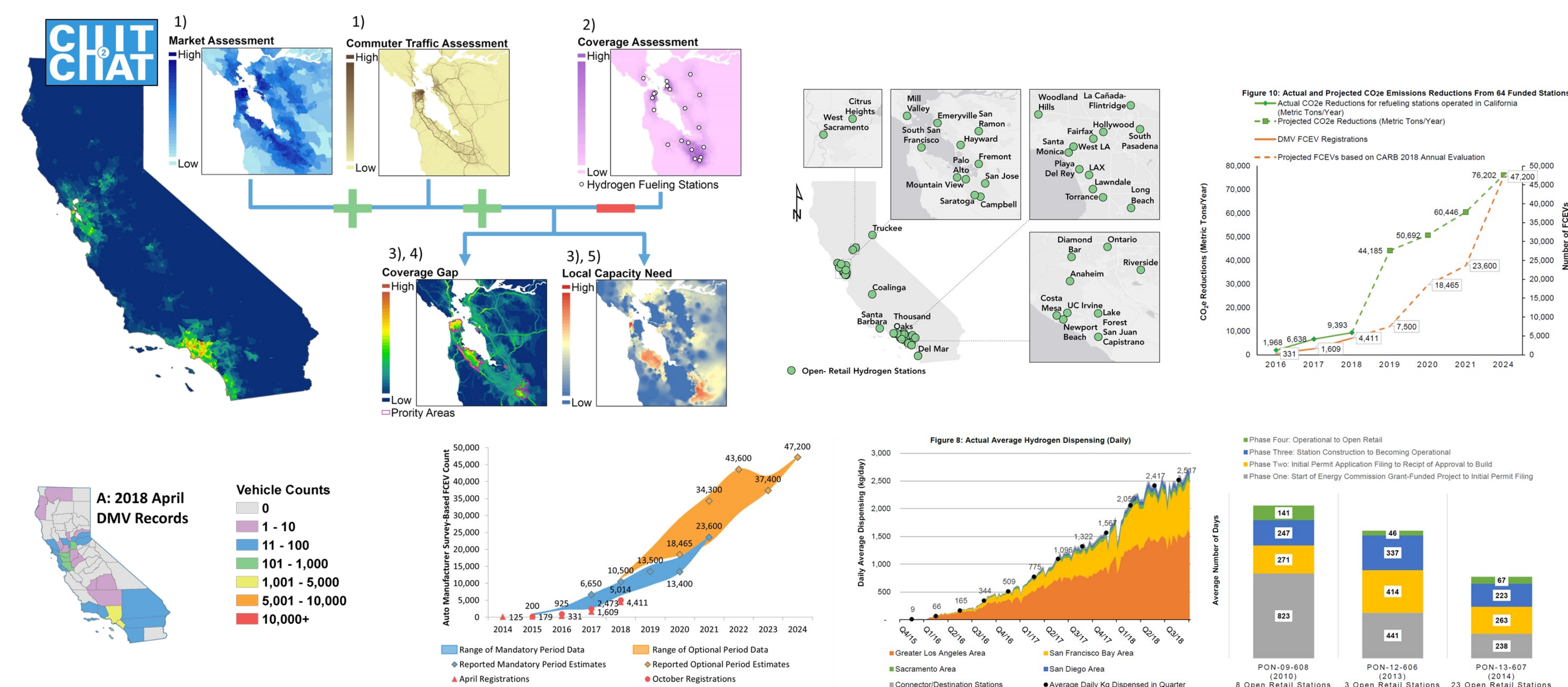


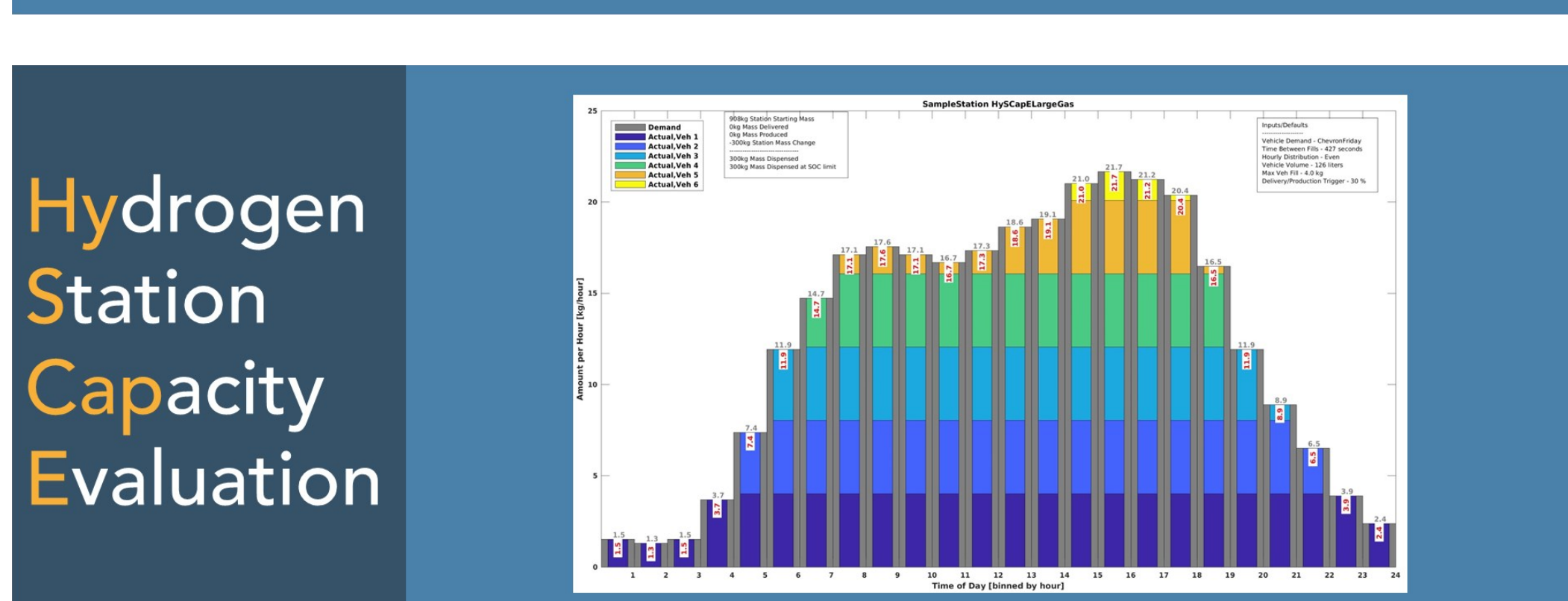
Light-Duty Hydrogen and FCEV Efforts in California

