Modeling Emerging Mobility using ActivitySim

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Modeling Mobility Conference
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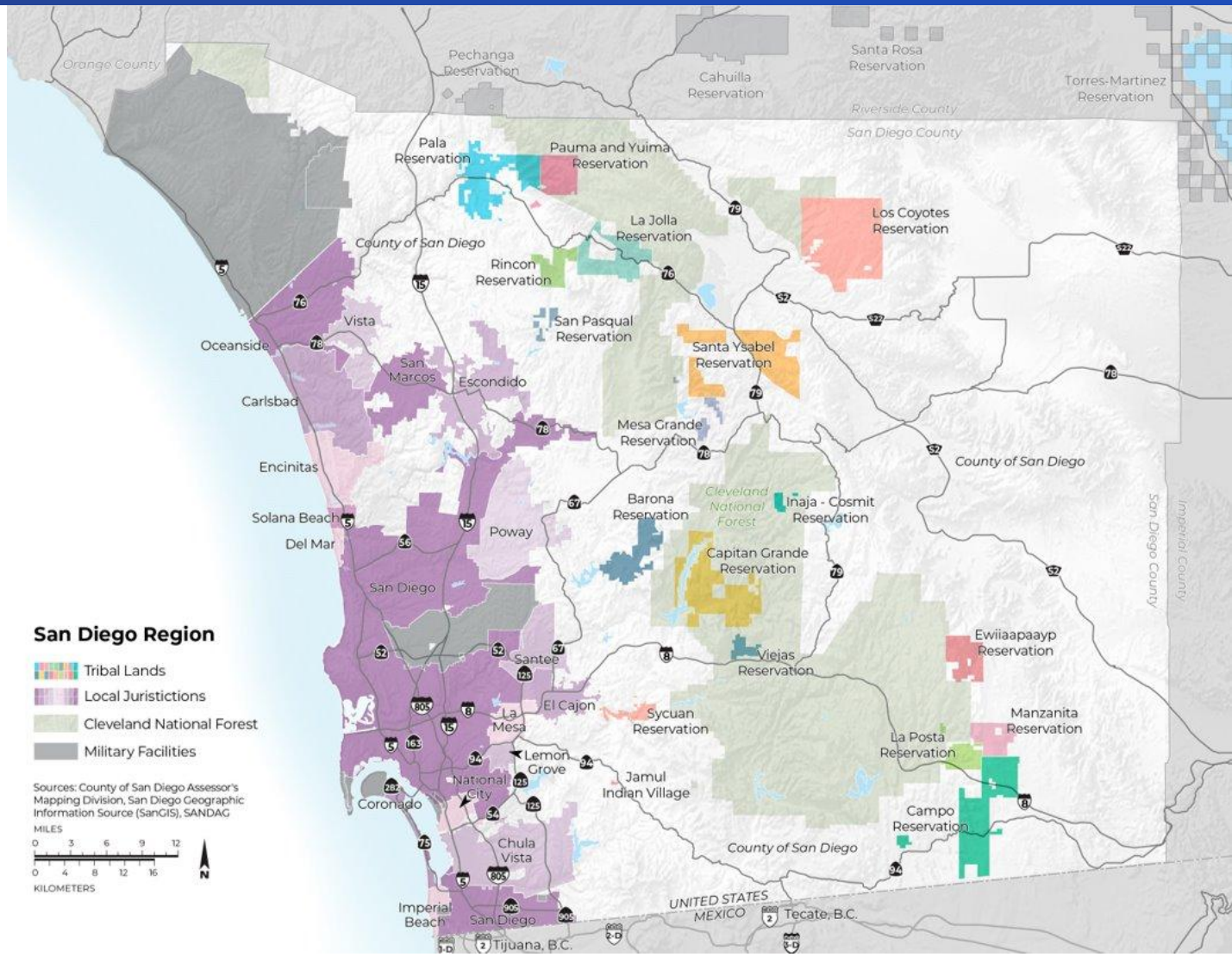
Agenda

