CALIFORNIA
AIR RESOURCES BOARD

California's Light-Duty Hydrogen Infrastructure and 2024 Annual Evaluation Highlights

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March 2025

Meeting overview

Goal: Provide an overview of the current light-duty Hydrogen FCEV infrastructure within California

Outline:

- Hydrogen and vehicle technology
- California Hydrogen infrastructure
- Highlights from 2024 analysis
- Methodology and tools
- Annual report outcome
- San Mateo County overview

Hydrogen and vehicle technology

- Hydrogen (H2) is **abundant** in nature and can be stored densely in gaseous or liquid form and used as fuel for industry, transportation, and power generation.
- It can be a **net zero emission fuel** derived from renewable electricity or renewable natural gas.
- With 24% of direct global transportation emissions from fuel combustion, H2 used in fuel cell electric (or possibly modified Internal Combustion Engine) vehicles, is a **promising solution** for achieving deep decarbonization, energy transition, and sustainable economic growth.
- The energy in 2.2 pounds (1 kilogram) of hydrogen gas is about the same as the energy in 1 gallon (6.2 pounds, 2.8 kilograms) of gasoline.
- Because hydrogen has a low volumetric energy density, it is stored onboard a vehicle as a compressed gas to achieve the driving range of conventional vehicles.

California hydrogen infrastructure

- The CA hydrogen fueling infrastructure is largely supported by:
  - **Clean Transportation Program (CTP),** originally authorized by Assembly Bill (AB) 118, re-authorized by AB 8 and subsequently AB 126.
  - **Low Carbon Fuel Standard (LCFS)**, providing credits for hydrogen infrastructure and low carbon fuel production

- AB 8 (2014-2023) had a goal of **100** publicly available stations.

- AB 126 reauthored focusing:
  - to support hydrogen vehicles until there is a **sufficient** network of hydrogen-fueling stations, which includes **all types available**, in operation in California…"
  - **Minimum 15%** funds for hydrogen stations – agencies interpret this to be flexible for various transportation sectors
  - 50% of these funds to benefit **disadvantaged communities**
  - Expires in 2035; hydrogen fund expires in 2030.

Examples of infrastructure investments (not exhaustive)

GFO 19-602

- Up to $115.7 million
- $52.7 million total awarded
- 20 stations still to build with awarded funds
- Shell returned $41 million grant (50 stations and 1 upgrade)

GFO 22-607

- Up to $27 million
- $9.7 million total awarded for light and multi-use stations
- Philips 66 cancelled $4 million grant that was supporting LDVs

GFO 23-604

- Up to $10.79 million
- Improvements in maintenance processes for stations
- 2 builders: Iwatani and First Element for 45 stations

New GFO 24-601

- Up to $15 million
- Light-Duty stations for SF and Sac
- $10 million for Capital Expenses and remaining $5 million for Operation & Maintenance

More examples of infrastructure investments

Federal Program Supporting ARCHES

- $8B IIJA funding for multiple hubs nationally
- Hydrogen Earth Shot Challenge:
  $5/kg target; Program to deploy H2 at scale

CA Public-Private Partnership

- $1.2 B (DOE) + $11.4 B (matching funds)
- M/HDV Stations & Industrial fuel use
- Local renewable H2 production
- ~220,000 well paying jobs

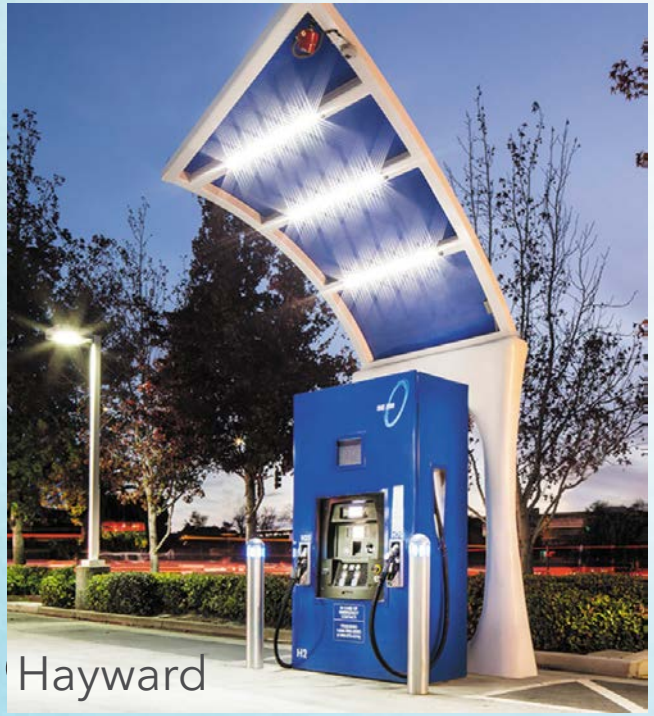
California hydrogen infrastructure: vehicle types

