Southern California Zero Emission Truck Infrastructure (ZETI) Study

February 21, 2024

WWW.SCAG.CA.GOV

Welcome

Jonathan Raspa

SCAG Project Manager

Re-introducing the Project Team

SCAG
INNOVATING FOR A BETTER TOMORROW

CAMBRIDGE SYSTEMATICS

C+R ASSOCIATES

ICF

redhillgroup
THE POWER OF INSIGHT

Tioga

BERKELEY LAB

Re-introducing TAC Member Organizations

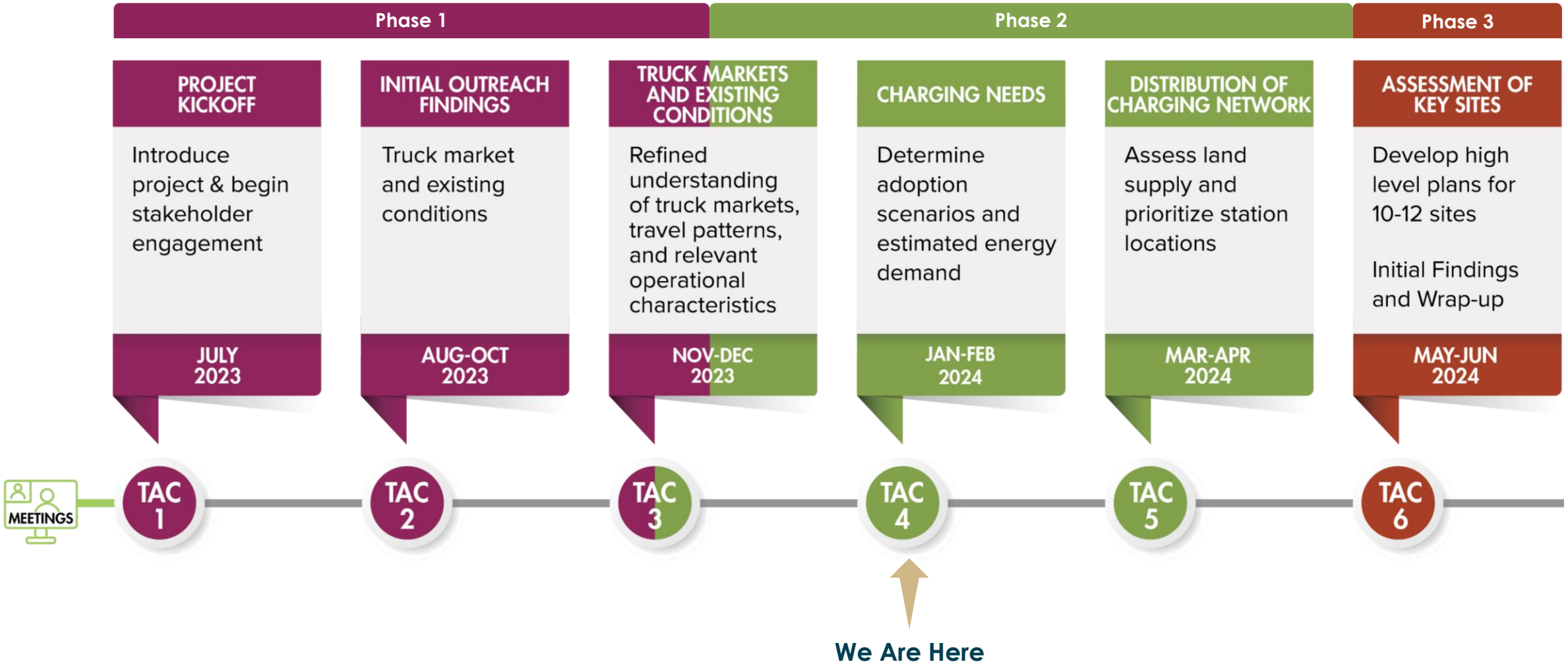
Technical Advisory Committee Meeting #4

Agenda

- Welcome and Introductions
- Project Progress to Date
- Initial Modeling Results
- Siting Criteria Continued
- Next Steps

PROJECT PROGRESS TO DATE

Project Phase Review, detail



Recap of TAC #3 meeting Next Steps

- Continue to develop HEVI-LOAD charging requirements analysis; develop future year demand forecasts by December 2023 ✓
- Finalize Framework and workflow for model implementation by January 2024 ✓
- Develop Siting Criteria for EV charging stations and hydrogen stations ⧗
- Begin work on developing the typologies for charging/fuel locations ⧗
- Review and incorporate findings from internal TAC survey on siting criteria ⧗

Project Progress to date, Phases

PHASE 2 (Stage 1)

TECHNICAL WORK

- [x] Completed Truck GPS Data Analysis
- [x] Completed Truck Trip Expansion
- [x] Identified Market Segments
- [x] Incorporated Payload Information

PHASE 2 (Stage 2)

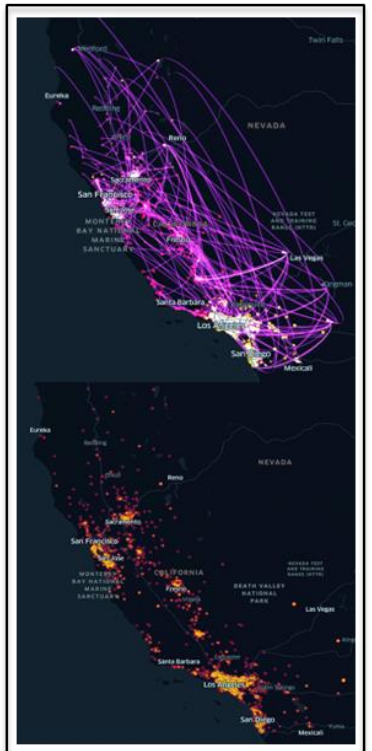
TECHNICAL WORK

- [x] Conduct Initial HEVI-LOAD Model Run
- [ ] Develop Adoption Scenarios
- [ ] Conduct HEVI-LOAD Model Scenarios Runs
- [ ] Assess Land Supply and Prioritize General Station Locations

INITIAL HEVI-LOAD MODELING RESULTS

Methodology – HEVI-LOAD Analysis Workflow

All results are preliminary for discussion only and confidential



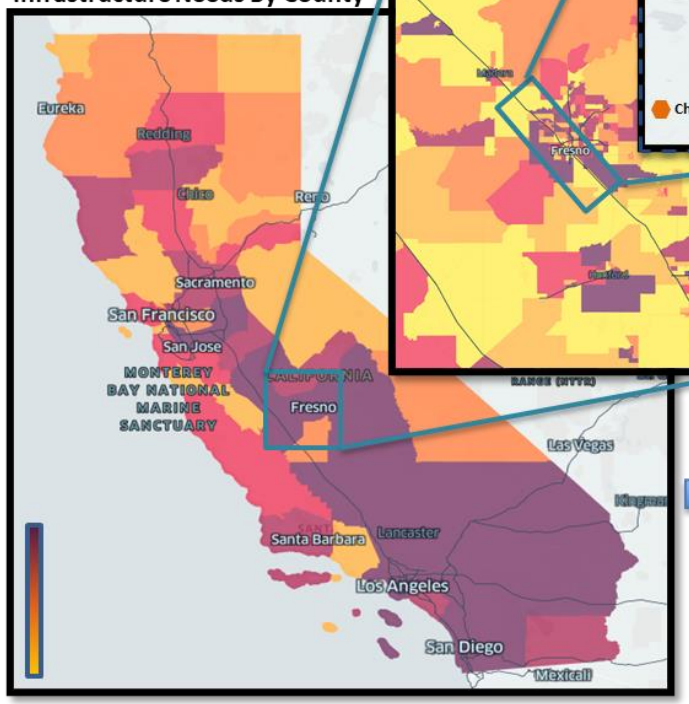
HEVI-LOAD Inputs

- MDHD travel demand (trips),
- parking and infra. location,
- truck GPS data,
- adoption scenarios,
- vehicle specifications, etc.