Station and Vehicle Deployment

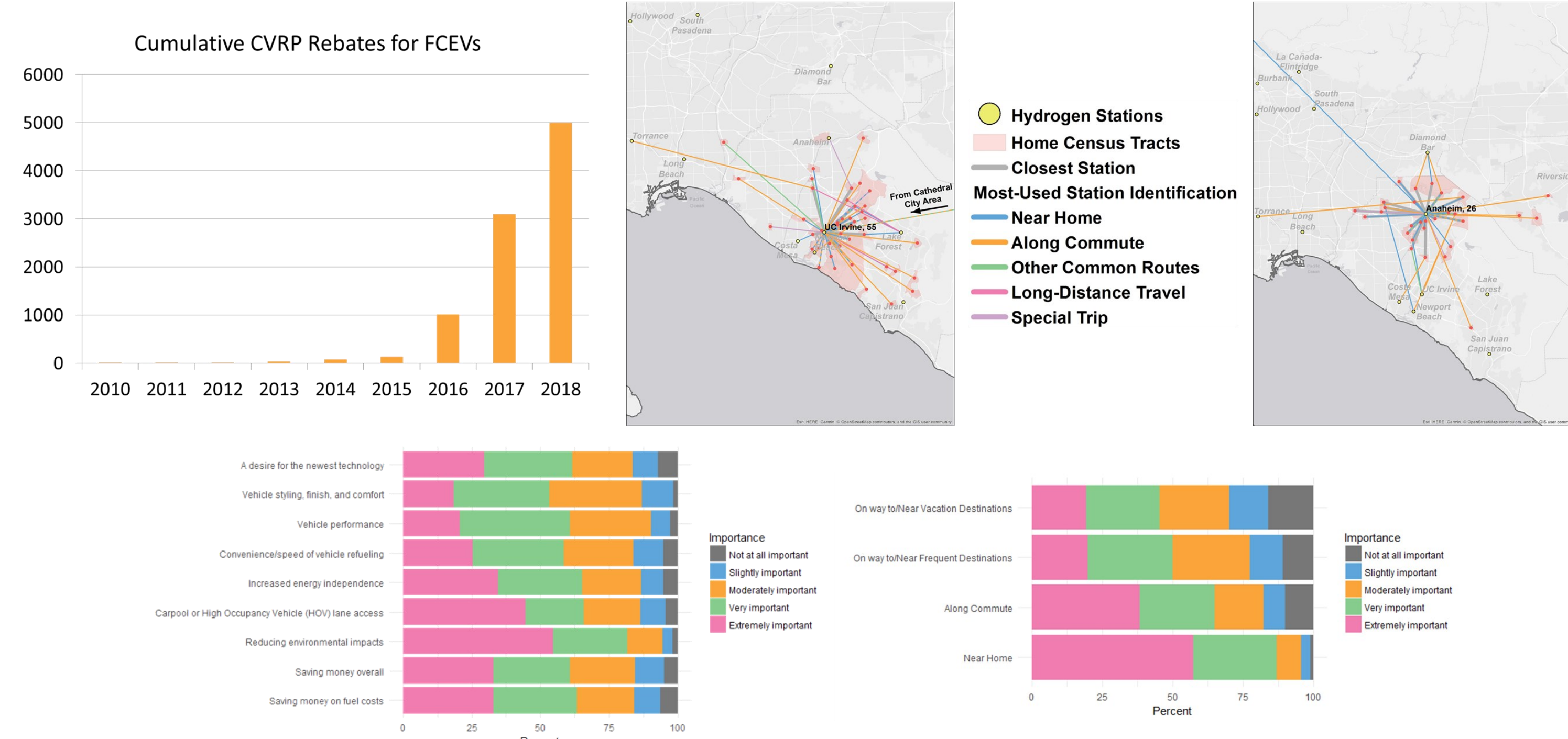


Station Testing and Evaluation