- Background
- Micromobility
- Microtransit
- Electric Vehicles
- Conclusion

Background

SANDAG Region

- MPO for San Diego County, California
- 4,200 Square Miles
  — 11,000 km²
- 3.3 Million People
- 2.1 Million Jobs
- Includes 17 tribal governments



SANDAG Model

ABM3 Released May 2024

- ActivitySim-Based

Used for 2025 Regional Transportation Plan

- Base year is 2022
- Horizon year is 2050
- 2035 plays major role in state-mandated emissions targets

Planners want to model new mobility technologies

- Important for estimating greenhouse gas reduction
- Previously in off-model calculators
- ActivitySim's flexibility makes it possible to move on-model

Micromobility

Micromobility

- E-bikes and e-scooters
- Added as mode in mode choice
  - In micromobility nest
- Calibrated to match distance data from micromobility providers

- Policy dials
  - Operating speed
  - Time to find rental
  - Cost
  - Share of households owning e-bikes

```
- name: MICROMOBILITY
  coefficient: coef_nest_MICROMOBILITY
  alternatives:
    - EBIKE
    - ESCOOTER
```

Microtransit

Microtransit

36 services planned to be in operation by 2035

- Two Flavors
  - **Microtransit**
    - Longer trips in larger vehicles over greater distances
  - **Neighborhood Electric Vehicles (NEV)**
    - Quick trips in smaller vehicles within a service area

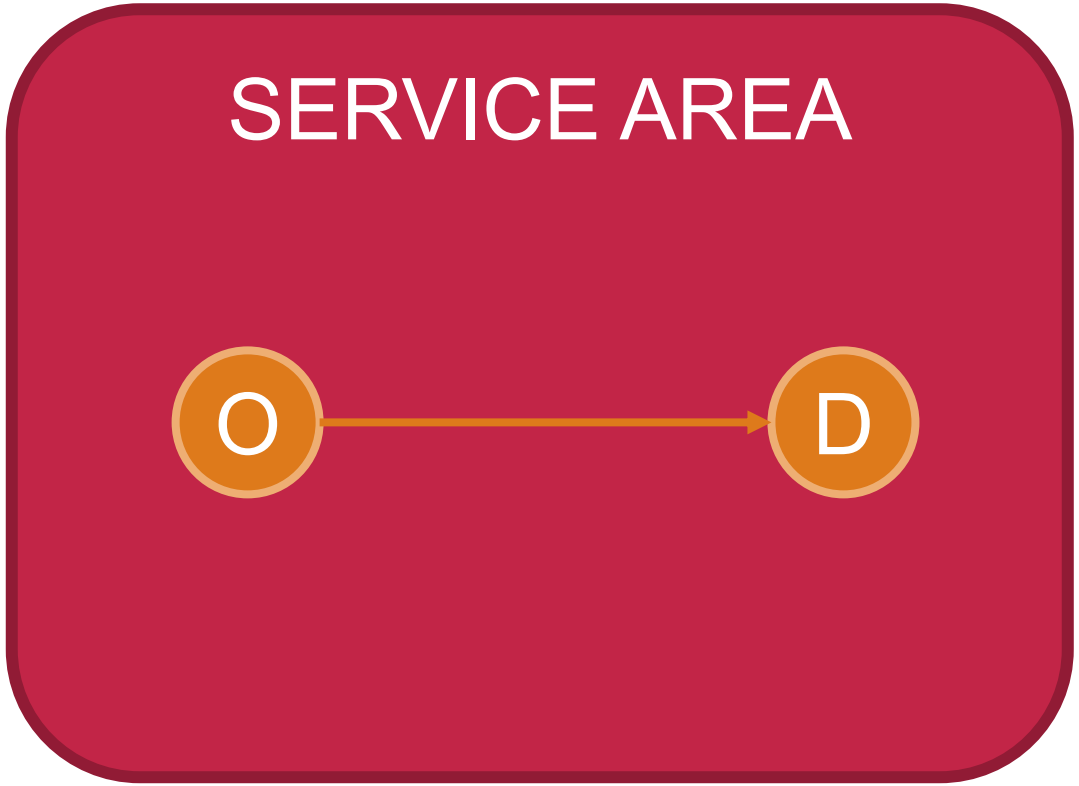
Microtransit

- Incorporated into utility calculations of existing modes based on use of microtransit
  - Full trips: Shared TNC
  - First-mile transit: TNC to transit
  - Last-mile transit: All transit modes
- Added service areas as land use attribute
  - Used to determine if trip is eligible to use service
- Not added as additional mode due to similarity to existing modes in model