HEVI-LOAD Agent-Based Simulation

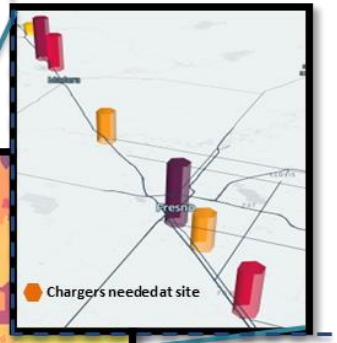
- Integrated driving-parking-refueling behavior modeling and simulation
- Smart/managed charging strategies

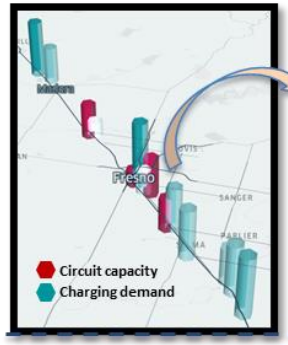
Infrastructure Needs By County

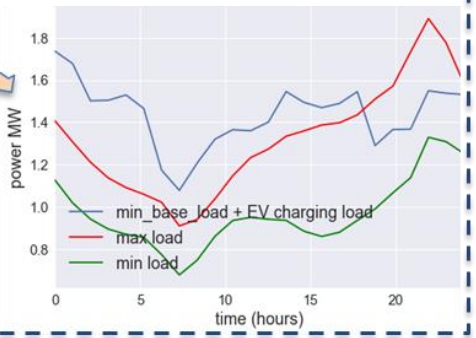


By TAZ

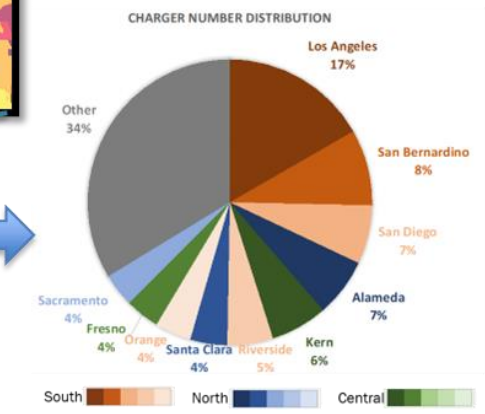
Infrastructure Assessment at the Site Level

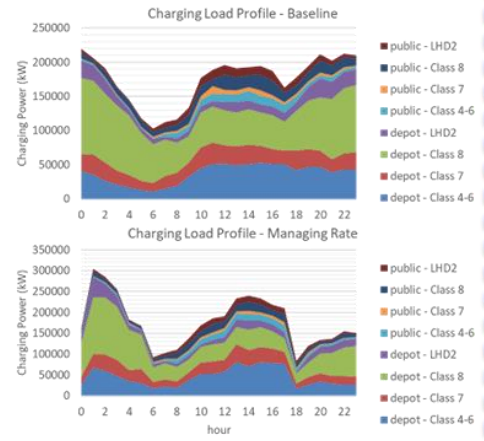






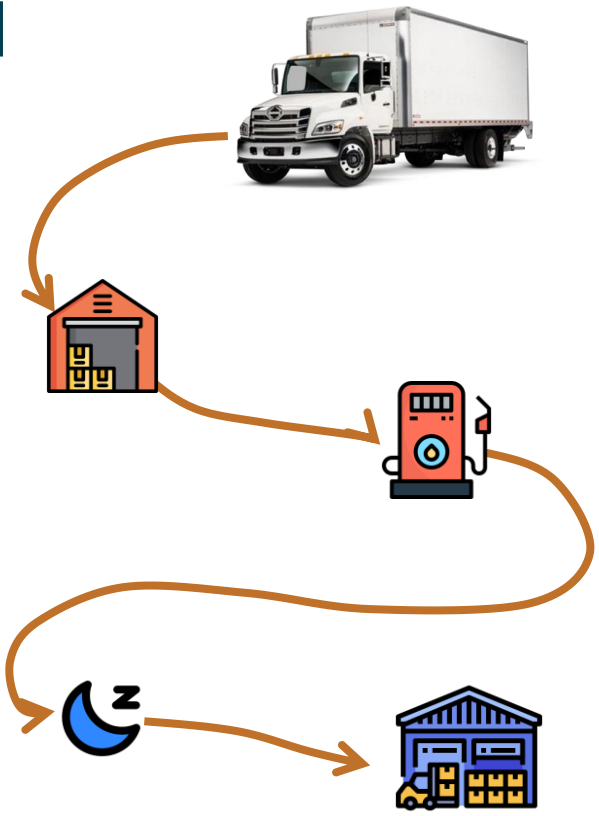
Infrastructure Assessment at the State and County Level





Tour-Based Data Analysis Results

- Tour based vehicle behavior design overview



Metric	Class 3 - 6	Class 7-8
Average trips per day	4.6 trips/day	3.51 trips/day
Average trip distance	28 miles	94 miles
Average tour distance	128 miles	330 miles

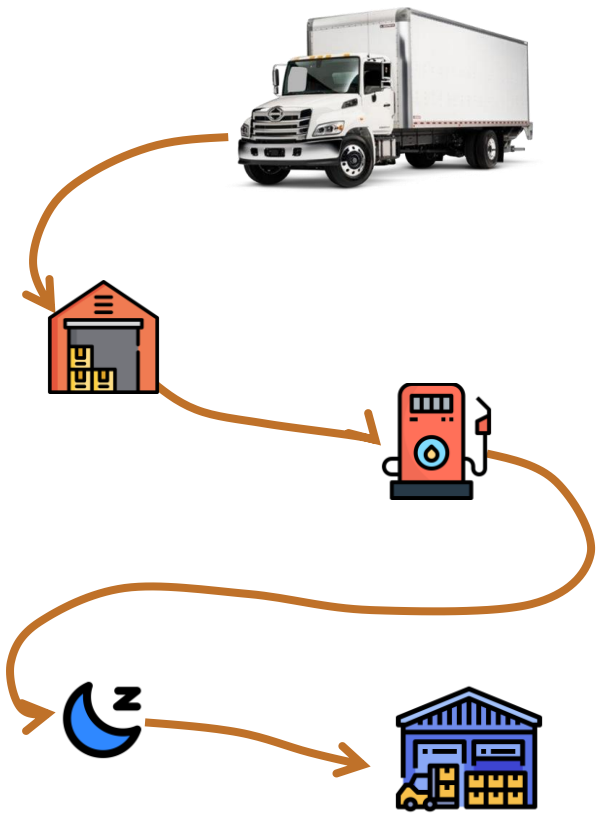
Draft Results

Tour-Based Data Analysis Results

Truck Market Segment	Port Truck		Truck Type		Total Mileage		Frequent Location	
	Yes	No	Heavy	Medium	0-300 mi	>300 mi	Yes	No
Drayage Heavy-Duty	☑		☑		N/A	N/A	N/A	N/A
Drayage Medium-Duty	☑			☑	N/A	N/A	N/A	N/A
Regional Return-to-Base: HD		☑	☑		☑		☑	
Regional Return-to-Base: MD		☑		☑	☑		☑	
Regional No–Home: HD		☑	☑		☑			☑
Regional No Home: MD		☑		☑	☑			☑
Long-Haul: HD		☑	☑			☑	N/A	N/A
Long-Haul: MD		☑		☑		☑	N/A	N/A

Draft Results

Tour-Based Data Analysis Framework



- Step 1: Identify location types

Warehouse large (occur > 250)	Warehouse small (occur < 250)	Ports	Public locations (occur > 250)	Private locations (occur < 250)

- Step 2: Identify time duration

Quick stop (t < 20 min)	Short stop (20 min < t < 6 h)	Long stop (t > 6 h)

- Step 3: Identify possible behavior

Long rest	Loading/ unloading	Short rest	Quick stop

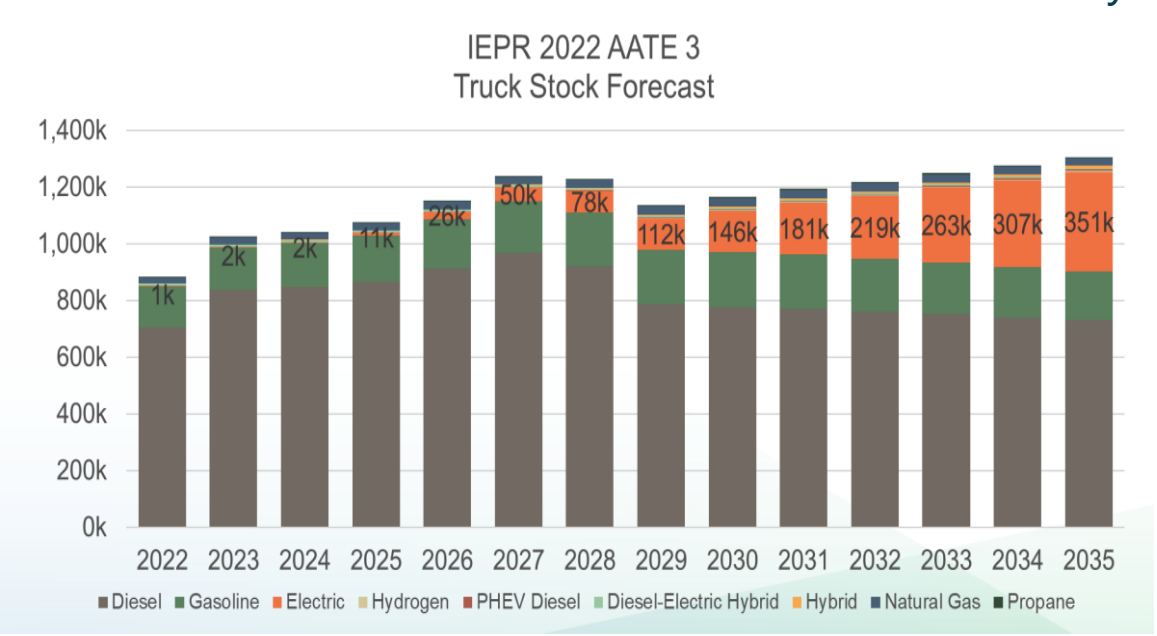
- Step 4: Define charging behavior at each location

