



California-Mexico Medium- and Heavy-Duty Zero-Emission Vehicles (MHD ZEV) Transition

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Ongoing and Future ZEV Work



- **Developing a blueprint for MD & HD ZEV infrastructure for Southern California Air Basin - CEC**
- **RHETTA - Research Hub from Electric Technologies in Truck Applications**
- **Fuel cell truck testing and evaluation – Cummins, Nikola**
- **Develop microgrids with hydrogen production/storage capabilities – proposed to DOE and NSF**
- **Effects of hydrogen injection on natural pipeline infrastructure – CPUC, Hydrogen Hub**
- **Evaluation of BEV sweepers – Caltrans**
- **Hydrogen production from biomass – CEC, Taylor Energy**
- **California Statewide ZEV deployment Tool - Caltrans**



- **Meet State and Federal regulatory requirements to deploy Zero Emission Vehicles (ZEVs)**
- **Comply with State mandates for state agencies to transition to ZEVs**
- **Diverse statewide fleet of roughly 12,000 vehicles**
- **Highly varied vehicle activity**
- **ZEV deployments require supporting refueling infrastructure**
- **Determination if vehicle range capabilities match vehicle usage patterns**
- **Determination if vehicle refueling needs can be met by existing and/or proposed charging or refueling infrastructure**





- ZEV compatibility
- Trip analysis
- Charging activity
- H2 refueling activity
- Vehicle range
- Charger type
- Opportunity charging
- Overnight charging
- LD/MD/HD
- BEV vs. H2
- Vehicle activity based

Zero Emission Vehicle Compatibility

Date Range:
 From: 2019-01-01 00:00:00
 To: 2100-01-01 00:00:00

EQUIP ID:
 7008894 CHEVROLET CRUZE

Refueling Options

- Elec. Level 1 (AC 120V) 4 mi/hr
- Elec. Level 2 (11772) 25 mi/hr
- Elec. Fast DC CHAdeMO 0 mi/hr
- Elec. Fast DC CCS 180 mi/hr
- Tesla 0 mi/hr
- Hydrogen All

Miles Range - MAX: 238

Additional Options

- EV Overnight Charging
- On-Demand Refueling
- Caltrans ONLY
- Proposed Fuel Stations

Find Required Miles Range (for ZEV-compatible)

Find ZEV-compatible Miles Range:

Quick Links: Preferences, Fuel Stations, Fleet Vehicles

Copy Settings -> New ZEV Vehicle

Analyze

ZEV Trips: 280 / 329
 Average Distance: 13.1 miles
 Longest Distance: 113.8 miles

85%

View As Table



- Select type of refueling infrastructure
- H2, Fast DC, L2, Caltrans
- Opportunity refueling preferences
- Analysis results with varied refueling preference

CaltransZEV

CaltransZEV Analysis About

Zero Emission Vehicle Compatibility

Event: Trip TripID: 217
Duration: 1.46 hour(s), Distance: 76.8 miles

Map showing a route from Oxnard to Los Angeles with various refueling stations marked. A red circle highlights a station near Thousand Oaks.