- Currently there are 3 fuel cell electric vehicles on the light duty vehicle market:
  - Toyota Mirai
  - Hyundai Nexo
  - Honda CR-V e:FCEV (plug-in)
- Others:
  - Honda Clarity (discontinued)
  - BMW iX5 (demonstration)

California hydrogen infrastructure

- Station developers that supply refueling needs in California:
  - First Element
  - Iwatani
  - Chevron (entering market)
  - Shell (exited LDV market)

Torrance


Hayward

Seal Beach

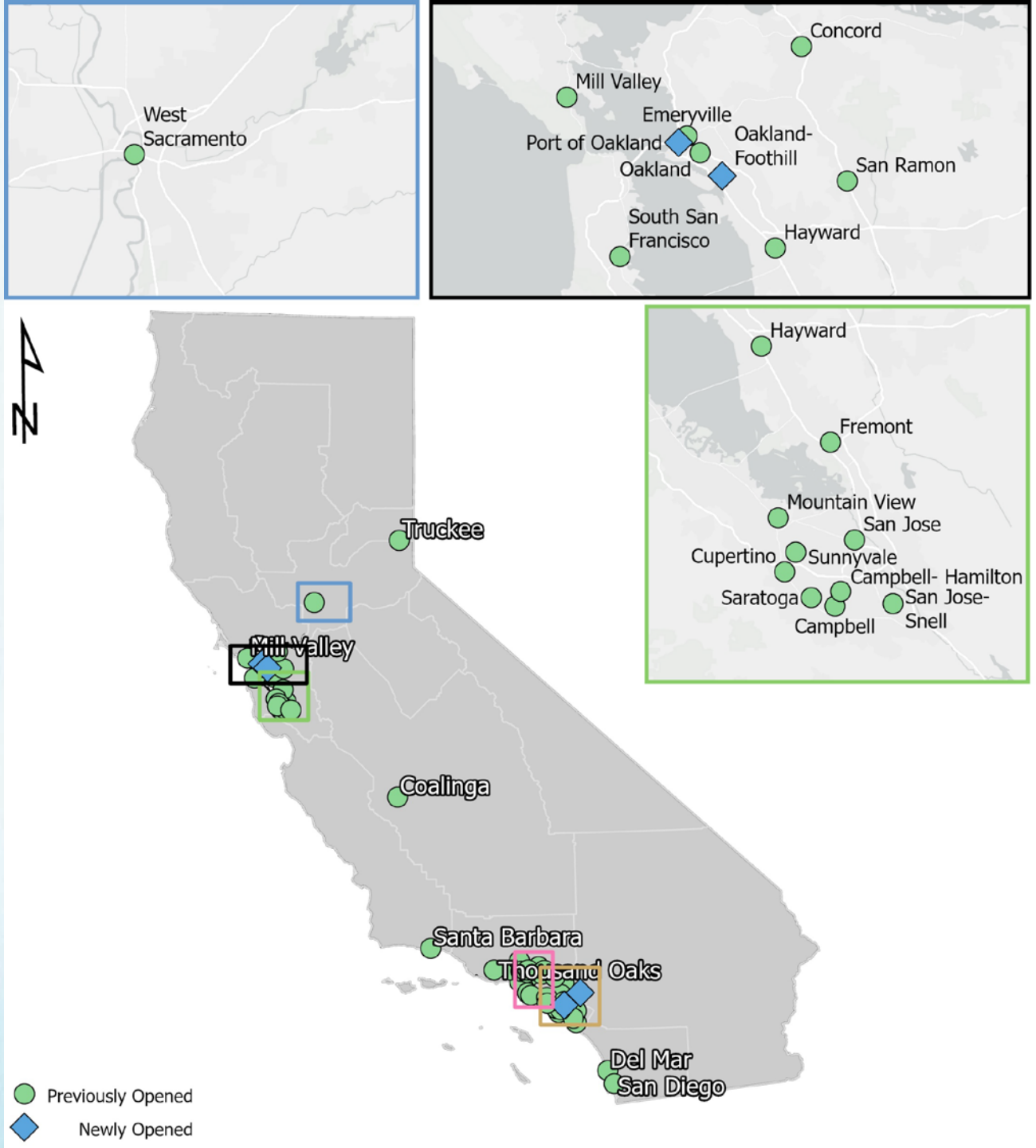
Harbor City

2024 Analysis: Current Station Network

During this analysis phase:
- 7 closed by shell
+ 4 newly opened

As of July 15, 2024, 62 stations network
→ 55 Open Retail
→ 7 Temporarily Non-Operational

[Current Station Map]