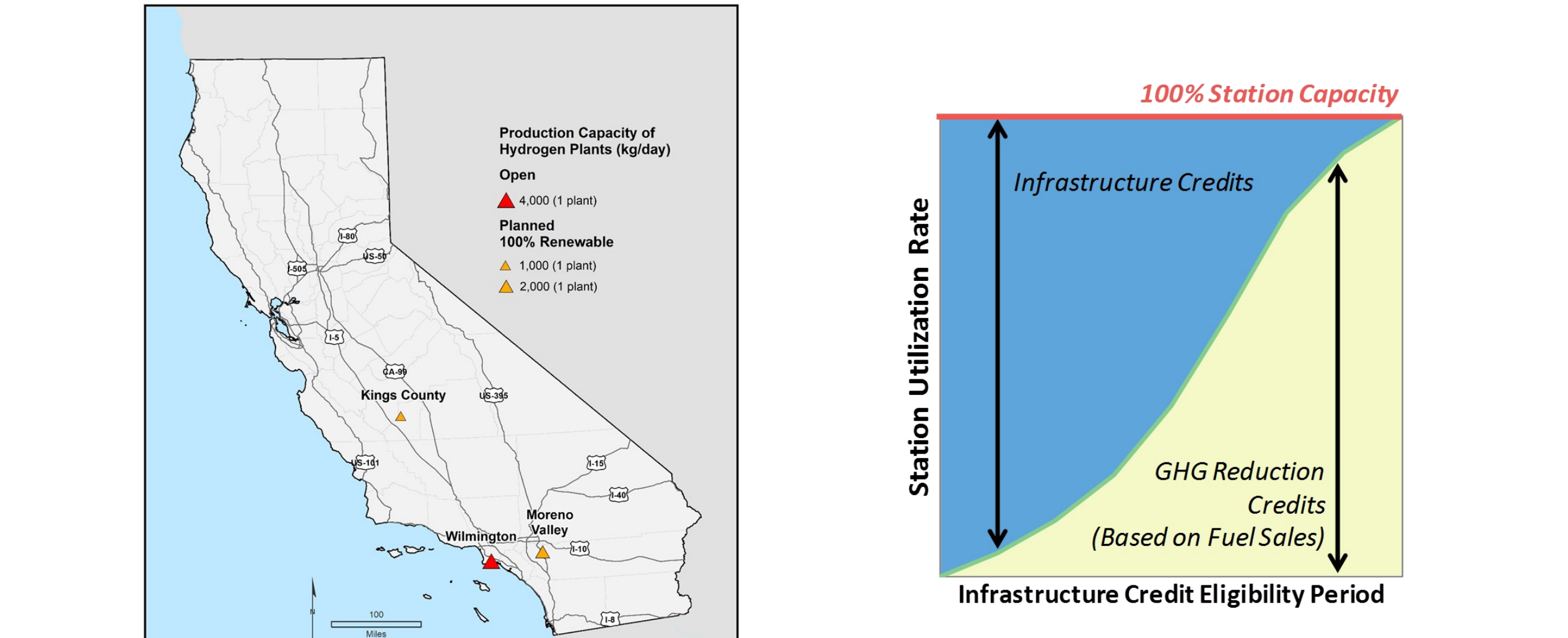
Hydrogen Station Equipment Performance