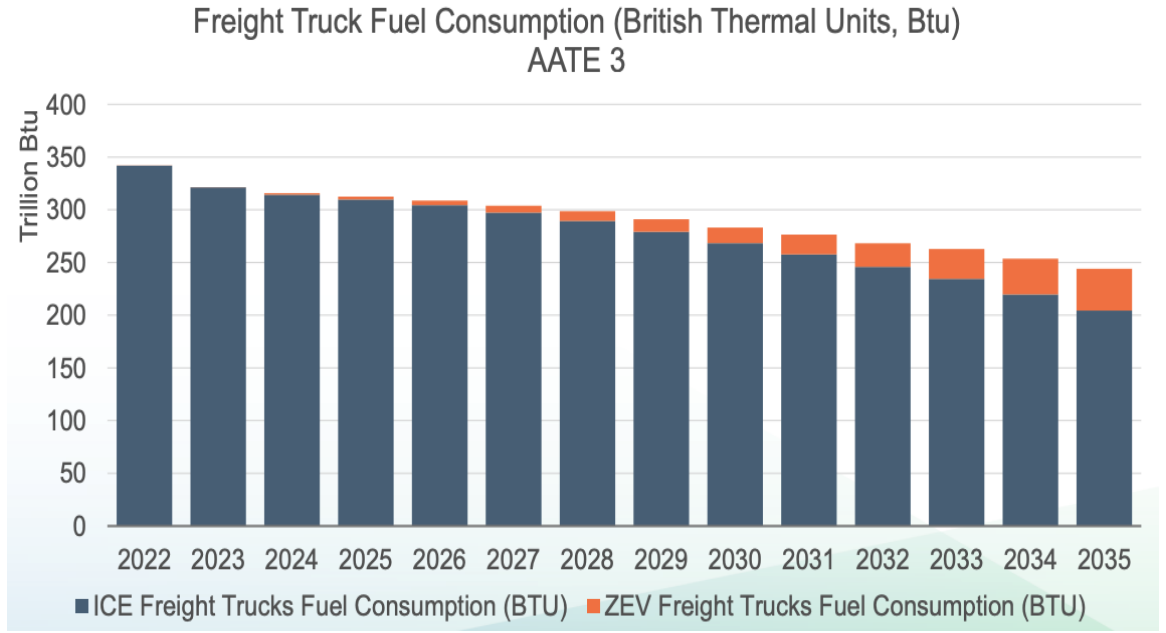
Overnight charging	Destination charging	Enroute charging	No charging

Draft Results

Statewide Truck ZEV Adoption Scenarios

- Current preferred statewide adoption scenario: AATE3 (Additional Achievable Transportation Electrification)
  - Data from CARB for ACF plus ACT scenario
  - Assume maximum ZEV share each forecast year





https://www.energy.ca.gov/sites/default/files/2022-11/DAWG_Transportation_Energy_Demand_Forecast_2022-11-15_ADA.pdf

Statewide Truck ZEV Adoption Scenarios

Input/Assumption	Baseline	AATE 2	AATE 3
CARB Regulations	Advanced Clean Trucks (ACT), other existing rules	Advanced Clean Trucks, other existing rules	Advanced Clean Fleets, ACT, and other existing rules
Regional Regulations	SCAQMD Truck and Bus rules	Implicit for refuse trucks and urban transit buses	Same as Baseline
HVIP (all years)	Voucher amounts scaled to incremental truck price		
Inflation Reduction Act	$7,500 for Class 3 and $40,000 for Classes 6 and 7		
Hydrogen Price	NREL mid-price		
Electricity Rates	Commercial Rates, Mid		
BEV Truck Prices given battery pack price in 2035	BEV prices based on battery price $488/kWh in 2021, declines to $73/kWh in 2035	Baseline truck prices plus 5%	Same as Baseline
Miles Per Gallon (conventional / alternative)	Same as Mid for IEPR 2021, based on ICF(2021) and KGD(2019)		

https://www.energy.ca.gov/sites/default/files/2022-11/DAWG_Transportation_Energy_Demand_Forecast_2022-11-15_ADA.pdf

Inputs for Preliminary 2030 AAT3 ZEV Adoption Scenario: Battery and Energy

	Medium Duty (Class 3 – 6)	Heavy Duty (Class 7-8)
EV Battery capacity	300 – 400 kWh	600 kWh
Charger power (kW)	[20,50,100,150,350,500,750,1000,1500]	
FCEV energy storage	1,000 – 1,300 kWh	2,000 kWh
H2 to electricity conversion	33.33kWh/kg	

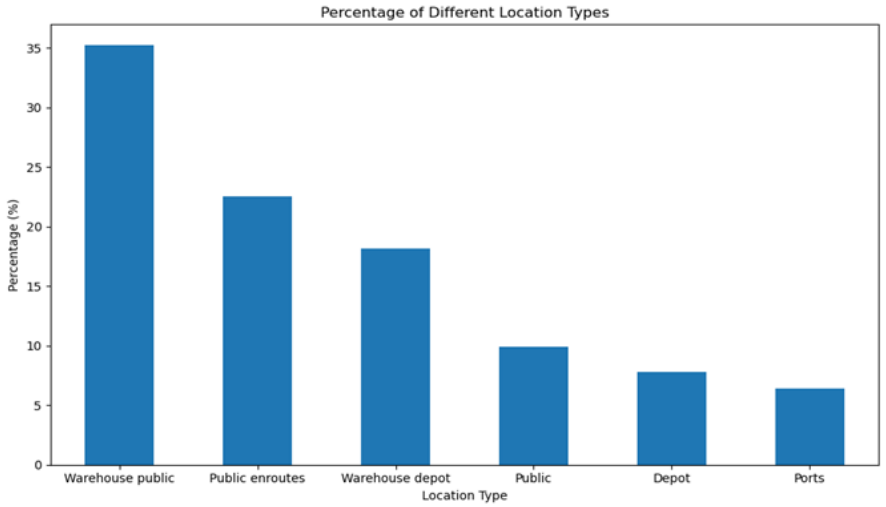
Inputs for Preliminary 2030 AAT3 ZEV Adoption Scenario: Dwell Locations

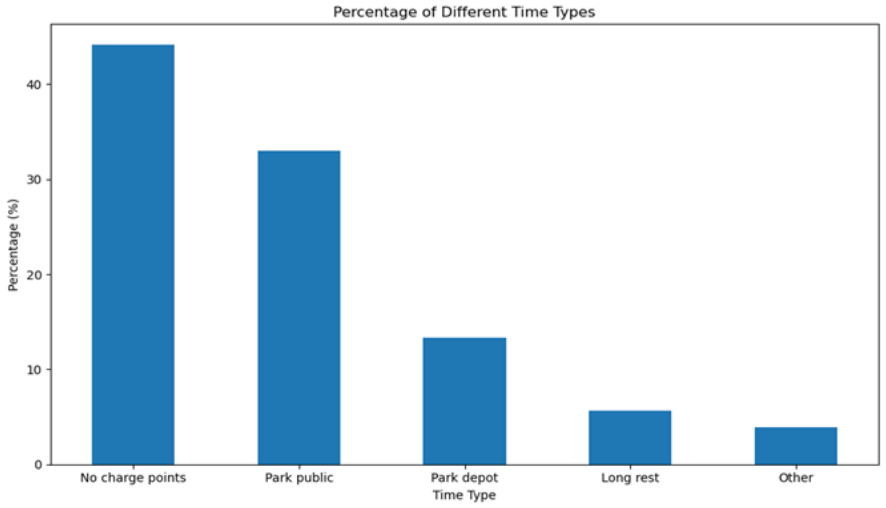
Location type definition

- Location occurrence, e.g., 250 trips
- Vehicle park & charging behaviors – Combined criteria of location and stop time