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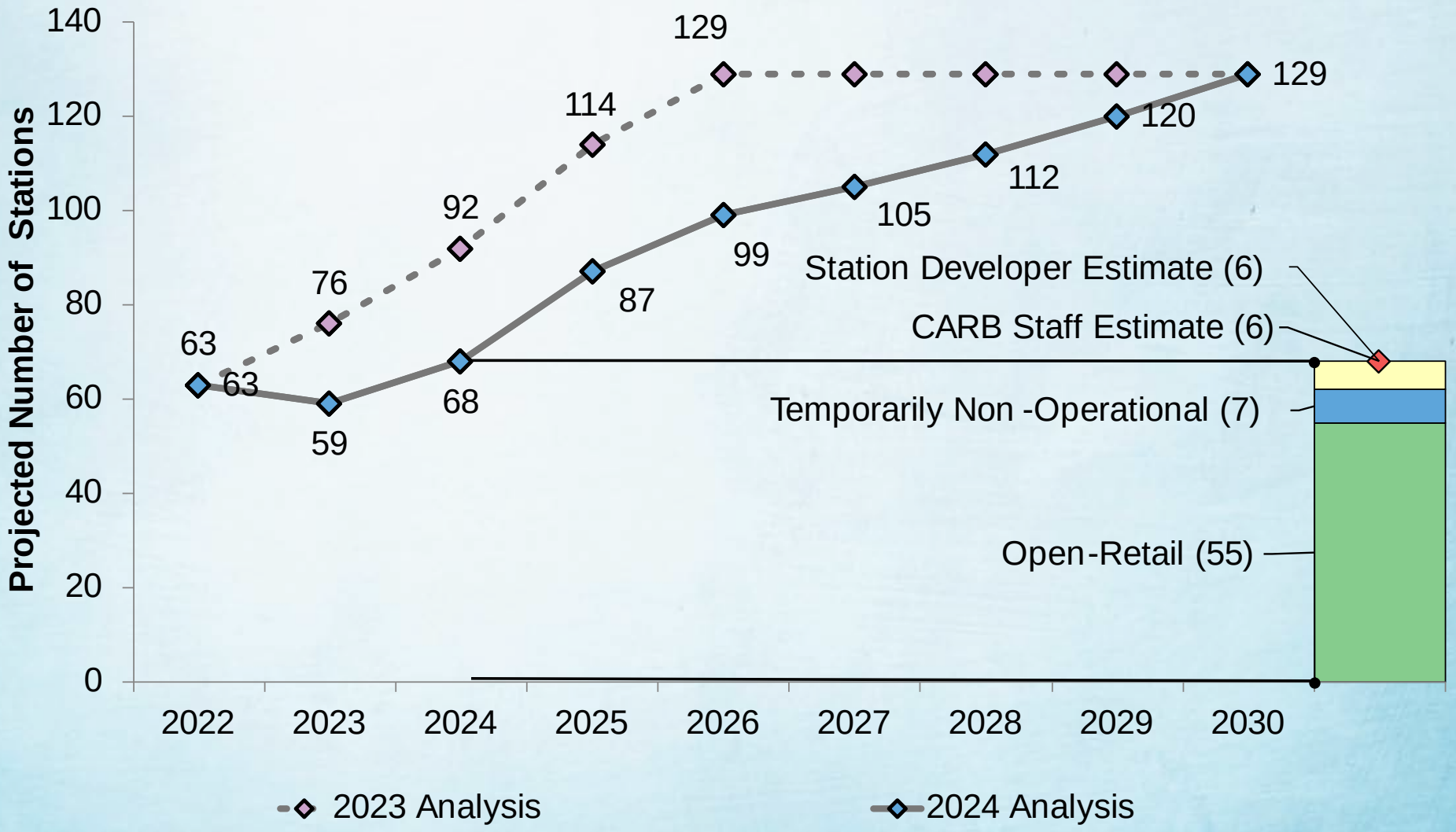
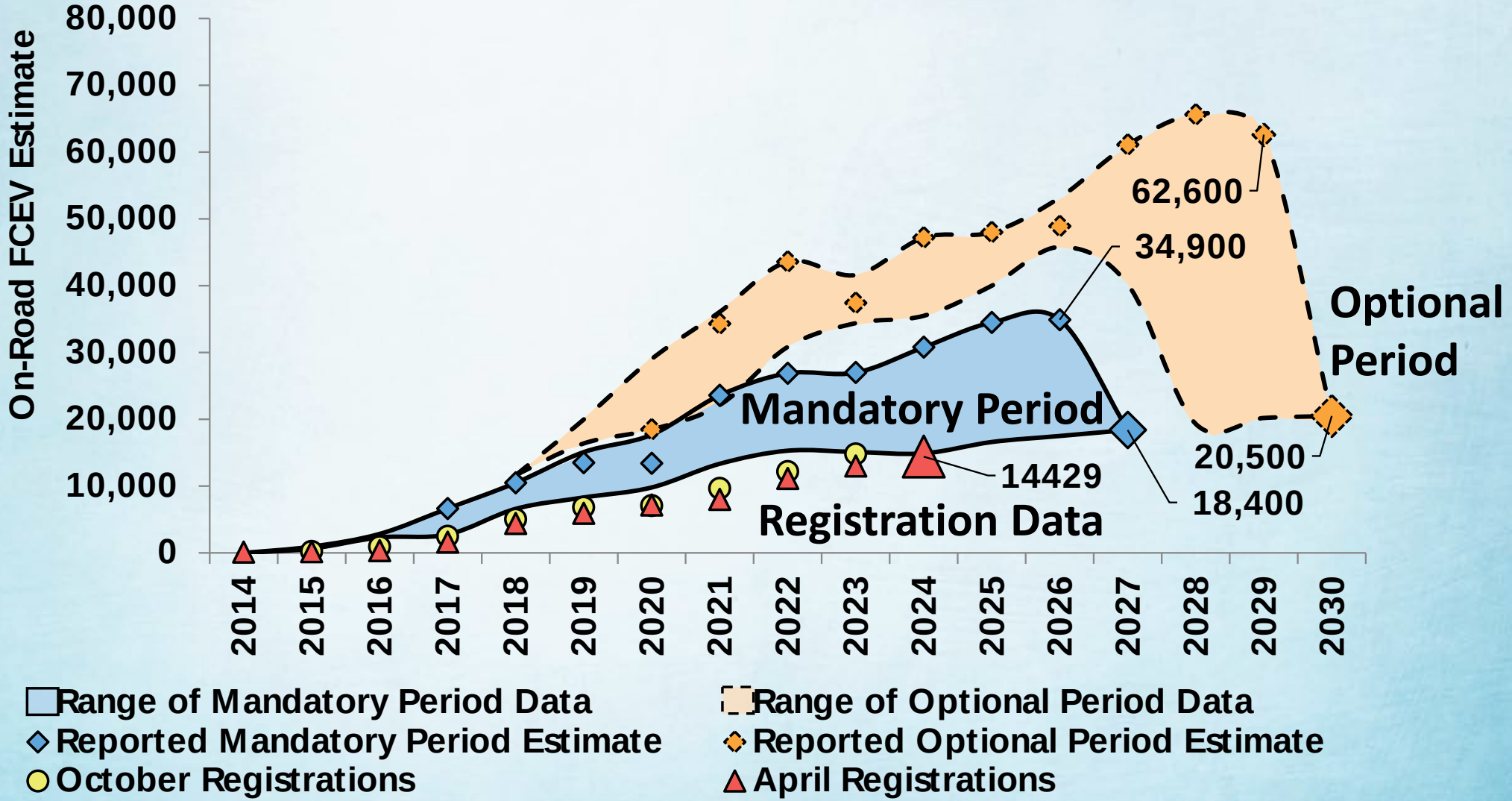
2024 Analysis: Future Station Projections