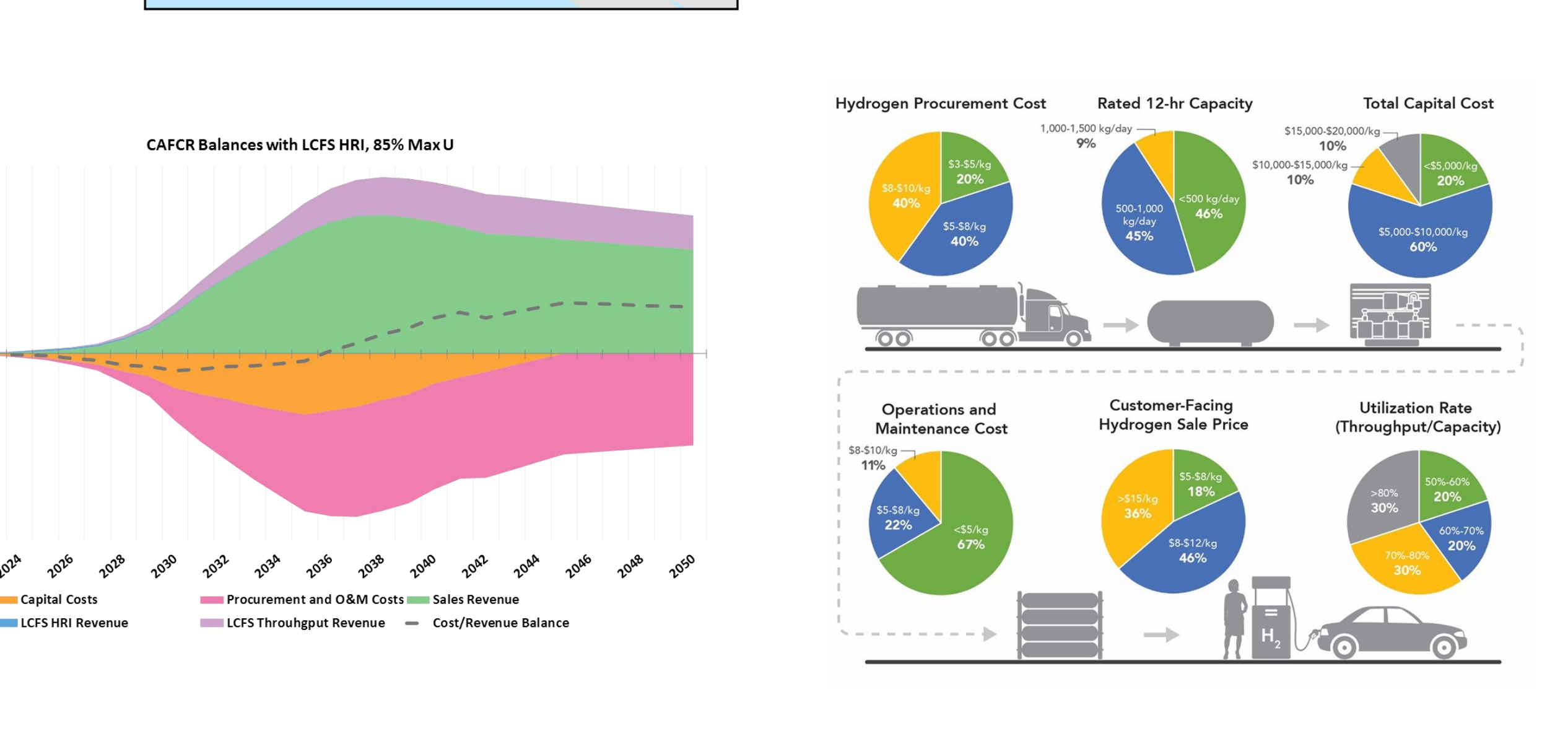
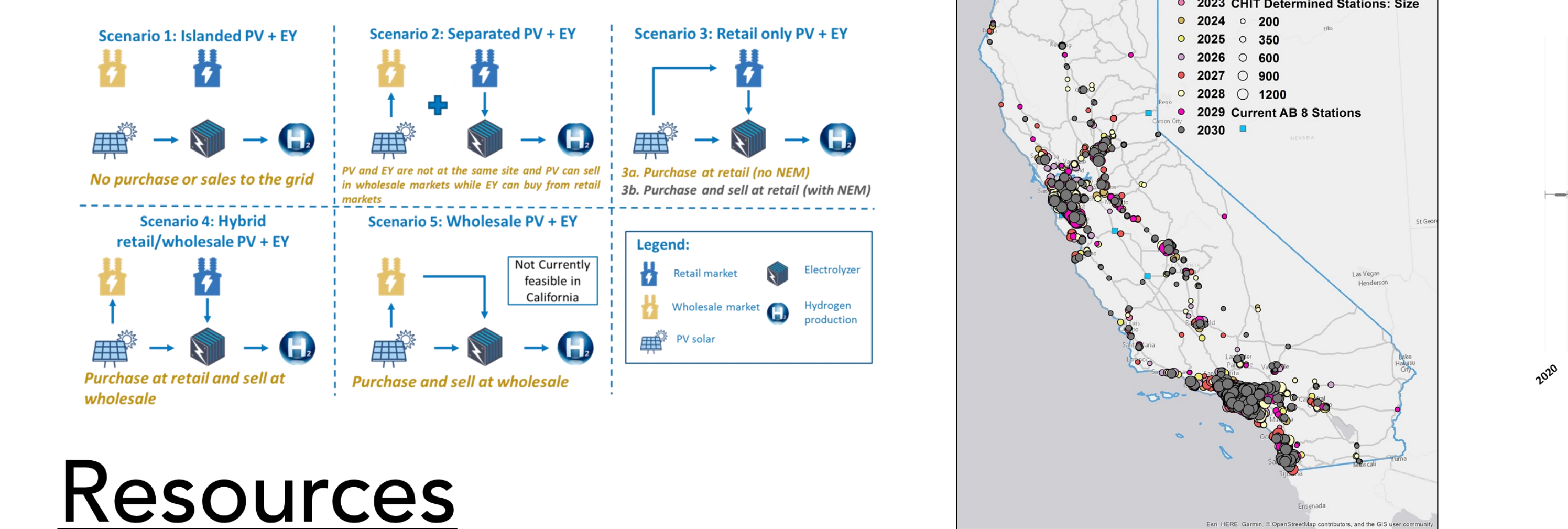
Vehicle Rebates