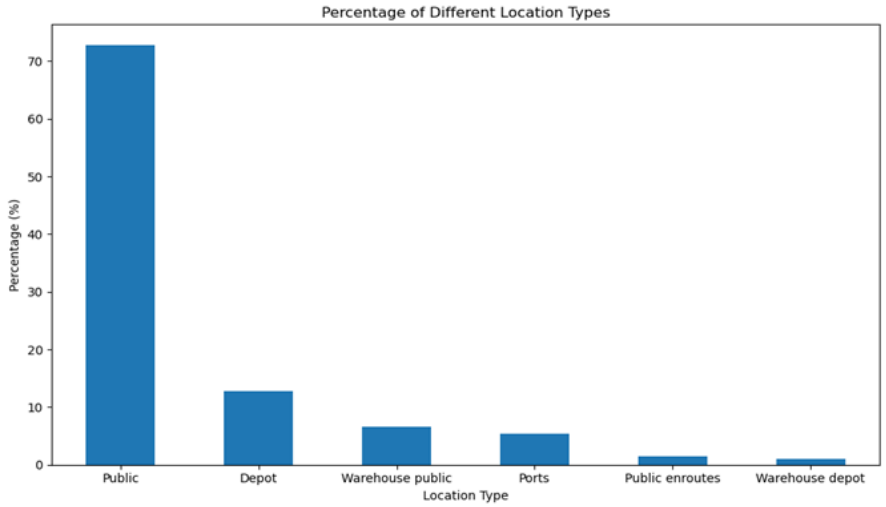
Draft Results

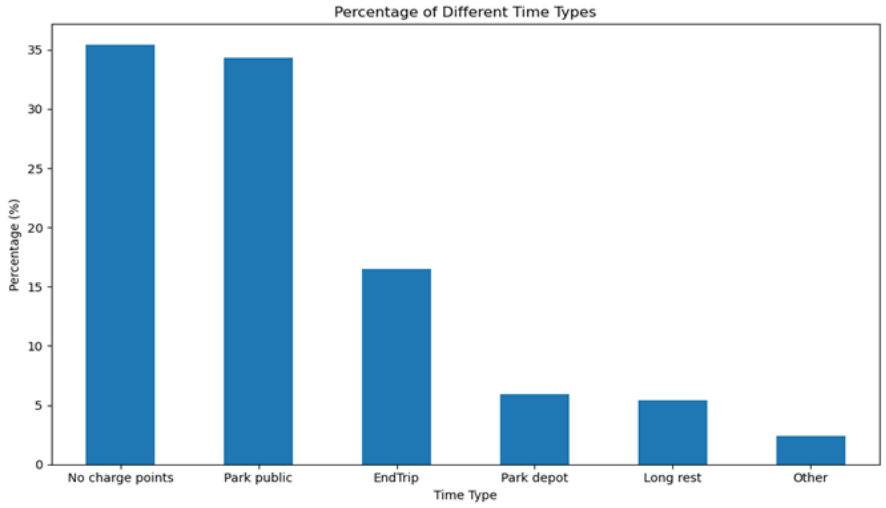
Class 7 - 8





Class 3 - 6



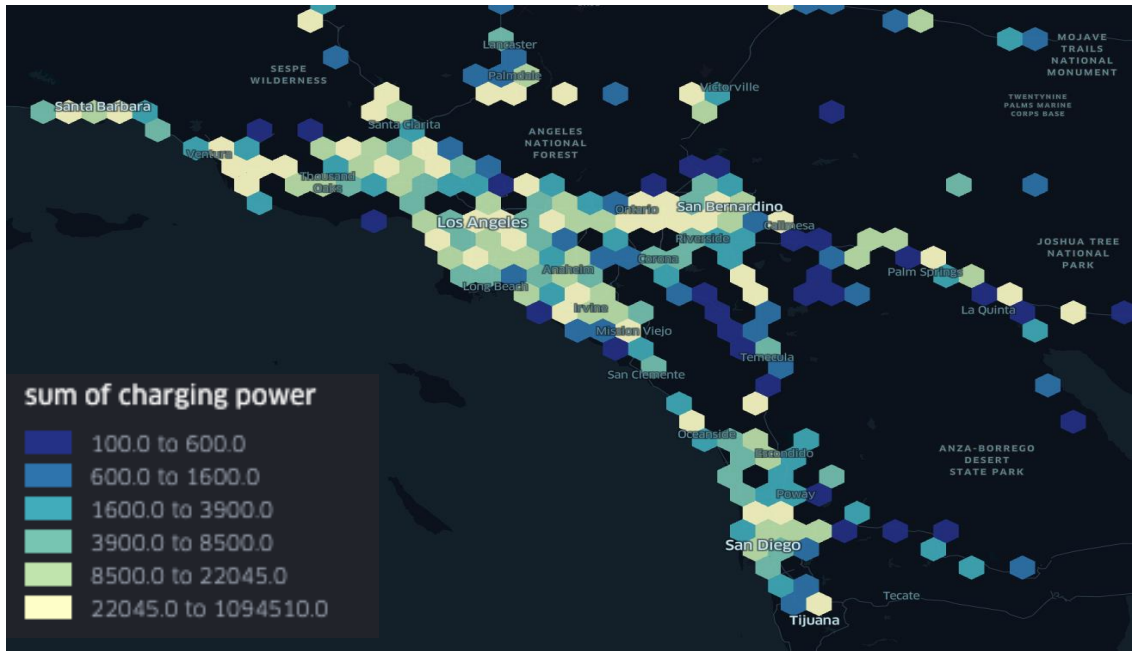


Preliminary Results: Total Energy Demand

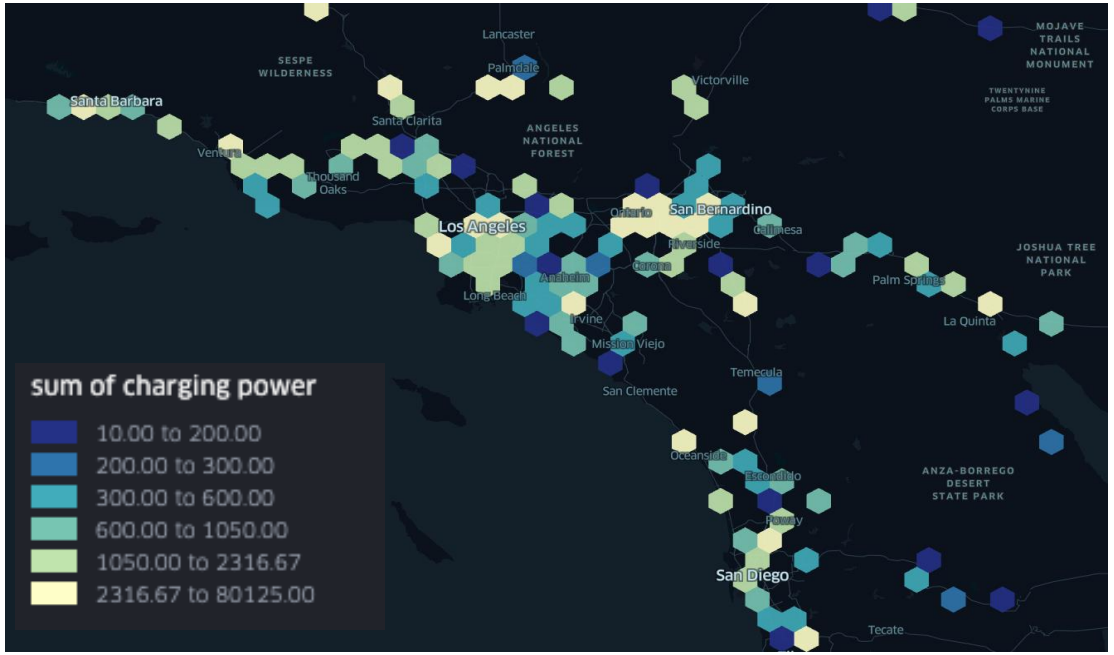
EV adoption scenario: AATE3 2030

- EV count:
  - Class 3-6: 80,999
  - Class 7-8: 74,571
- Tour count
  - Class 3-6: 60,749
  - Class 7-8: 55,928

Daily charging demand (kWh)



Peak hour demand (kWh)



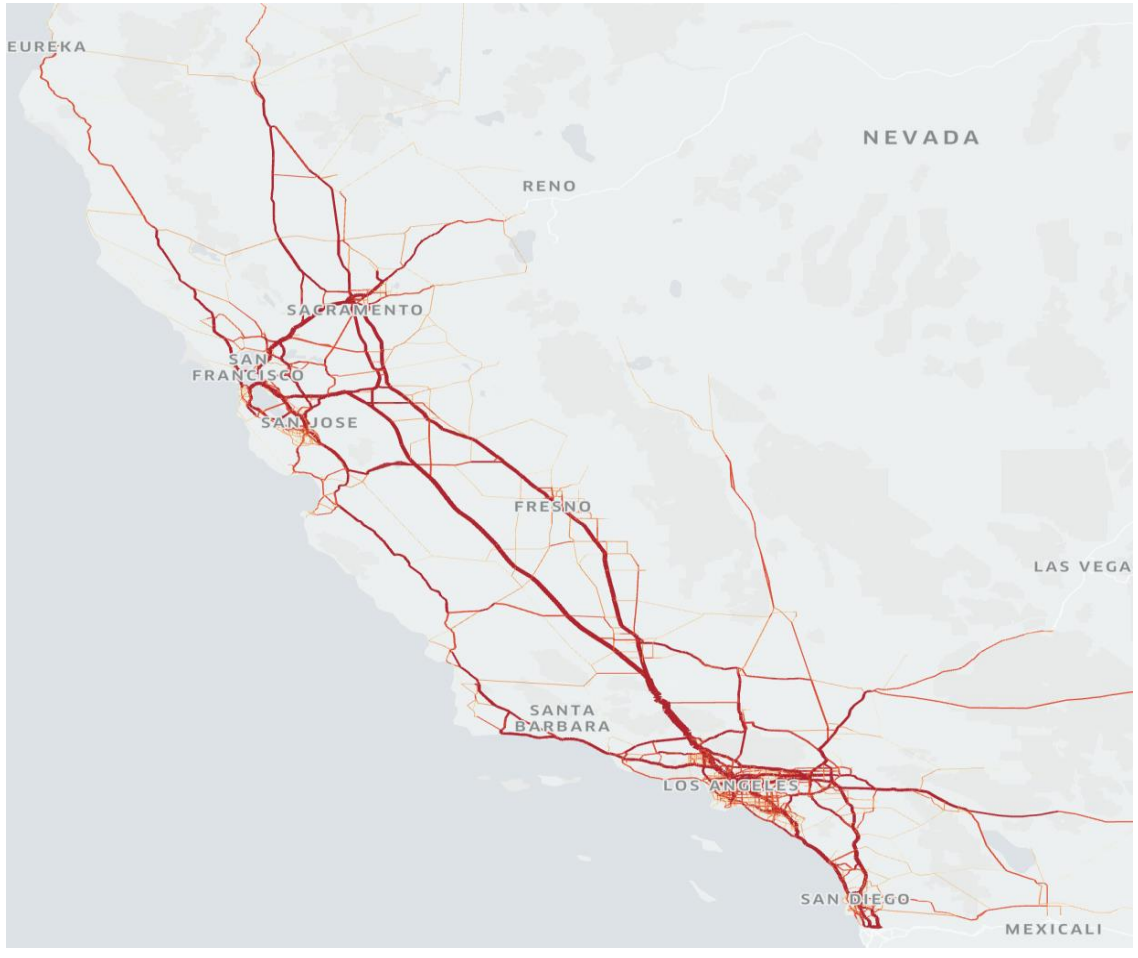
Preliminary Results: Total Energy Demand