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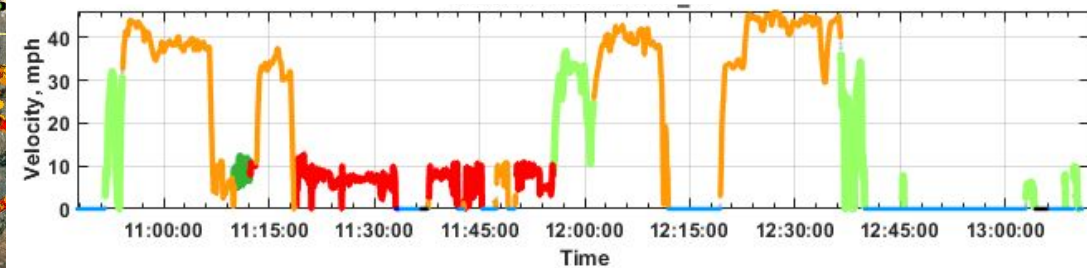
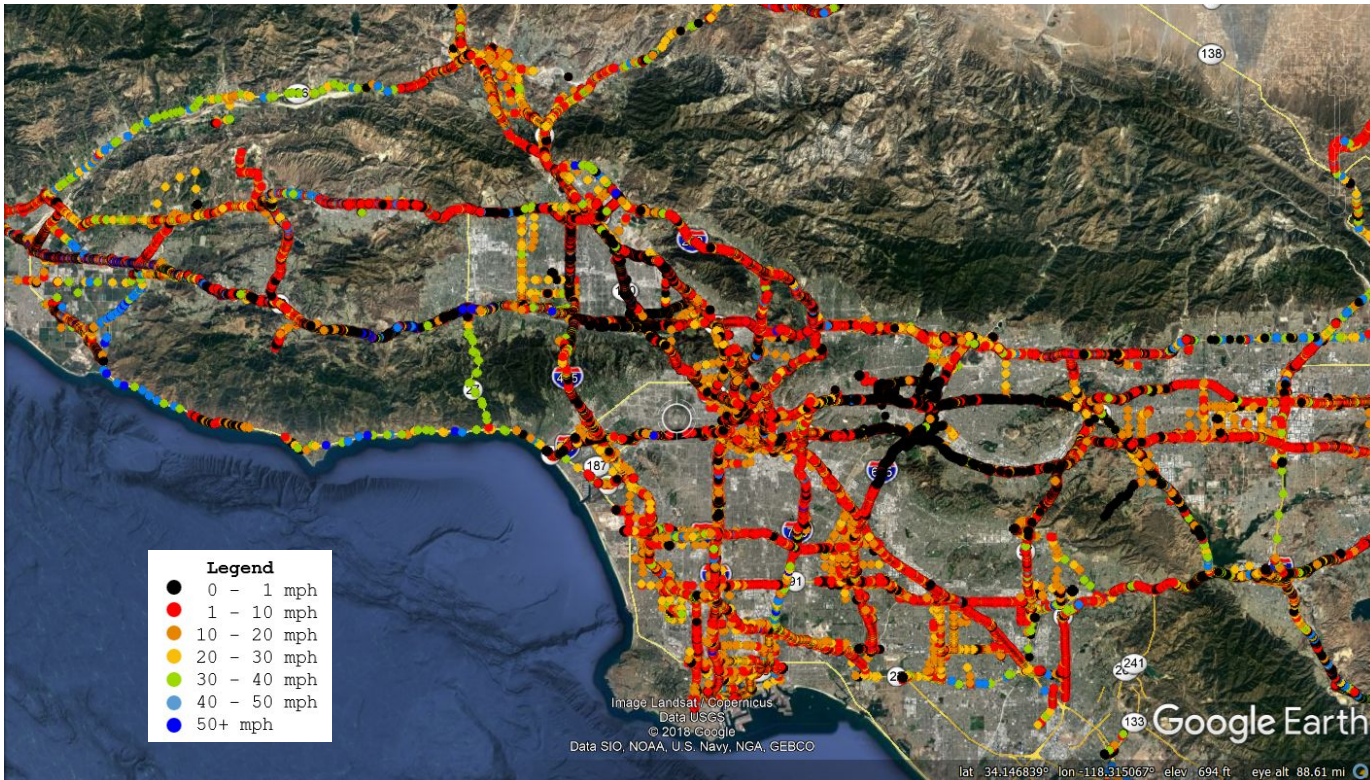
Form

<p>Station Type</p> <p><input checked="" type="radio"/> Public</p> <p><input type="radio"/> Caltrans</p> <p>Station Status</p> <p><input type="radio"/> Operational</p> <p><input checked="" type="radio"/> Planned</p> <p><input type="radio"/> Temporally</p> <p>Station Info</p> <p>Station Name: <input type="text" value="Test Station"/></p> <p>Station Address: <input type="text" value="123 Test"/></p> <p>City: <input type="text" value="Riverside"/> Zip: <input type="text" value="92507"/></p>	<p>Fuel Type</p> <p><input checked="" type="radio"/> Electric</p> <p><input type="radio"/> Hydrogen</p> <p>Level 1 - AC 120V: <input type="text" value="1"/></p> <p>Level 2 - J1772: <input type="text" value="1"/></p> <p>Level 3 - CHAdeMO: <input type="text" value="1"/></p> <p>Level 3 - CCS: <input type="text" value="0"/></p> <p>Tesla: <input type="text" value="0"/></p> <p><input type="checkbox"/> 350 Bar</p> <p><input type="checkbox"/> 700 Bar</p>
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Caltrans ZEV Sweeper Deployment