2024 Analysis: FCEV Projections



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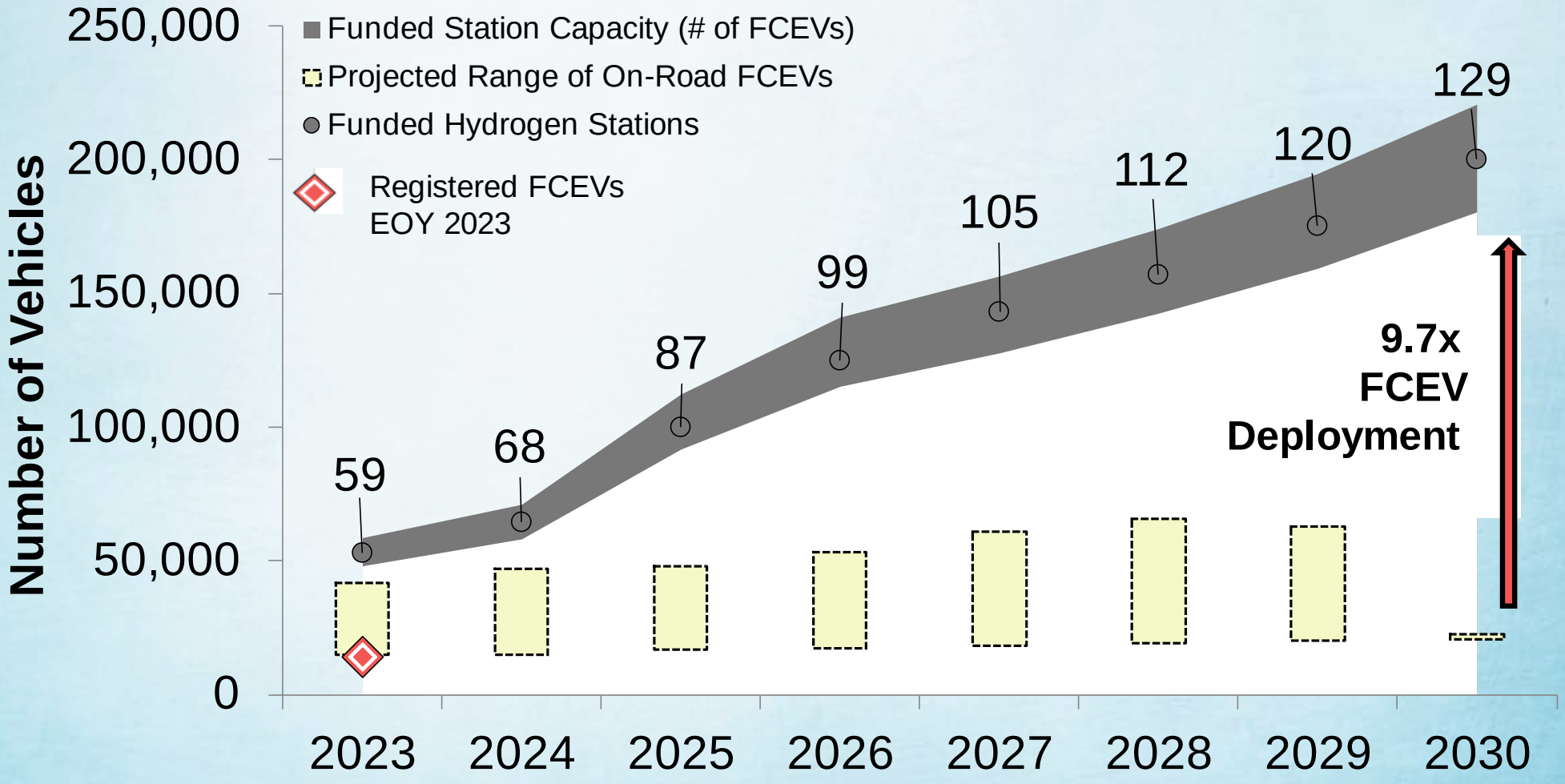
2024 Analysis: Projected Station Capacity