Region	Daily load	Peak hour load	Max Daily Load - Zone
California	14.4 GWh	1.1 GW	1.1 GWh
Los Angeles county	3.1 GWh	255 MW	1.1 GWh
San Bernardino county	1.2 GWh	76.5 MW	328 MWh
Orange county	513 MWh	43.6 MW	303 MWh
Riverside county	834 MWh	63.7 MW	210 MWh
Ventura county	191 MWh	27.4 MW	34.1 MWh
Imperial county	118 MWh	10.7 MW	23 MWh

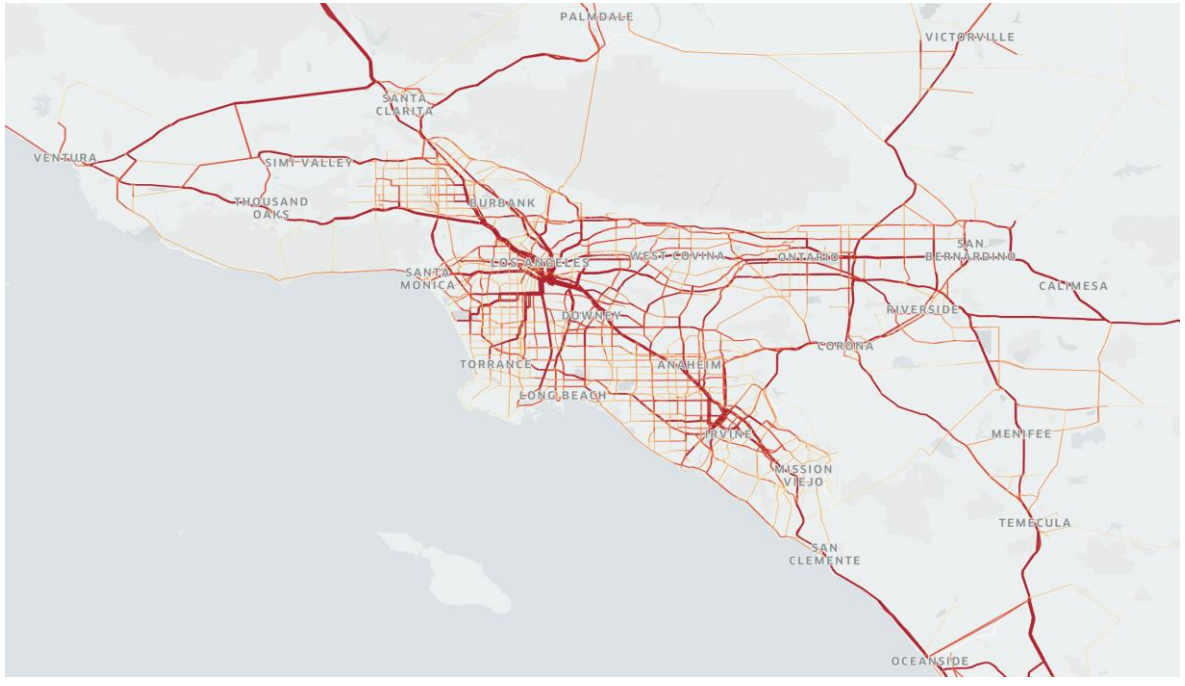
Draft Results

Preliminary Results

Traffic assignment: Statewide



Traffic assignment: SCAG Region



Draft Results

Q&A and General Comments

Do you have specific questions about any of the processes discussed?

What are your thoughts regarding the preliminary results?

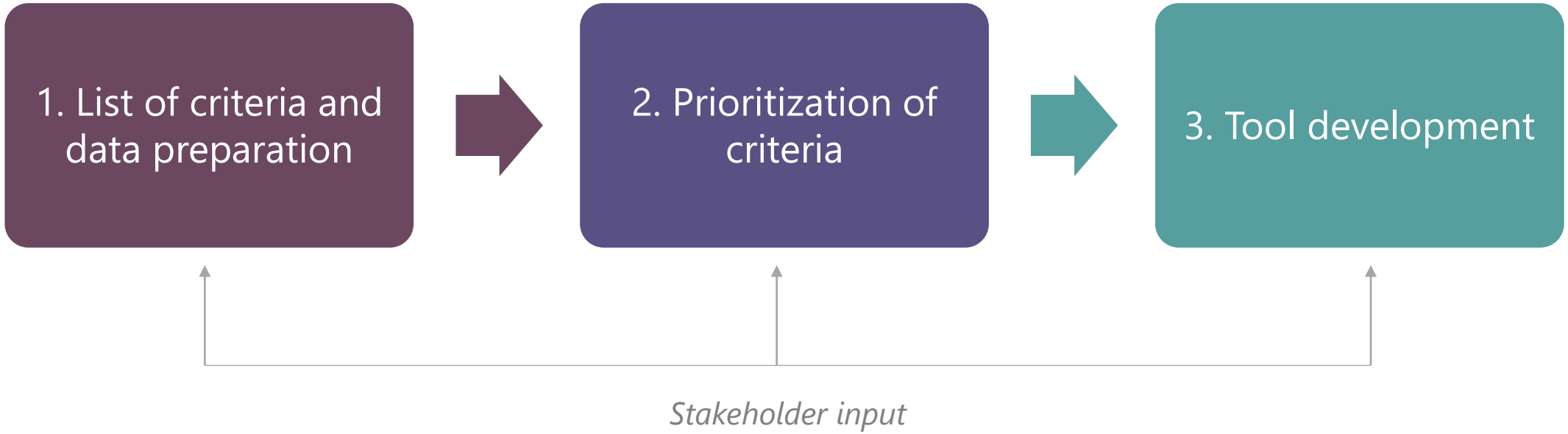
TAC Input Questions

- Are there future adoption rates for specific market segments like drayage, that you think are sound?

SITING CRITERIA CONTINUED

Siting Analysis Recap

- The siting tool is designed to enable stakeholders to assess different scenarios for prioritizing locations for the development of electric vehicle (EV) charging and hydrogen (H2) refueling infrastructure.
- Multi-criteria decision making analysis (MCDA) approach to prioritize sites



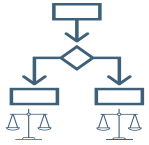
Prioritization of Criteria

- Stakeholder Input through Survey

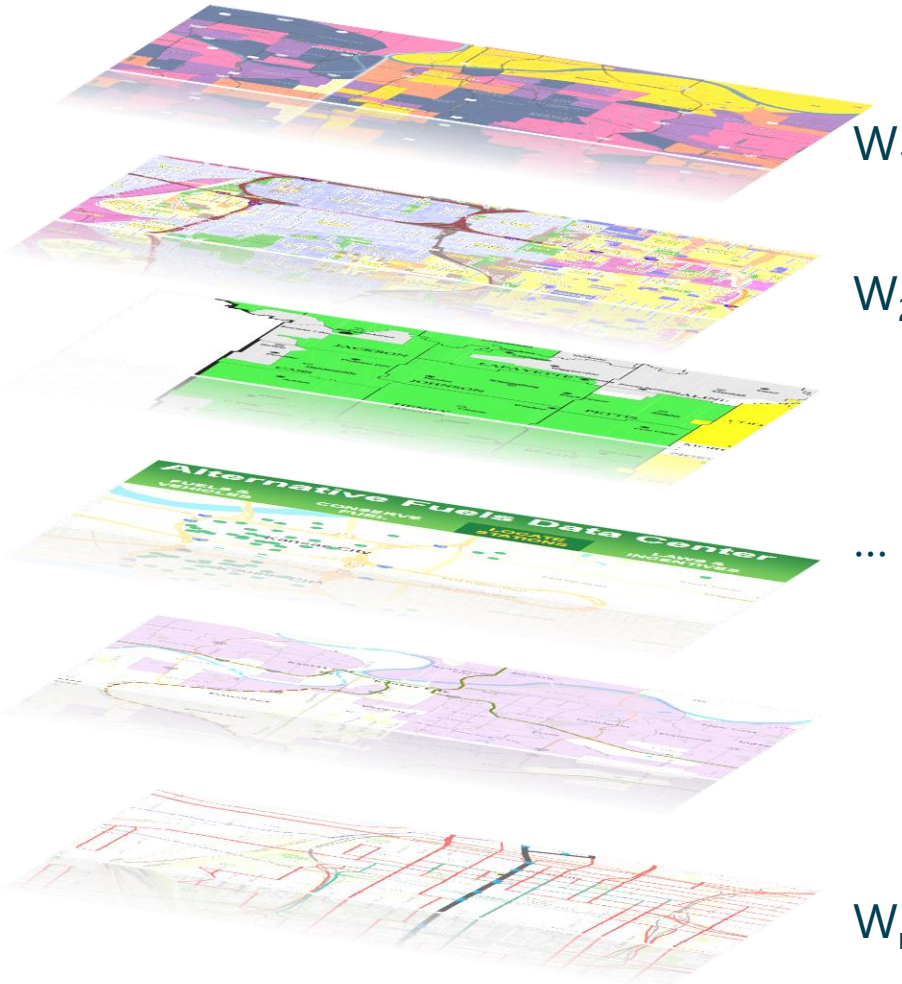
Develop survey to be distributed to stakeholders & distribute 100 points among criteria groups