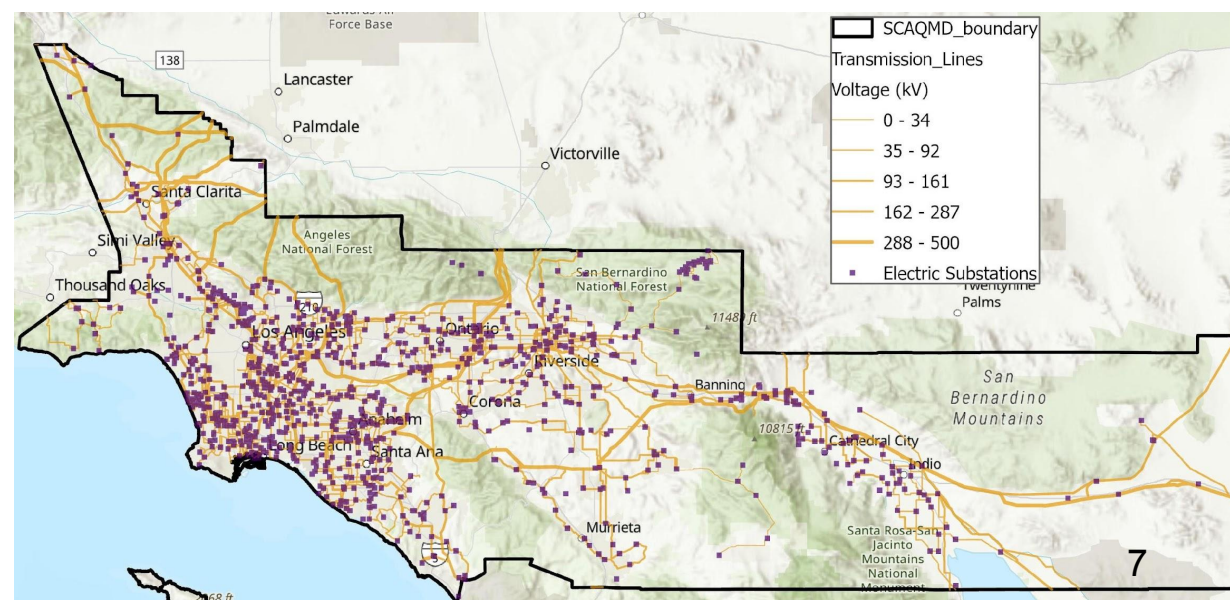
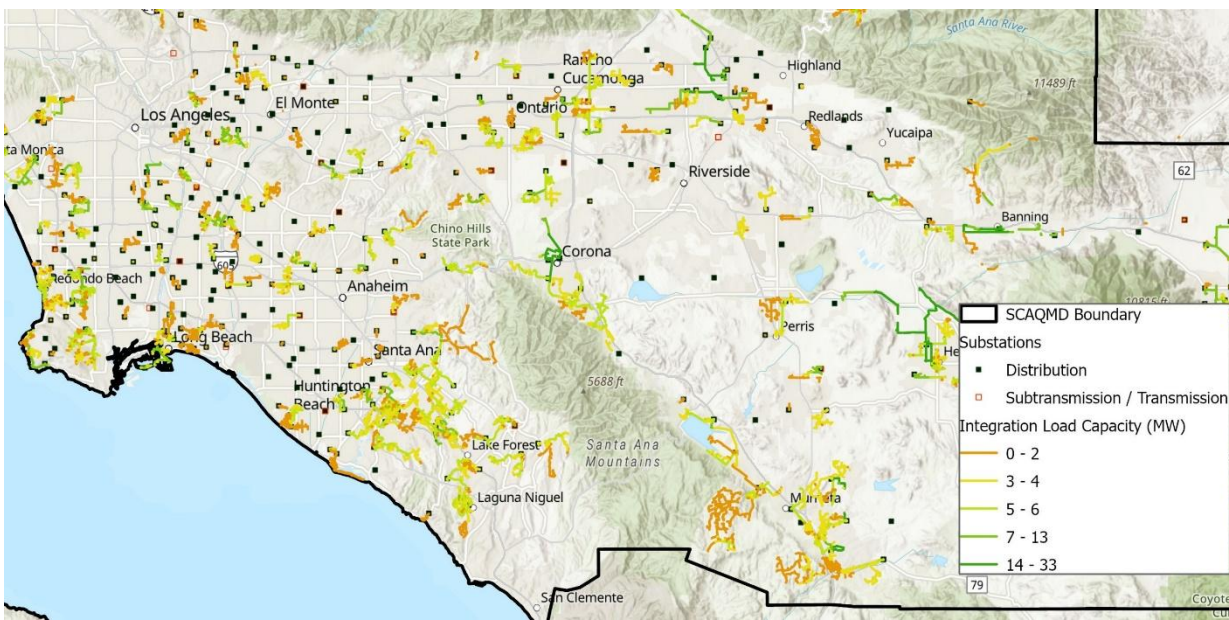
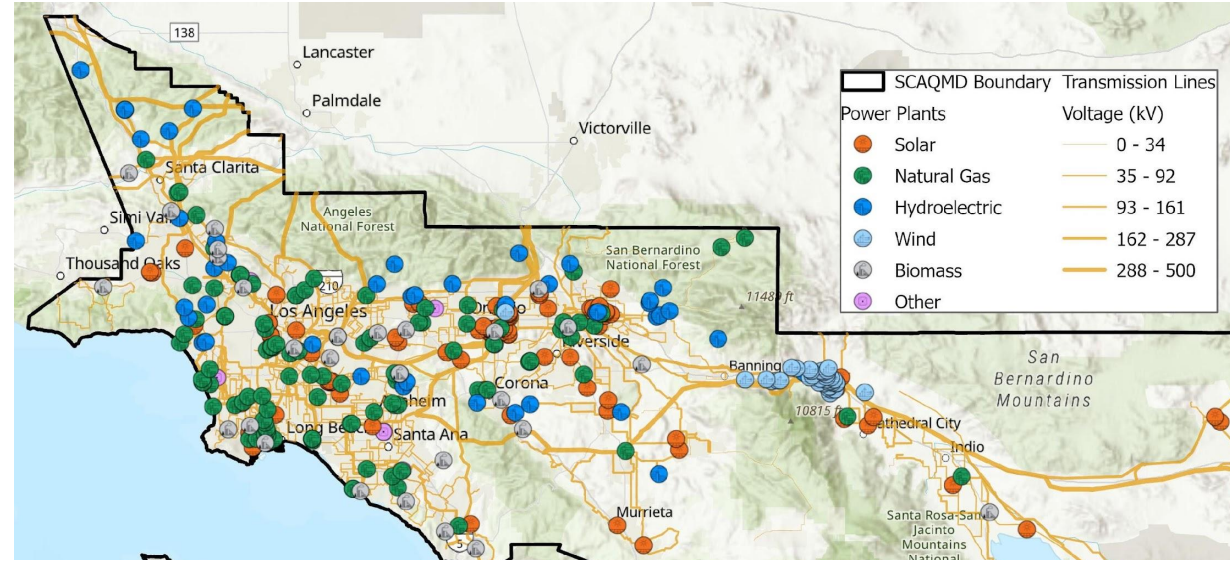
- UC Riverside independent evaluation
- Hydrogen Fuel Cell sweeper deployment
- Vehicle activity based performance evaluation
- Energy/emissions dyno evaluation
- Future evaluation of 18 BEV sweepers



