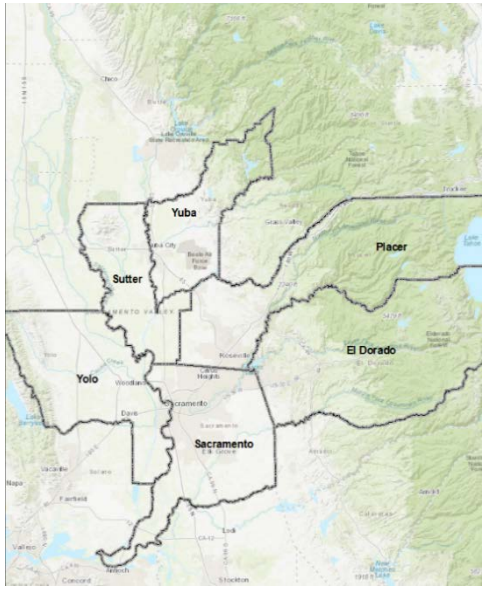
SACOG 2020 MTP/SCS

- SACOG is currently developing/updating the next long range plan, adopted in 2020, with horizon year of 2040
- Question asked- is travel demand model capable

  and credible to forecast the demand of AV/TNC?

- **Modeling approaches to address AV/TNCs in the plan**
  - More conservative approach for forecasting travel demand for purposes of the 2020 MTP/SCS
  - Separate scenario-based risk analysis to identify additional actions the region should initiate and pursue over time



SACOG Travel Demand Model

- RSG's DaySim - Activity based
- Recent enhancements to handle unique aspects of autonomous vehicle demand -
  - from work done by RSG for Task 4 of the FHWA Project for exploratory modeling and analysis (EMA) for autonomous and connected vehicle scenarios in the Jacksonville region
  - Technically, major changes in DAYSIM includes:
    - **Auto ownership model,** modified so a household can own conventional or automated vehicles. **Assumptions for AV ownership are:**
      - Alternative-specific constant affecting overall penetration rate
      - Adoption rate is Higher for younger households, higher income households, with longer commute distances
      - Households choosing AVs are less likely to own multiple vehicles
      - With strength of sharing economy, more households less likely to own a car
    - **"Paid rideshare" mode** by uber/lyft like TNCs, added to the mode choice models.
      - Mode-specific constant affecting overall mode shares
      - Usage rate is higher for trips originating in denser areas (supply effect)
      - Usage rate is higher for younger households
      - Higher usage is associated with lower private ownership ("sharing economy")
      - Use AVs if AV deployed

Three Revolutions in Urban Transportation

Business-as-Usual Scenario

20th Century Technology

Through 2050, we continue to use vehicles with internal combustion engines at an increased rate, and use transit and shared vehicles at the current rate, as population and income grow over time.

2 Revolutions (2R) Scenario

Electrification + Automation

We embrace more technology. Electric vehicles become common by 2030, and automated electric vehicles become dominant by 2040. However, we continue our current embrace of single-occupancy vehicles, with even more car travel than in the BAU.

3 Revolutions (3R) Scenario

Electrification + Automation + Sharing

We take the embrace of technology in the 2R scenario and then maximize the use of shared vehicle trips. By 2030, there is widespread ride sharing, increased transit performance—with on-demand availability—and strengthened infrastructure for walking and cycling, allowing maximum energy efficiency.

Number of Vehicles on the Road by 2050

= 250 million vehicles

2.1 billion

2.1 billion

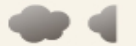
0.5 billion

CO2 Emissions by 2050

= 500 megatonnes of CO2

4,600 megatonnes

1,700 megatonnes



700 megatonnes

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DRAFT--Scenario Testing

	Business-as-Usual (BUS)	1 Revolution (1R) Automation	2 Revolutions (2R) Automation+Sharing
Vehicle Ownership			
Total private owned vehicles	1.6 Million	1.3 Million	0.5 Million
% Private owned AVs	1%	**70%**	**70%**
# Private owned cars/HH	2.0	1.5	0.5
Person Trip Mode Share			
% Paid rideshare (TNC)	3%	**5%**	**70%**
% drive alone	44%	42%	10%
% transit trips	1.0%	0.8%	**0.2%**
Vehicle Mile Traveled (VMT)			
VMT (Internal HH VMT)	43 Million	**45 Million(5% higher)**	42 Million

Risks and Actions

- Risks are defined as MTP/SCS performance failure, e.g. Clean Air Act, Greenhouse reduction target etc.
- Risks identified:
  - Increased VMT with rapid deployment of AVs without the intervention of sharing
  - Potential impact on congestion—depends on impacts of connected vehicles on roadway capacity & operations
  - Undermining of conventional fixed route transit market with wide scale of TNCs and shared AVs
- Actions
  - Active monitoring on the development of emerging technologies
  - Research and pilot projects (autonomous transit bus, Uber pooling)

Tool limitations & Next steps

Limitations:

- Deadhead trips by TNCs or empty trips by AVs not modeled
- Assignment is still static, can't capture the impact of driver behaviors in a AV

Next Steps:

- Off-model adjustment methodology to account for VMTs by deadhead/empty trips
- Validate base year TNC trip shares using upcoming household travel survey (substitute for actual counts of TNC trips from operators)
- Use microsimulation model to capture driver behaviors with various levels of vehicle automation