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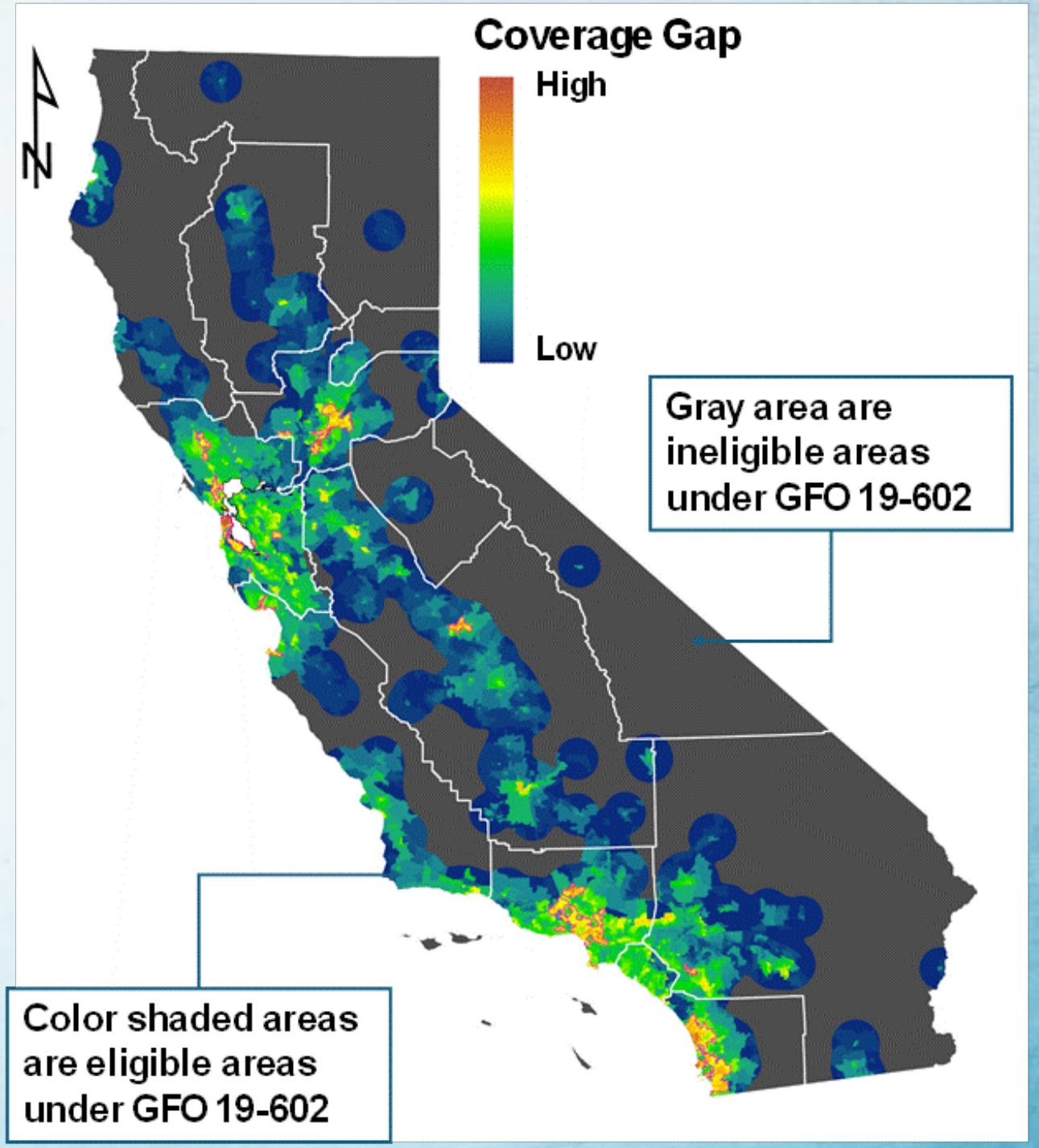
2024 Analysis: Spatial coverage and gap