Microtransit

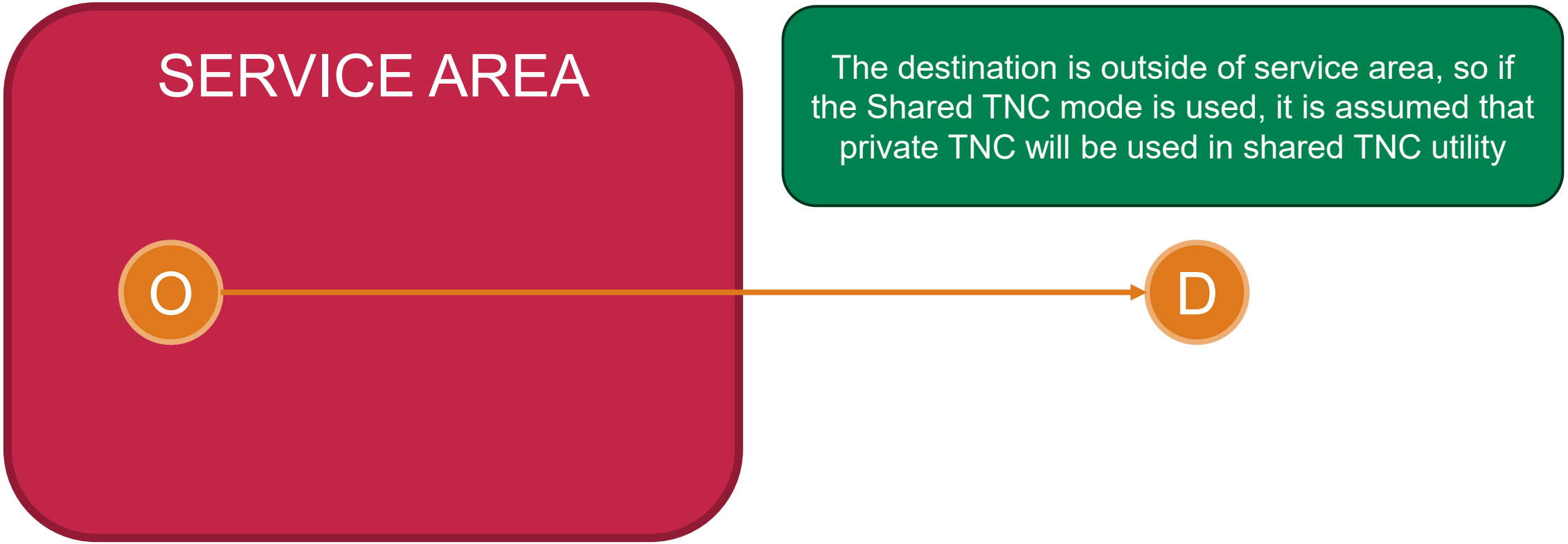
- Hierarchy enforced assuming traveler preference
  - NEV
  - Microtransit
  - Other (what previously existed in model)
- Checks if service is available based on trip characteristics
  - If available, that service is used
  - If not, next service is checked
- Travel times based on distance, assumed operating speed, and maximum amount of redirection to serve other customers