Arterial Broom On Freeway Broom On Stopped Broom On Hopper Lift
 Arterial Broom Off Freeway Broom Off Stopped Broom Off



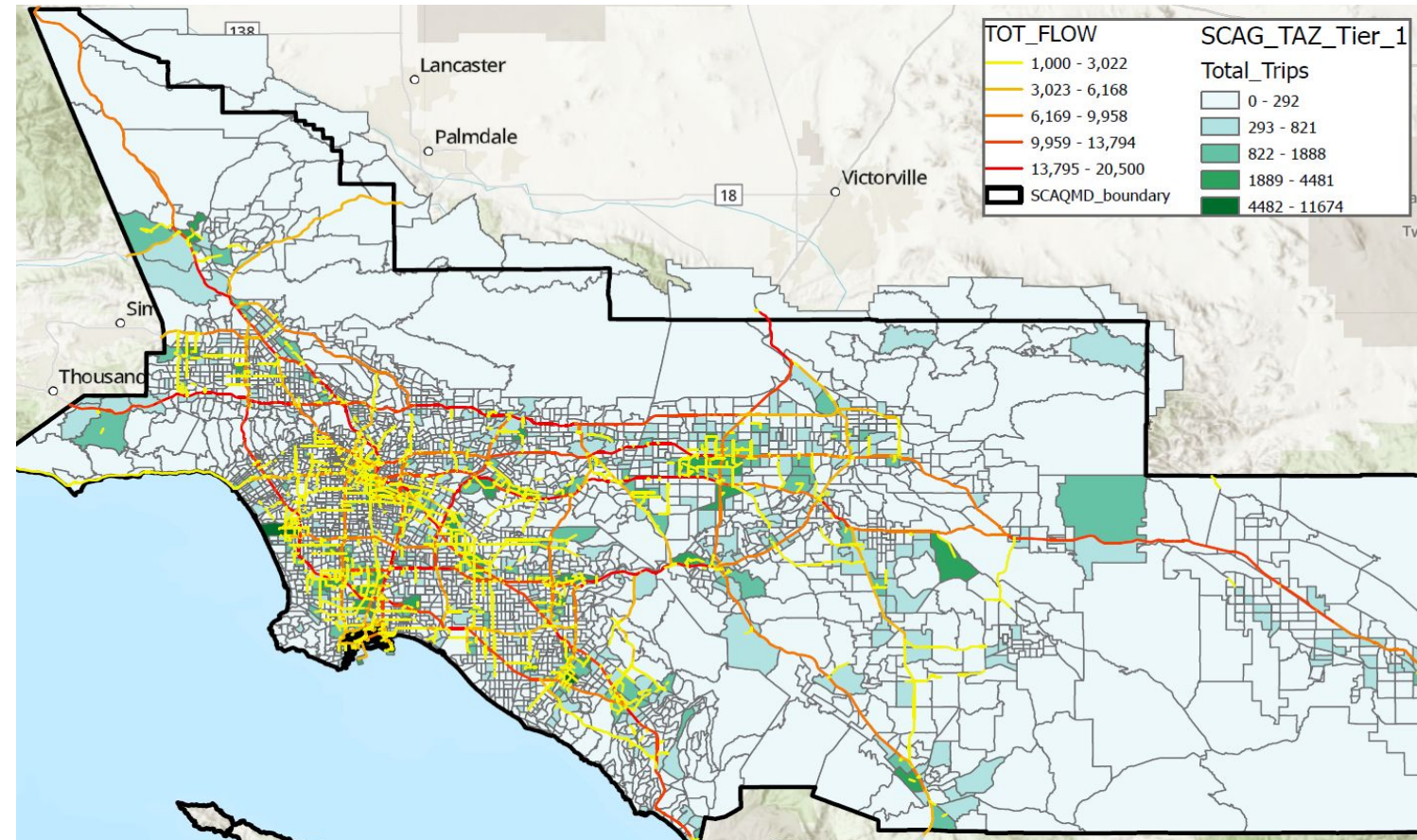
- Geospatial assessment of the electric grid infrastructure, including transmission, distribution, and substations information
- Geospatial assessment of existing electric power plants' generation capacity
- Geospatial assessment of new load integration capacity at the distribution level, within Southern California Edison (SCE) service territory





MD/HD Transportation Network Analysis:

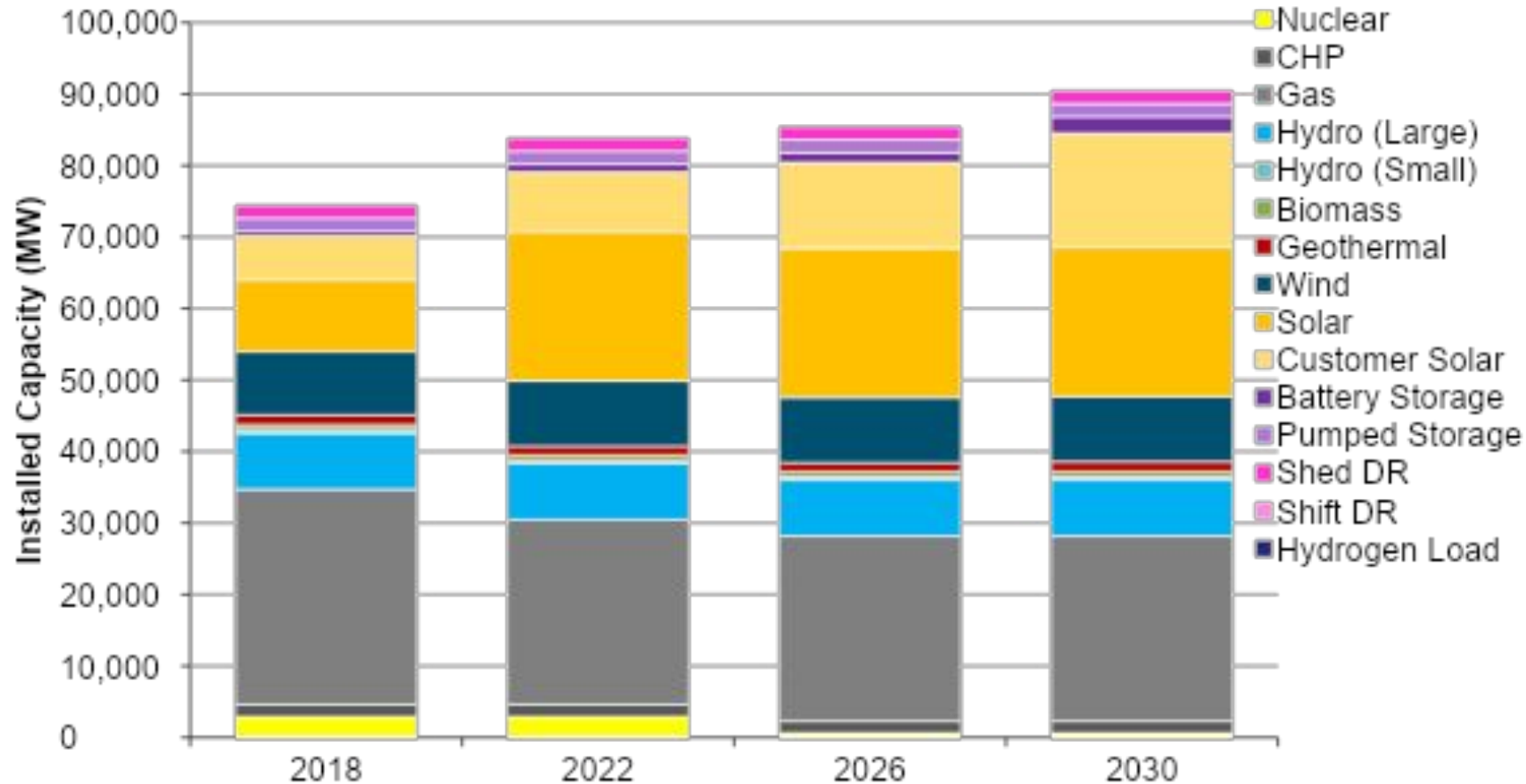
- Utilizing Southern California Association of Government (SCAG) truck model for SCAQMD region
- Developing an inventory of major driving routes, average traffic volumes, trips, current refueling locations, and other points of interest





NCST: Electric Fleet Adoption Strategies – Addressing Storage and Infrastructure Needs Resolve Modeling Results