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Methodology and tools

- DMV data (Vehicle and Zip code)
  - is used to create historic fleet database for interpolation of future fleet in MS-Excel and MS- Access.
  - is used to plot the spatial distribution of FCEVs across the state.

- OEM survey data (3 mandatory + 3 optional projection)
  - model year and bulk sale is provided.
  - assumes 1/3rd of a model year is sold in pervious year and remaining 2/3 in the same year.
  - is used to distribute projected vehicles across the state based on various socio-economic factors.

Methodology and tools

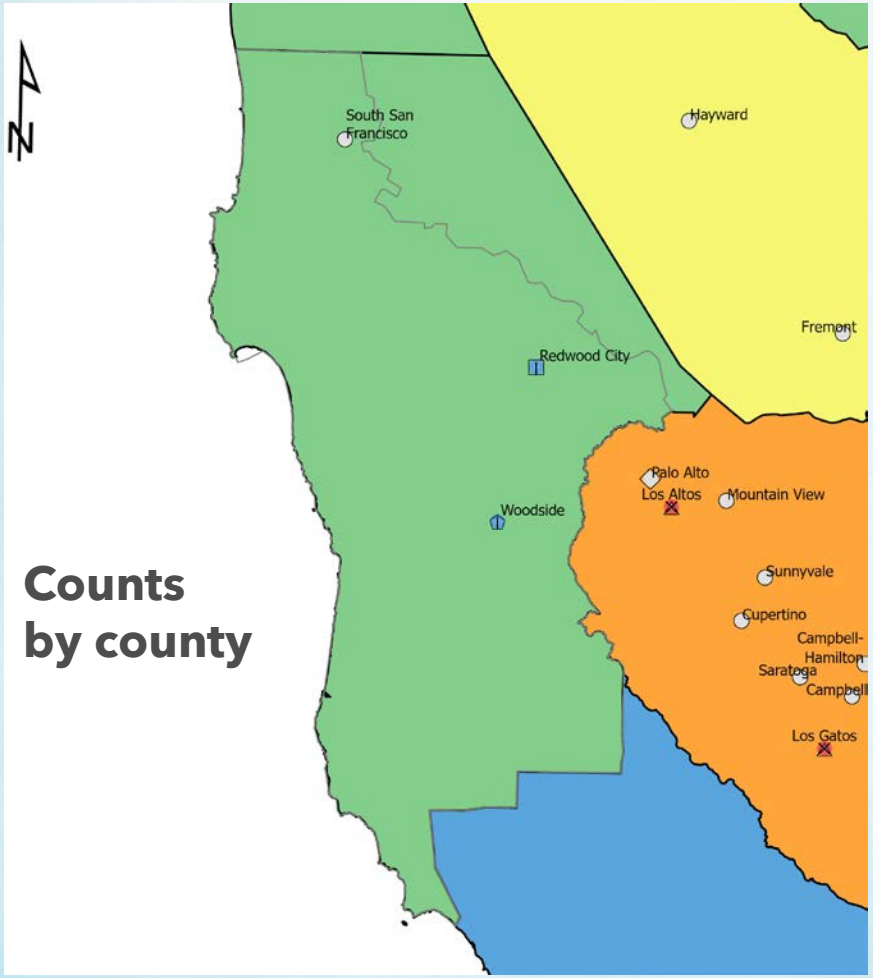
- H2FCP station network status and availability
  - is used to identify operation and temporarily non-operational stations
  - is used to determine 15 mins coverage of each station in ArcGIS.
  - is used to calculate the name plate capacity assuming a vehicle uses 0.7 kg per day