Stakeholders assign weights to criteria groups (0-100)

Stakeholders assign weights to sub-criteria within each criteria group
(0-max group weight)



Use of Survey Results



W_1

W_2

...

W_n

Stakeholder survey:
average weight value across
respondents for each subcriterion

→

"Suitability index (I)"

(weighted average sum)

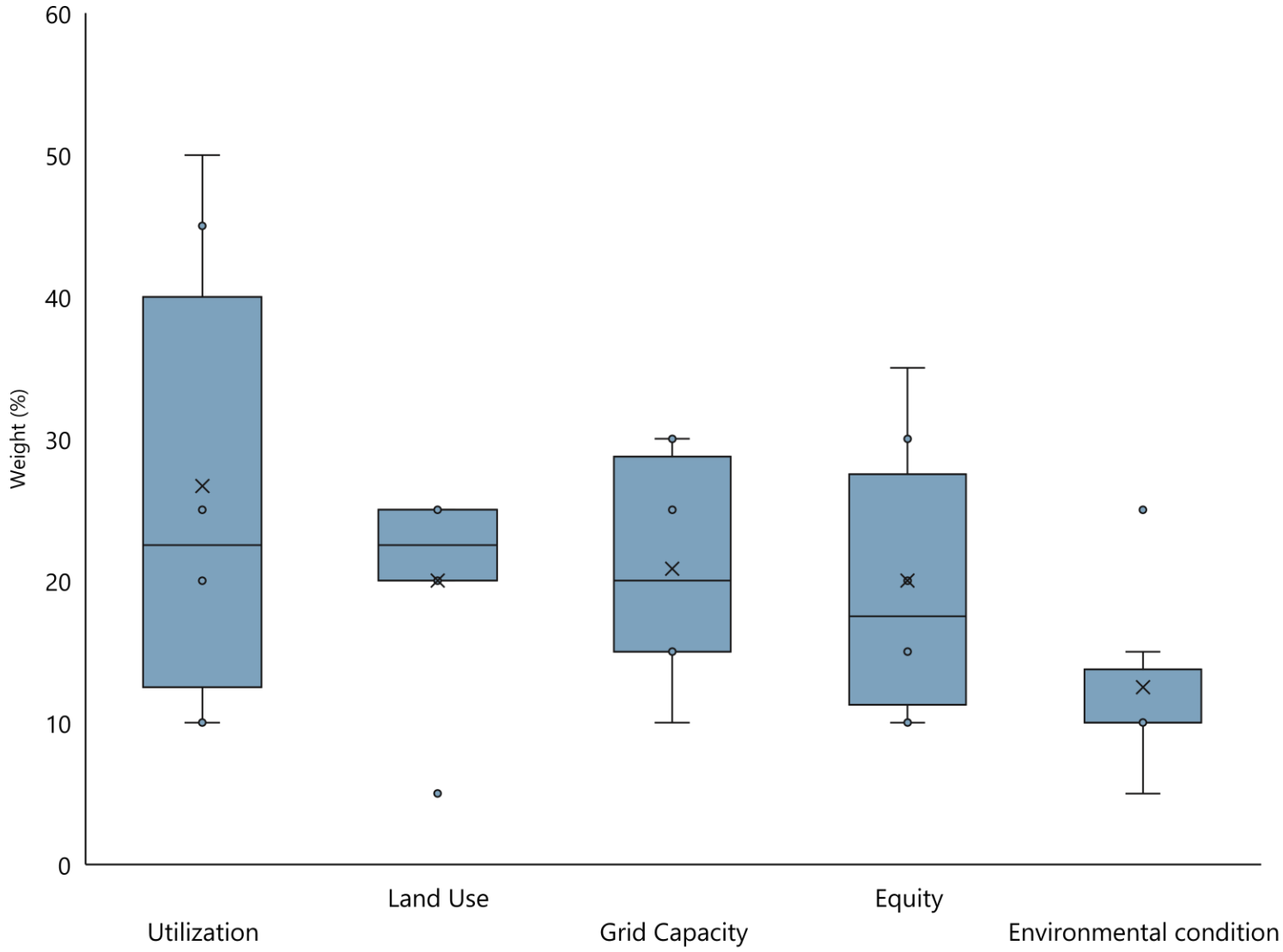
Survey Results

Weighting Criteria Groups

Total number of complete responses: 6

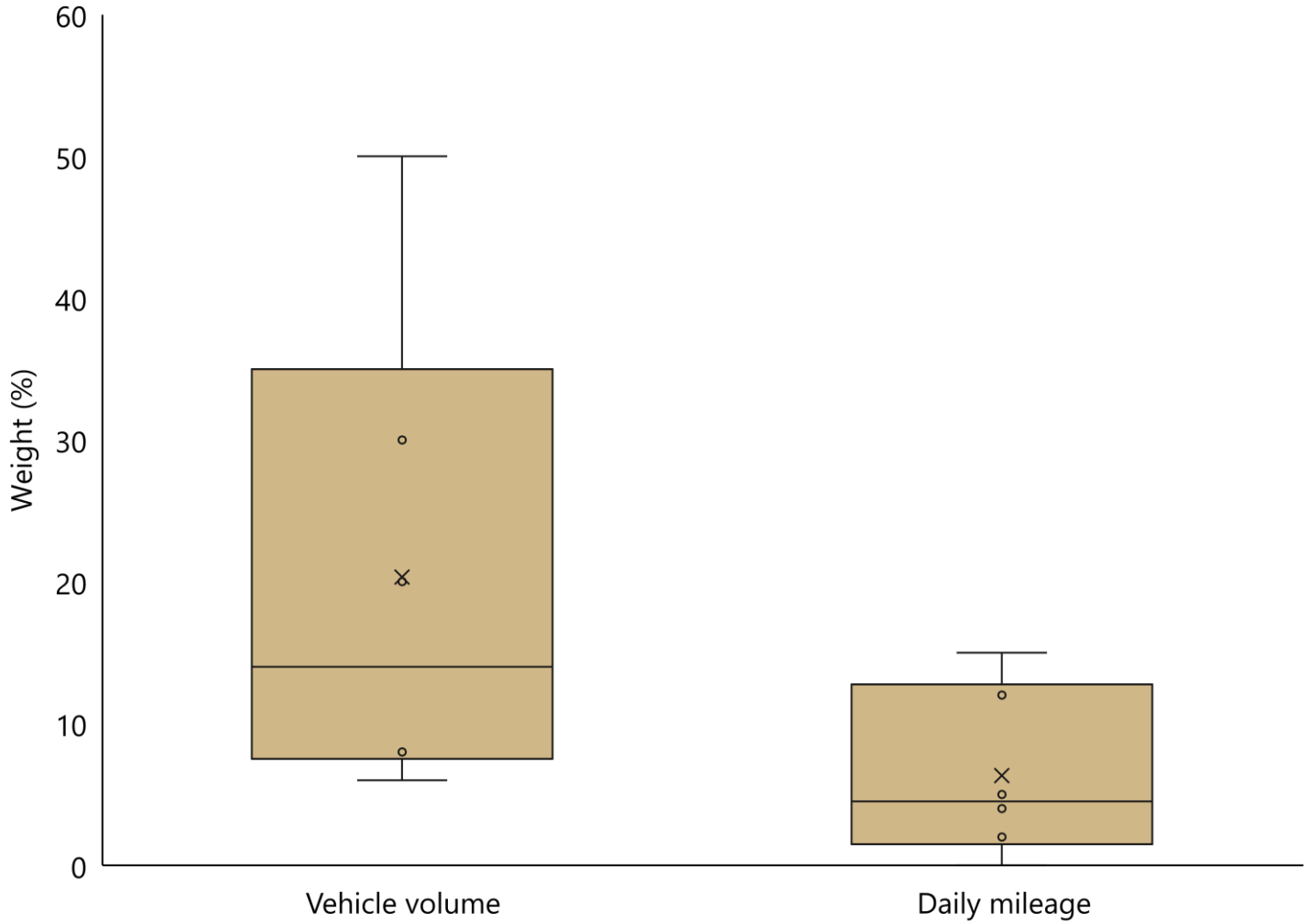
Partial responses: 4

**as of February 20*



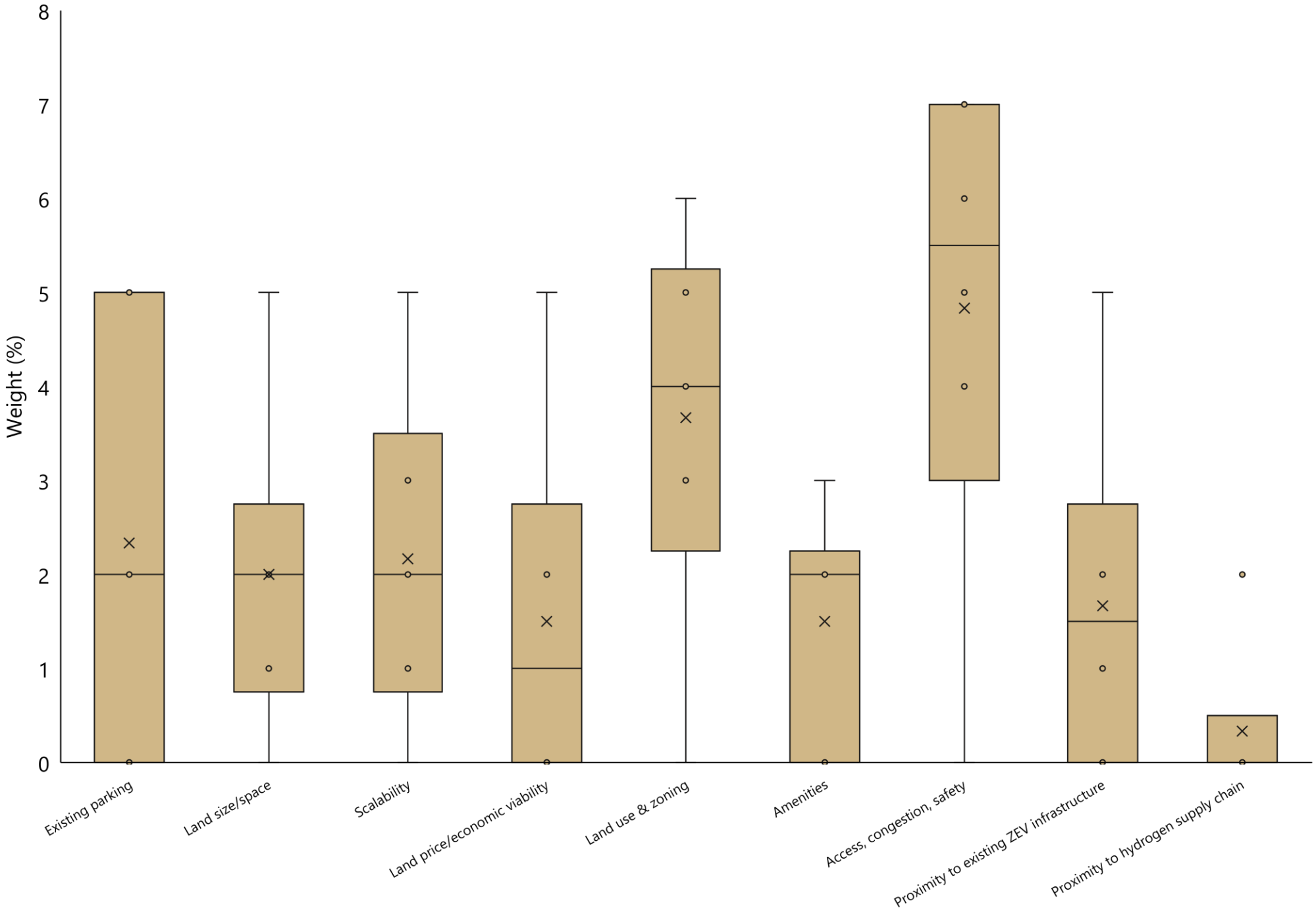
Survey Results

Utilization



Survey Results

Land Use



Preliminary Site Typologies

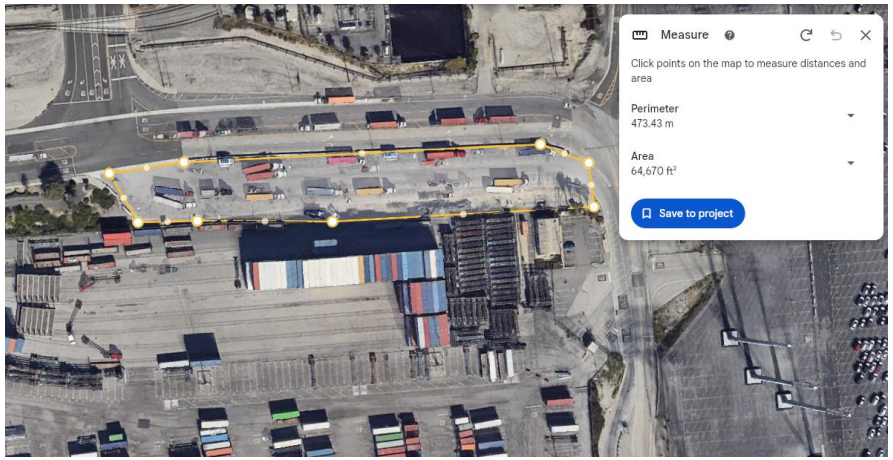
Electric Vehicle Charging

Small Facilities	10 dual port chargers
	Minimum of 20 parking spots
	Land Space: 60,000 sq. ft. (*3,000 sq.ft. per spot*)
	Grid Capacity: 3 MW
	500 truck trips a day *(assuming each truck stops for 1 hr and charging facilities are operational 24 hrs)*
Medium Facilities	25 dual port chargers