- 50% RPS by 2030

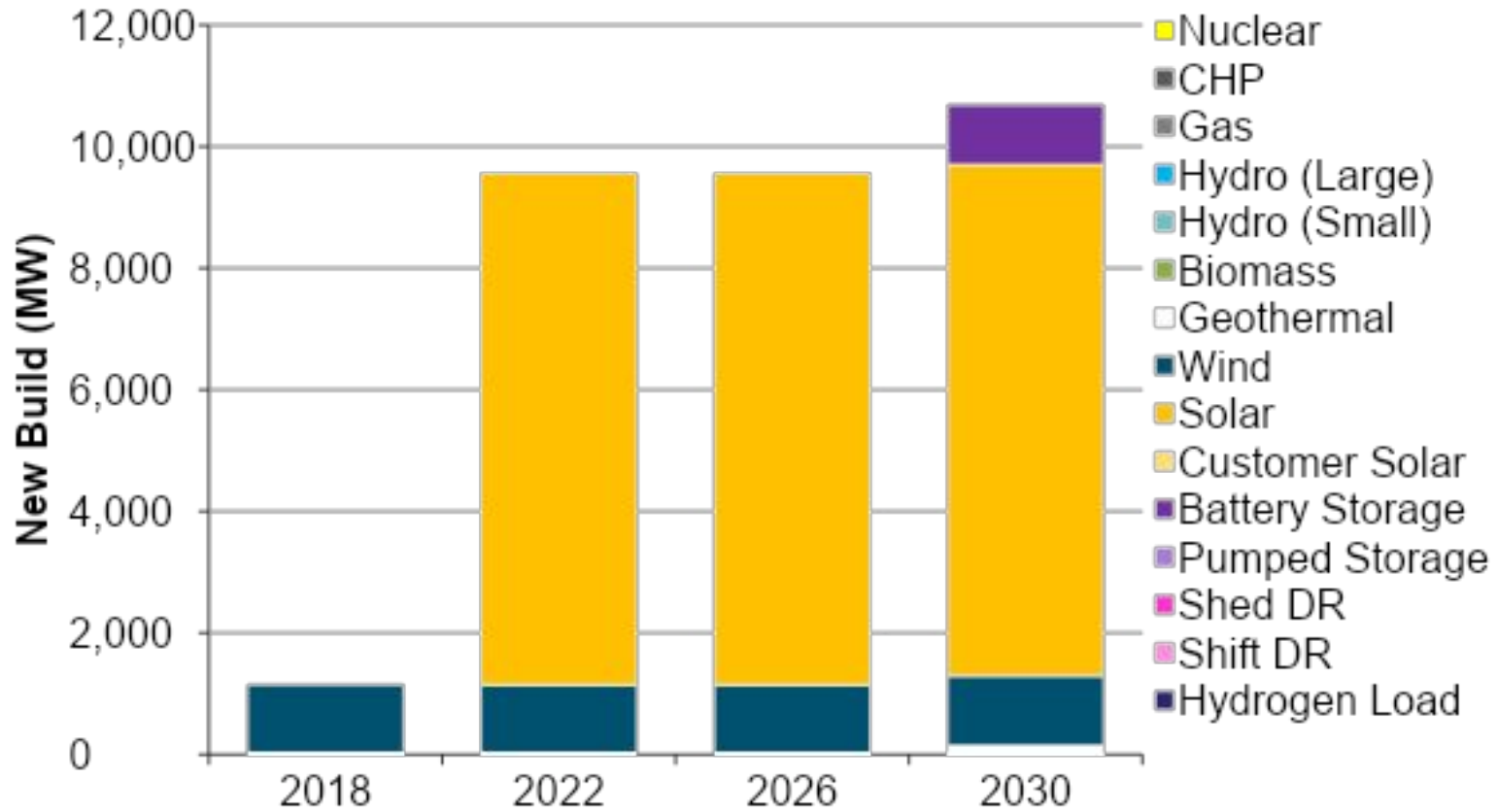


Total CAISO installed generating capacity



NCST: Electric Fleet Adoption Strategies – Addressing Storage and Infrastructure Needs Resolve Modeling Results

- 50% RPS by 2030



Total CAISO new build

MHD ZEV Transition Challenges



- **MHD compatible battery electric and hydrogen fueling infrastructure**
- **Availability of MHD vehicle quantities and configurations**
- **Technology limitations: vehicles, batteries, H2 fuel cells, H2 storage, H2 handling, refueling/recharging**
- **Electrical grid capacities (T&D) and hydrogen gas supplies**
- **Economics of vehicle replacements, refueling stations, and infrastructure upgrades**
- **Workforce training**
- **Community engagement and environmental justice**
- **Regional, state, national, and international coordination**