Microtransit

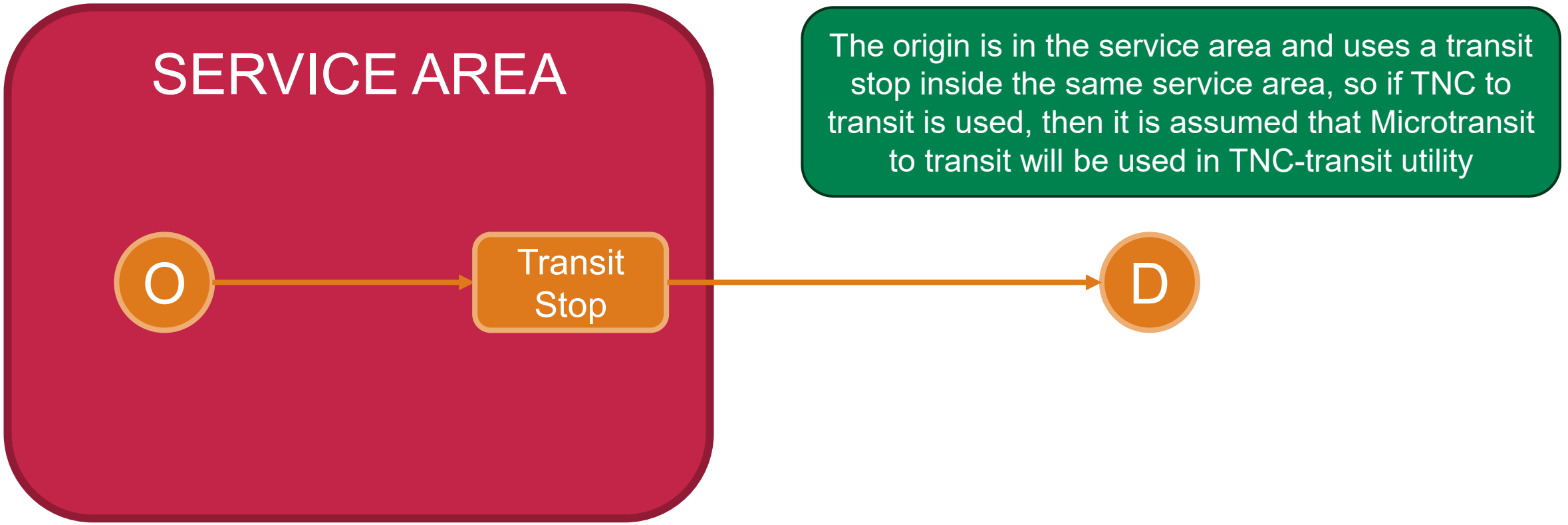


The origin and destination are within a single service area, so if the Shared TNC mode is used, it is assumed that Microtransit will be used in Shared TNC utility