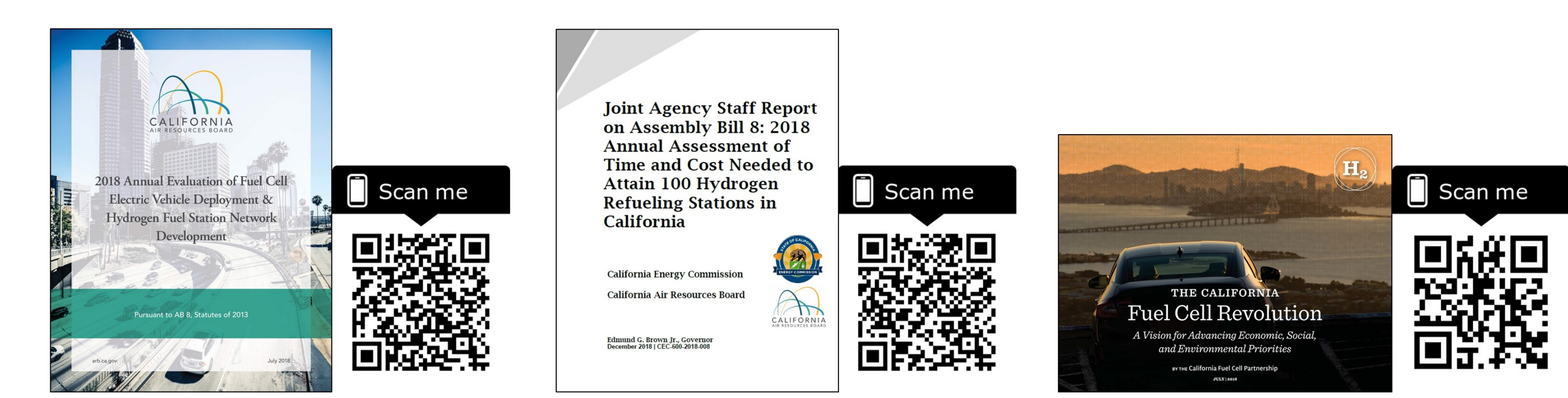
Fuel and Infrastructure Incentives



Future Opportunities



Resources

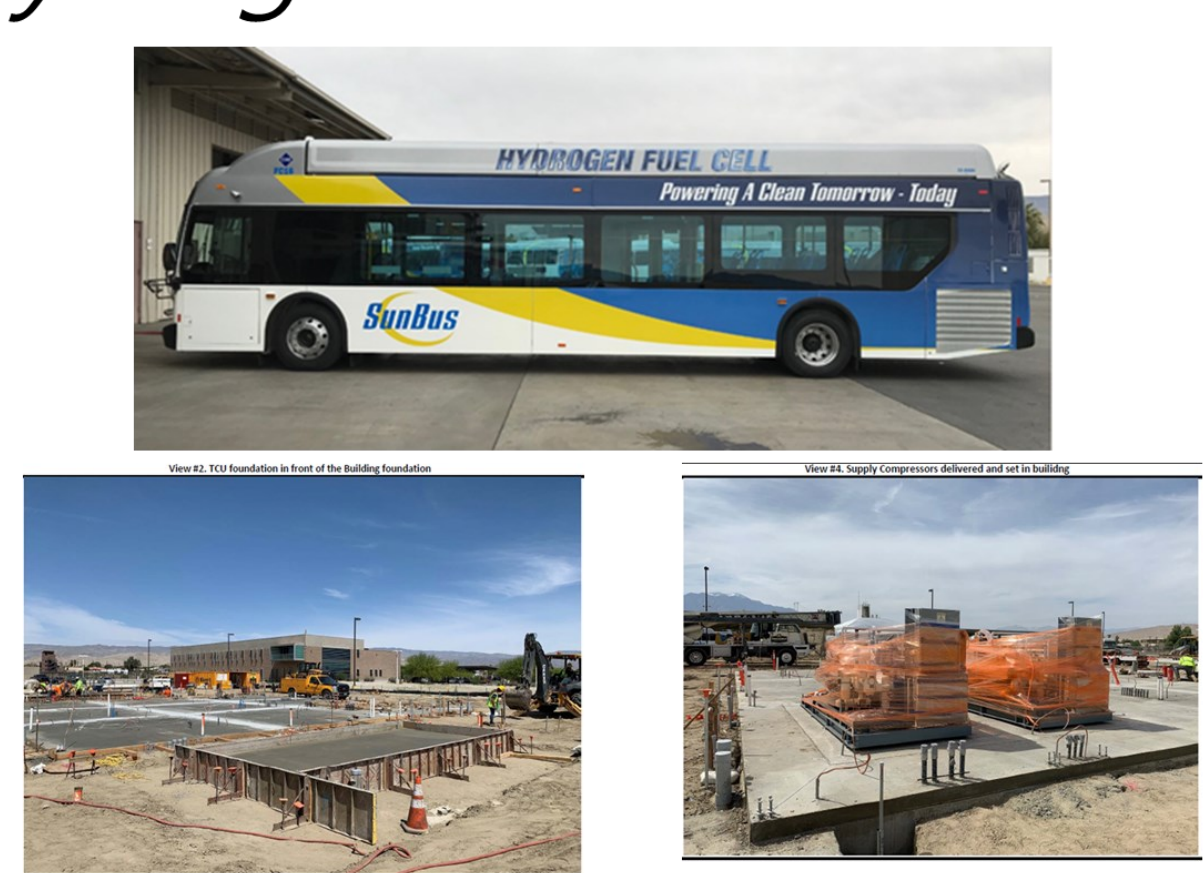


Heavy Duty and Off-Road Hydrogen and FCEV Projects

Pilot Commercial Deployment Projects

SunLine FCEBs & On-Site Hydrogen Generation

- Funding: \$12.6M grant, \$17.8M total
- Thousand Palms, Coachella Valley
- 5 NewFlyer Xcelsior® XHE40 Buses
 - 40' FCEBs, standard propulsion system
 - Ballard FCveloCity-HD 85kw modules
- Nel Hydrogen Production/Fueling Station
 - Modular PEM electrolyzer
 - 900 kg/day, 350 bar
 - Complete turnkey solution
- Buses delivered January 2019
- Station complete August 2019