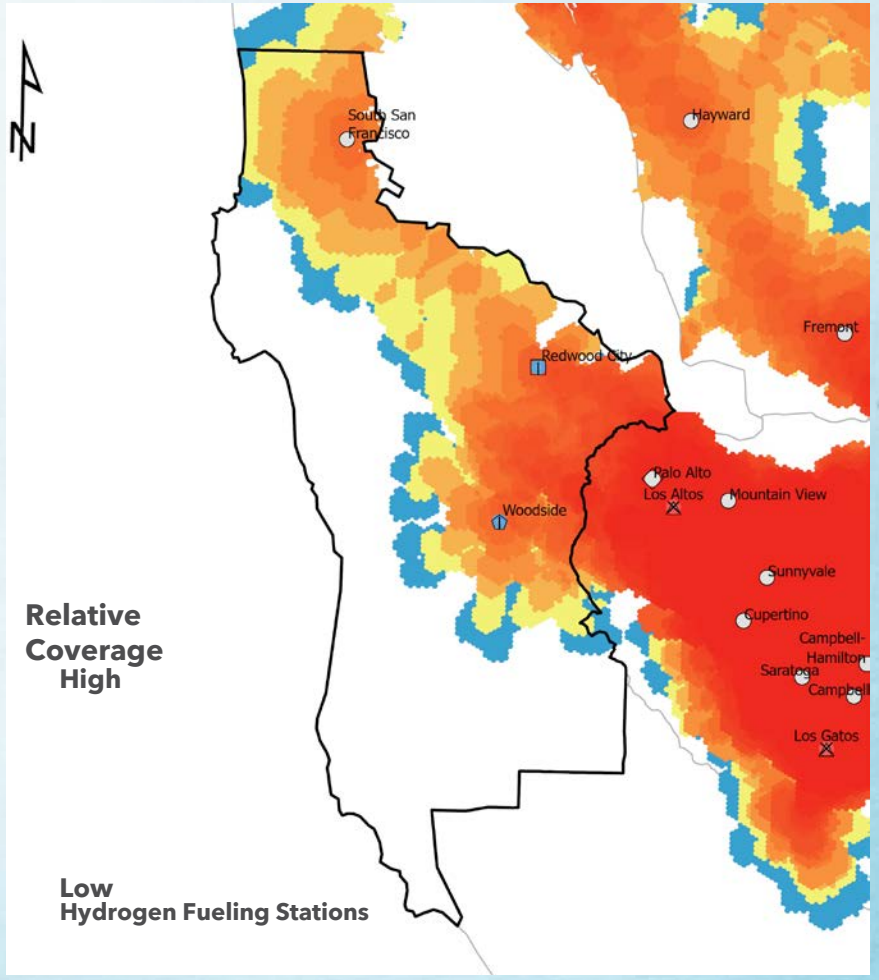
- Award list and development timeline data
  - new station location under development and their capacity are determined
  - based on spatial and temporal information, capacity is distributed across the county
  - comparing the projected vehicle distribution and station coverage, market gap and priority areas are determined.