	Minimum of 50 parking spots
	Land Space: 150,000 sq. ft.
	Grid Capacity: 7.5 MW
	1,200 truck trips a day
Large Facilities	40 dual port chargers
	Minimum of 80 parking spots
	Land Space: 240,000 sq. ft.
	Grid Capacity: 12 MW
	2,000 truck trips a day

Port of Long Beach-WattEV

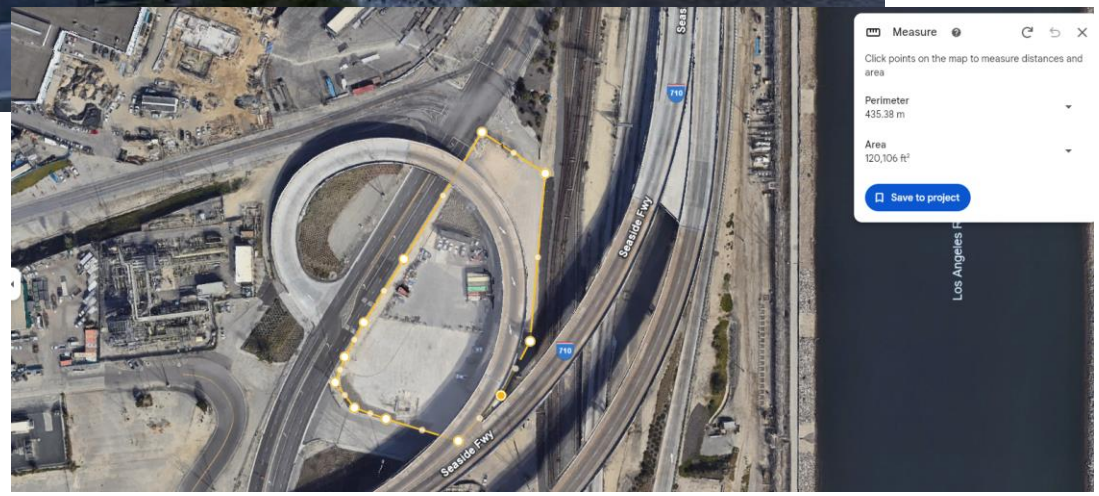
- Example of **small** facility
- Opened: 7/24/2023
- 13 dual-port chargers (26 trucks charged simultaneously)
- 360 kW each charger
- 5 MW of power
- 2-3 hours of charging time
- Plans to offer megawatt charging reducing charging times to 20 to 40 minutes
- Operational 24/7
- Land space: ~65,000 sq.ft

2404 Pier A Way, Long Beach, CA 90802



Port of Long Beach-Forum Mobility

- Example of **medium** facility
- Planned facility (Fall 2024)
- 19 dual-port chargers
- 6 single-dispenser chargers
- 360 kW each charger
- 44 trucks charged simultaneously
- 9 MW of power
- Planned to serve over 200 electric trucks a day (at full capacity)
- Ability to charge an electric Class-8 truck in about 90 minutes
- Land space: ~120,000 sq.ft



