Accurate 2025 Future-cast? Worth $2?

- Future-cast accountability?
- Far too many change vectors
- Forecast = fcn(methodology, background, biases, optimism, breadth)
- 2 main things different in your future-cast?
Aside: Technooptimism vs. Climate Pessimism

Bay Area 2015+

Traffic: #2 after LA
- 7M pop → 9M in 2040
New freeway HOT lanes?
- Permanent capital shortfall
Hwy 101 “breaks” in 2020
- Quick fix (occupancy)
  - HOV5, HOV3, Genl Purpose, GP
- US commute occupancy
  - 1.3 in 1977
  - 1.13 in 2009
36 miles from SF to SV
- ~$6,000/year/worker motorcoach
  - ~10 tech companies
  - 90% of SF Googlers
CA climate law (AB32, SB375)
- Modest change driver
- SB350 – Goals: Renewables, bldg efficiency, EVs
- SB32 – 80% of 1990 GHG by 2050
Gentrification ➔ push to edges
HSR == Zombie.
Road/Parking Pricing → Occupancy (2020)

<table>
<thead>
<tr>
<th>Bay Area Commute</th>
<th>SOV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free parking</td>
<td>77%</td>
</tr>
<tr>
<td>Pay-to-park</td>
<td>39%</td>
</tr>
</tbody>
</table>

Pricing → carpool, transit, UberPool, robotaxi, etc
75% CA opposes $0.25 gas tax increase

Bike!
Amsterdam 30% bike commute

Cold and rainy vs. American wussiness

9 VMT per capita per day, not 26

Plan Bay Area
- SB 375 Sustainable Communities
- Regional Housing Needs Allocation

Ideal Bay Area resident
- Lives, shops (walks) in downtown Palo Alto
- Commutes via Caltrain
- Owns fewer cars

Increase housing quantity & affordability.
Mobility as a Service (MaaS) – BMW, Daimler, Toyota

One Seamless App
Multimodal trip planning, Discounted monthly bill, Customer-centered, Pay like Clipper.

Faster-than-real-time Intelligent Agents
- Accesses calendar, e-mail, GPS & optimizes
- Google Now / Microsoft Cortana

Bay Area – smartphone mobility HQ
- For critical mass, some poach taxi & transit riders

Uber + Lyft: 140K Bay Area passenger trips/day
- Aspiration: $0/hr robo-drivers

Lyft Line & UberPool ➔ half cost ➔ occupancy
- Match within 60 seconds, small route deviation
- Critical mass of vehicles, riders, overlapping trip vectors

<table>
<thead>
<tr>
<th>Service</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>NYC Taxi</td>
<td>Services 2.2% of trips</td>
</tr>
<tr>
<td>Uber/Lyft in Bay Area</td>
<td>Services 0.5% (mostly SF)</td>
</tr>
<tr>
<td>Uber/Lyft in Silicon Valley</td>
<td>Services ~0.1% of trips</td>
</tr>
<tr>
<td>Sidecar, RidePal, Chariot, Carma ..</td>
<td>Fraction of Uber/Lyft, mostly SF</td>
</tr>
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</table>
Electric Vehicles: 8% HEV, 1.4% PHEV, 1.3% EV

20+ EVs on the market
- $2,500 rebate, $7,500 income tax credit, HOV lane
- Free parking in San Jose, reduced PG&E rates, etc
- Need: $40 ICE fee ⇒ $3,000 EV rebate (adjustable)
- Nissan Leaf 200+ mi ⇒ 2025 45 mpg CAFE
- Vs. current 50 to 84 mile battery range.

Misc: car safety, e-scooters

Non-robotic cars ⇒ 60% fewer fatalities
- Drowsy driver detection, etc (Richard Bishop)

Lightweight electric first/last mile + e-bikes for wussies
- Fits-in-transit-seat (Urb-e, $400 e-unicycle).
## Autonomous Timeline

<table>
<thead>
<tr>
<th>Year</th>
<th>Milestone</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>GM SuperCruise (Nissan CEO: ‘16)</td>
</tr>
<tr>
<td>2020</td>
<td>Road/parking pricing ➔ congestion</td>
</tr>
<tr>
<td>2022</td>
<td>Read-a-magazine freeway robocar</td>
</tr>
<tr>
<td>2025</td>
<td>5% freeway robocar penetration</td>
</tr>
<tr>
<td>2025</td>
<td>3 robotaxi systems (Uber w/ robot)</td>
</tr>
<tr>
<td>2030</td>
<td>Significant positive robotaxi impact</td>
</tr>
<tr>
<td>2030</td>
<td>30% freeway robocar ➔ platooning</td>
</tr>
</tbody>
</table>

### 5% Read-a-magazine Freeway Robocars (2022)

Regulators facilitating, supply chain ready
95% of trips, 5% invoke 5-second rule
Induced demand
- “Driving easier ⇒ live further away” - Toyota
- “Steal transit riders” - Sven Beiker, Stanford
- Reduced peak hour pain
- Poor suffer

Steve Shladover pessimism (youtube of MeetUp)
50% of US < 6” snow/year
2030: platooning (network effect).
Robotic Surface Street Driving

Empty vehicle movements
Private auto @ $0.55/mi
- Subsidy for low income?

Occupancy trumps tech
Carsharing: each ➔ -10 cars
- Real-estate gain.
Robotaxi - continued

Small suburban exercise:
- "Fake" critical mass
- 21% SOV
- 2.6 occupancy

Private sector ⇒ public bus transit
- $0.25 per passenger mile vs. $1 for public transit bus
- 4X the frequency

Helsinki Kutsuplus demand-responsive minibus
- Part of car-free Helsinki effort

Robotic, containerized Amazon Fresh Express.

RoboVan – Niche Biz Model Proof (2025)
2 main things different in your future-cast?

GM EN-V, 1:00-3:40, youtube

Employment within ½ mile of freeway ramps
75% of total

Regionally most jobs locate near freeways

Maps produced by Mark Shoret, Arup for SPUR
Large firms are not located next to transit

Maps produced by Mark Shorritt, Arup for SPUR