2024 Annual report outcome

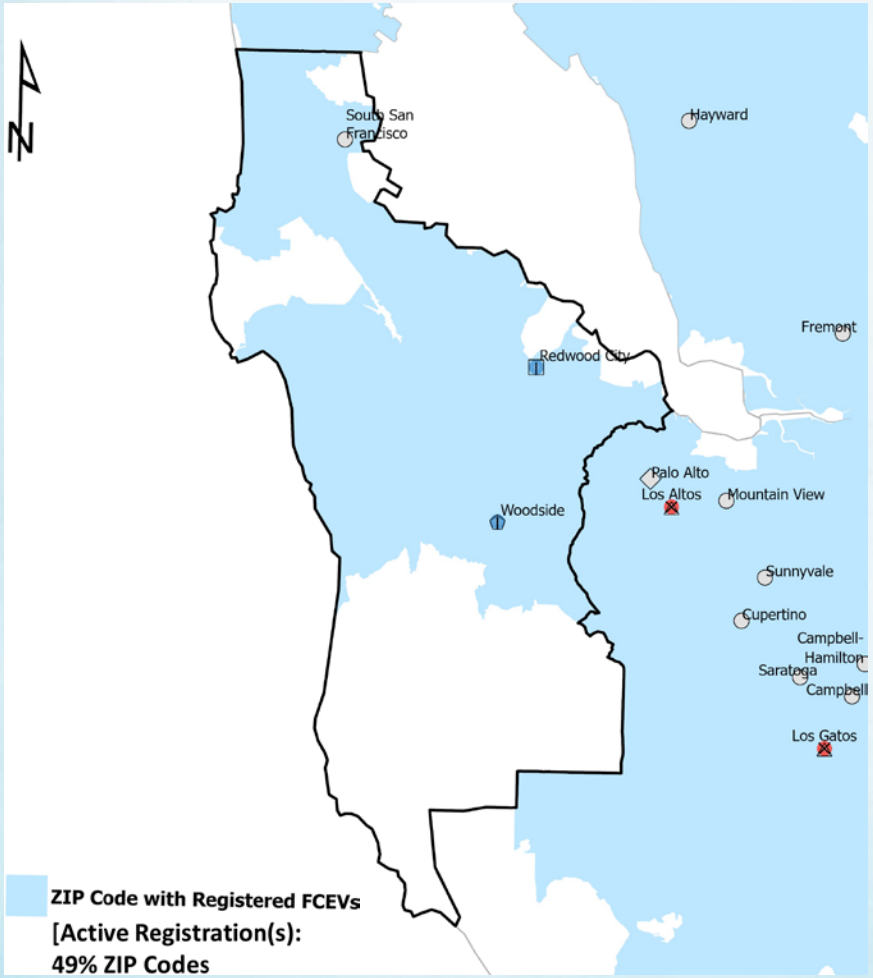
- Major recommendations for CEC to support hydrogen infrastructure for light–duty vehicles:
  - Use hydrogen infrastructure support funds to address improvement of station reliability and existing station retrofits.
  - Increase dialogue with hydrogen industry stakeholders to support light-duty infrastructure.
  - Potentially leverage opportunities with ARCHES to invest in light-duty hydrogen stations co-located with stations for heavy-duty and transit fuel cell buses.
- URL: https://ww2.arb.ca.gov/sites/default/files/2024-12/AB-126-Report-2024-Final.pdf

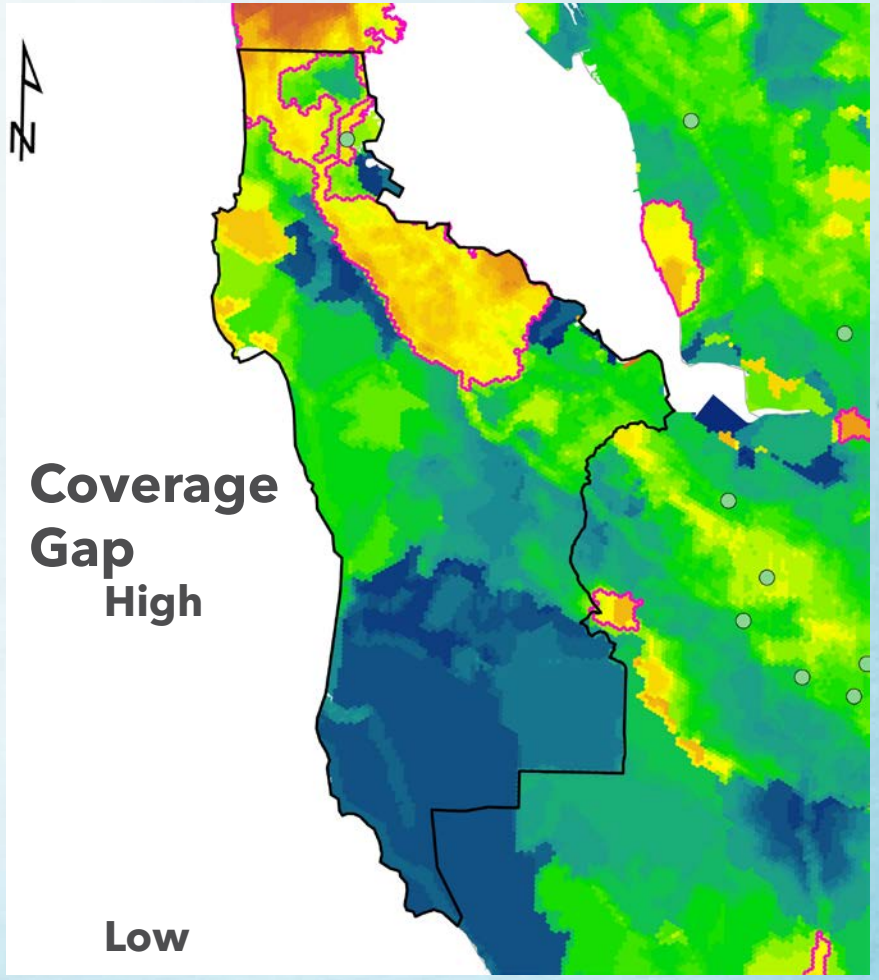
San Mateo County





San Mateo County





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CARB H2 Network Analysis

https://ww2.arb.ca.gov/our-work/programs/hydrogen-fueling-infrastructure