260 Pico Ave, Long Beach, CA 90802. Adjacent to the Long Beach Container Terminal

Bakersfield-WattEV

- Example of **large** facility
- Planned (end of 2024)
- 16 360-kW dual-port chargers served by PG&E
- 15 240-kW chargers powered by on-site solar
- Charging time will take 2-3 hours
- Plans to offer megawatt charging reducing charging times to 30 minutes
- Planned to serve 200 trucks a day
- 5 MW of solar power served by 2 MWh of battery storage
- PG&E to supply 640 kW, with plans to upgrade to 7 MW, and eventual generation and utilization of 25 MW of solar power
- Land space: ~115 acres (100 acres for solar)

Highway 65, north of Meadows Field Airport

Preliminary Site Typologies

Hydrogen Fueling

Small Facilities	1,000 kg/day
	2 dispenser units
	32 trucks per day *(assuming hydrogen tank capacity of 31 kg)*
	10,000 sq.ft.
	2.1 MW *(assuming 50 kWh per kg)*
Medium Facilities	3,000 kg/day
	6 dispenser units
	96 trucks per day
	30,000 sq.ft.
	6.3 MW
Large Facilities	6,000 kg/day
	12 dispenser units
	193 trucks per day
	60,000 sq.ft.
	12.5 MW

An average of 5,000 sq.ft. per truck lane

NEXT STEPS

Next Steps: Modeling Refinement

- Design and test different adoption scenarios
  - *ZEV adoption – vary by truck market segment*
  - *ZEV adoption – pivot off AATE3 adoption rates as plausible alternative futures*
  - *Public charging usage – use survey results to refine*
  - *Charge levels at the beginning of the travel day*
- Evaluate modeling assignment results – refine and adjust
- Incorporate/test different number of public charging locations/areas
- Run for multiple future years in the 2030-2045 horizon year

Next Steps: Siting Typologies

- Finalize data for development of the siting tool (e.g., land-use data)
- Incorporate TAC survey results into prioritization framework
- Design and develop web-based mapping tool

Next Steps: Project Overall

- Integrate the two technical streams of work – modeling and siting
- Refine the analysis further from preliminary to draft to final
- Develop case studies using siting typologies for the blueprint
- Start-up second round of engagement using draft results as a means of discussion
- Evaluate ways to provide interim findings with TAC between TAC meetings

Contact

Jonathan Raspa
raspa@scag.ca.gov

Anurag Komanduri
akomanduri@camsys.com

Sam Zneimer
SZneimer@Camsys.com

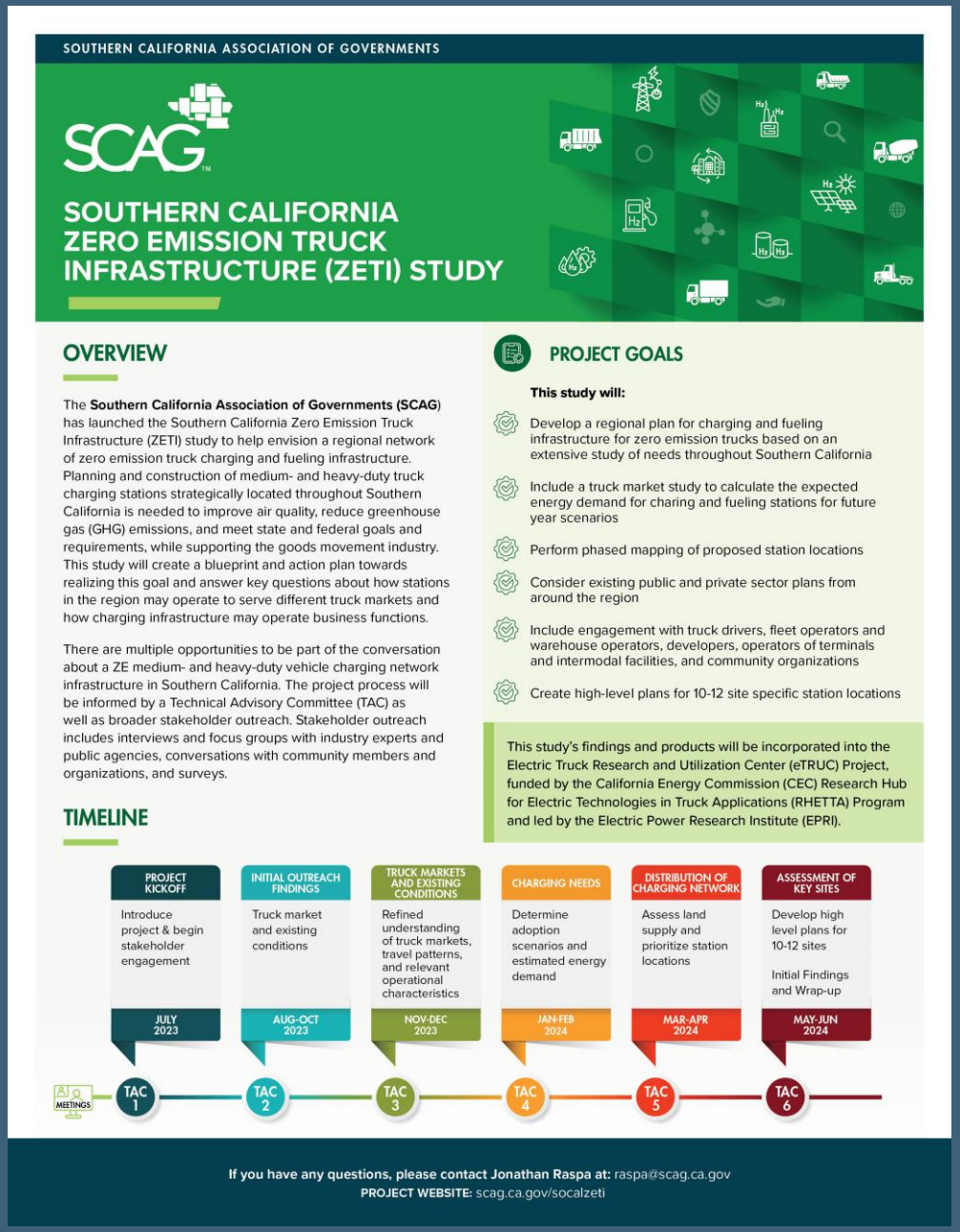
Lars Christiansen
SCAG-ZETI@cramobility.com

THANK YOU!

For more information, please visit:

https://scag.ca.gov/socalzeti

SCAG-ZETI@cramobility.com



SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS

SOUTHERN CALIFORNIA ZERO EMISSION TRUCK INFRASTRUCTURE (ZETI) STUDY

OVERVIEW

The **Southern California Association of Governments (SCAG)** has launched the Southern California Zero Emission Truck Infrastructure (ZETI) study to help envision a regional network of zero emission truck charging and fueling infrastructure. Planning and construction of medium- and heavy-duty truck charging stations strategically located throughout Southern California is needed to improve air quality, reduce greenhouse gas (GHG) emissions, and meet state and federal goals and requirements, while supporting the goods movement industry. This study will create a blueprint and action plan towards realizing this goal and answer key questions about how stations in the region may operate to serve different truck markets and how charging infrastructure may operate business functions.

There are multiple opportunities to be part of the conversation about a ZE medium- and heavy-duty vehicle charging network infrastructure in Southern California. The project process will be informed by a Technical Advisory Committee (TAC) as well as broader stakeholder outreach. Stakeholder outreach includes interviews and focus groups with industry experts and public agencies, conversations with community members and organizations, and surveys.

PROJECT GOALS

This study will:

- Develop a regional plan for charging and fueling infrastructure for zero emission trucks based on an extensive study of needs throughout Southern California
- Include a truck market study to calculate the expected energy demand for charing and fueling stations for future year scenarios
- Perform phased mapping of proposed station locations
- Consider existing public and private sector plans from around the region
- Include engagement with truck drivers, fleet operators and warehouse operators, developers, operators of terminals and intermodal facilities, and community organizations
- Create high-level plans for 10-12 site specific station locations

This study's findings and products will be incorporated into the Electric Truck Research and Utilization Center (eTRUC) Project, funded by the California Energy Commission (CEC) Research Hub for Electric Technologies in Truck Applications (RHETTA) Program and led by the Electric Power Research Institute (EPRI).

TIMELINE

PROJECT KICKOFF	INITIAL OUTREACH FINDINGS	TRUCK MARKETS AND EXISTING CONDITIONS	CHARGING NEEDS	DISTRIBUTION OF CHARGING NETWORK	ASSESSMENT OF KEY SITES
Introduce project & begin stakeholder engagement	Truck market and existing conditions	Refined understanding of truck markets, travel patterns, and relevant operational characteristics	Determine adoption scenarios and estimated energy demand	Assess land supply and prioritize station locations	Develop high level plans for 10-12 sites Initial Findings and Wrap-up
JULY 2023	AUG-OCT 2023	NOV-DEC 2023	JAN-FEB 2024	MAR-APR 2024	MAY-JUN 2024
MEETINGS TAC 1	TAC 2	TAC 3	TAC 4	TAC 5	TAC 6

If you have any questions, please contact Jonathan Raspa at: raspa@scag.ca.gov
PROJECT WEBSITE: scag.ca.gov/socalzeti