Fuel Cell Electric Bus Commercialization Consortium

- Funding: \$22.3M grant, \$45.5M total
- 20 NewFlyer Xcelsior® XHE40 Buses
- 10 buses to Orange County (Southern CA)
- 10 buses to AC Transit (SF Bay Area)
- Trillium/Air Products
 - Delivered LH2
 - 1,750 kg/day - up to 50 buses
 - Service bay upgrade
 - Commissioning in May 2019
- Messer, LLC - Station upgrade
 - Delivered LH2
 - 1,050 kg/day - up to 30 buses
 - Commissioning in Dec. 2019
- First 2 buses accepted, all buses to be deployed in June 2019



Demonstration Projects

Zero-Emission Hydrogen Ferry

- Funding: \$3M grant, \$5.5M total
- Fuel cell ferry - 22 knots top speed and up to 84 passengers
- BAE Systems - electric propulsion system
- Hydrogenics - three 120kw fuel cells
- On-board H2 storage for 2 days of operation
- Air Liquide - 350 bar tube trailer at dock
- Ferry operational in September 2019
- Project complete in Spring 2020



Port of Los Angeles Shore-to-Store

- Funding: \$41.1M grant, \$82.5M total
- 10 hydrogen fuel cell Class 8 trucks
- Kenworth truck w/ Toyota FC technology
- 60 kg on-board storage
- Developed in partnership with California Energy Commission and SCAQMD
- Two large-capacity H2 refueling stations
 - Wilmington and Ontario, California
 - Delivered gas, 1500 kg/day capacity, 700 bar
- First truck delivered summer 2019
- Stations complete spring 2020



Fast-Track Fuel Cell Truck

- Funding: \$5.1M grant, \$6.8M total
- 5 plug-in hybrid fuel cell electric Class 8 trucks
 - 3 trucks - update existing EV Navistar chassis, Hydrogenics fuel cells
 - 2 trucks - Peterbilt glider, Loop Energy fuel cells
- Drop-and-swap mobile tube trailers and chargers at Port of LA and Fontana
- Demonstration partners: TTSI and Daylight Transport
- Project complete: Spring 2020



Fuel Cell Hybrid Electric Top Loader

- Funding: \$6.5M grant, \$15.4M total
- Electric top loader demonstration
- Hyster-Yale - build and integrate
- Nuvera - two 45kw fuel cell engines
- WAVE - two 250kw wireless charging systems
- Mobile refueler to provide hydrogen
- Fenix Marine Services will operate yard trucks in Port of LA
- Project complete: Spring 2020



Fuel Cell Hybrid Electric Delivery Van

- Funding: \$4.3M grant, \$9.5M total
- UPS in Ontario and surrounding areas
- 15 FC hybrid delivery vans
 - Retrofitting existing UPS vans
 - Based on prototype built in partnership with DOE
 - Integration by Unique Electric Solutions
 - Hydrogenics 30kw fuel cell engines
- Goal: develop FC retrofit kit
- Complete: Spring 2021



Hybrid Fuel Cell Yard Truck

- Funding: \$5.8M grant, \$12.1M total
- 2 hybrid fuel cell 242,000 lb capacity yard trucks
 - BAE Systems powertrain-270hp, 3800 ft-lb torque
 - Ballard FCveloCity-HD 85kw fuel cell modules
 - 20 kg on-board H2 storage @ 350 bar
- HTEC stationary-placed mobile tube trailer
 - 400 kg storage at 450 bar
 - 2 kg/min dispensing
- TraPac will operate yard trucks in Port of LA
- Project complete: Spring 2021



Next Generation Fuel Cell Delivery Van

- Funding: \$5.8M grant, \$11.7M total
- UPS in Ontario and surrounding areas
- 4 FC hybrid electric delivery vans
 - Linamar - Gen 2.0 eAxle design integrated into new Ford F-59 chassis
 - Ballard - 30kw fuel cell engines
- Goal: develop FC retrofit kit
- Complete: Spring 2021