Microtransit



Microtransit



Microtransit

Calibrated to available observed data

- Only two services open in base year

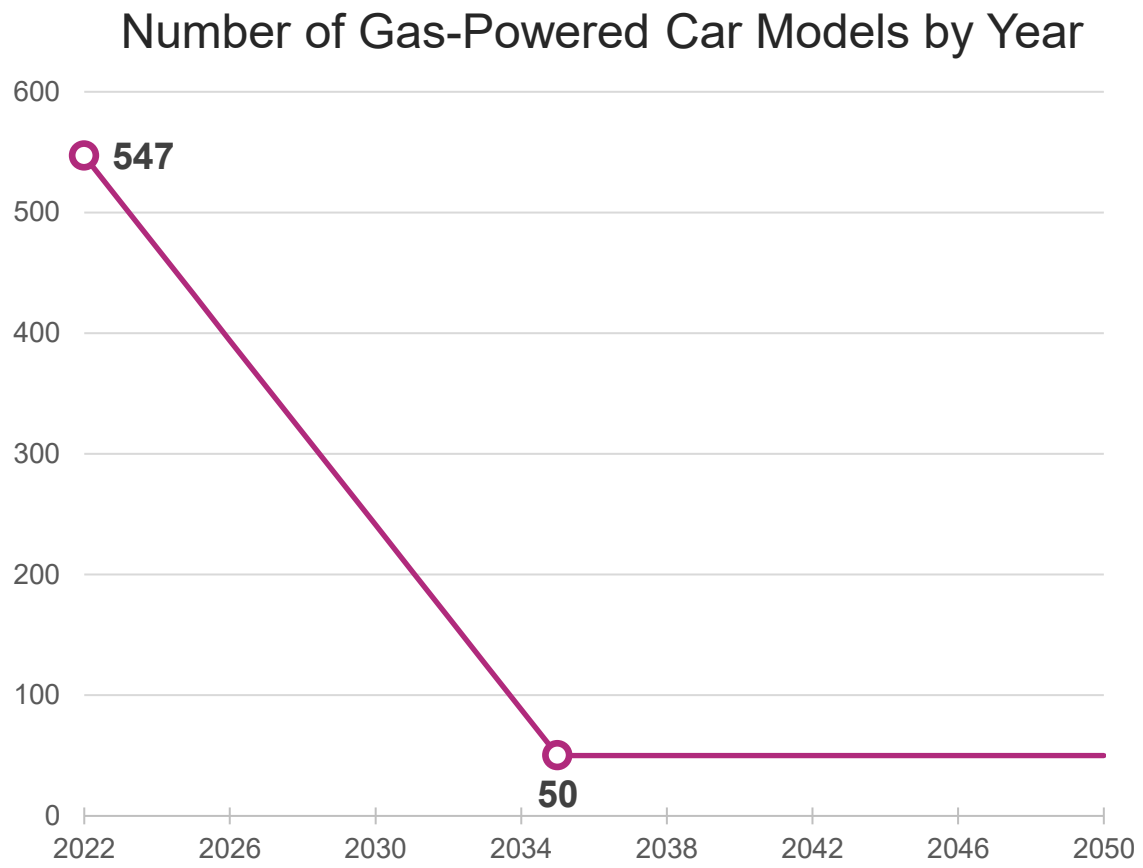
Policy dials

- Wait time
- Fare
- Maximum redirection

Electric Vehicles

EVs: Fleet Changes

- ActivitySim has vehicle type choice and vehicle allocation models
  - Predicts fuel type, body type, and age for all vehicles owned by each household
- Starting in 2035, sale of new gas-powered vehicles will be prohibited in California
  - Assumed that number of new models dropped down to 50



EVs: Rebates

- Climate planners wanted to test how offering rebates to low- and middle-income households would impact eVMT
- One of the predictor variables is new purchase price
- Rebates were incorporated by editing two vehicle type choice configuration files:
  - The appropriate rebate amount for BEVs and PEVs was determined in the preprocessor based on the household income
  - The rebate values were deducted from the new purchase prices in the specification file

EVs: Charger Sensitivity

- Vehicle type choice model has coefficients relating the EV utility to the number of publicly available chargers per capita
  - Estimated with 2017 data
  - Large increase in number of chargers since then
- Planners assume that the **number of chargers will grow 11% annually** through the horizon of the plan
  - Necessitated large calibration coefficients to match assumed EV ownership shares

EVs: Charger Sensitivity

Scenario	Chargers	Chargers per Capita	EV Ownership Share	EVMT%
2035 No Build	29,968	0.0088		
2035 Build	40,000	0.0118		

EVs: Charger Sensitivity

- Direct elasticity = (1 – EV Share) × Coefficient × Value
- (1 – 0.25) × 1686.871 × ln(1 + 0.0088) = **11.08**
- Paper found in literature review suggested that the elasticity should be **0.8**
- Desired coefficients can be calculated by solving the equation for the coefficient based on EV share and number of chargers
  - 2022: 354.031
  - 2035: 121.518
  - 2050: 35.193
- Closely follows exponential decay

EVs: Charger Sensitivity

- The desired coefficient decays exponentially over time
  - Coefficient = 354.347 × exp(-0.0825 × (Scenario Year – 2022))
  - The number in the coefficient file is the base year coefficient
  - The decay factor is stored in the constants file and implemented in the utility expression in the specification file
- EV Share now 33%

Label	Description	Expression	Coefficient
util_ln_chpc_ev	ln(1+number of chargers per capita in MSA/state)	@df.logged_chargers_per_capita * ((df.fuel_type_num_coded==5) | (df.fuel_type_num_coded==1)) * np.exp(chargerSensitivityDecayFactor*(scenarioYear-2022))	coef_ln_chpc_ev

Conclusion

Conclusion

Flexibility of ActivitySim allows for modeling of policies around emerging mobilities with relative ease

- Micromobility
- Microtransit
- Changes in future vehicle fleets
- Rebates to buy EVs
- Decreasing sensitivity to novel infrastructure

Questions?

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