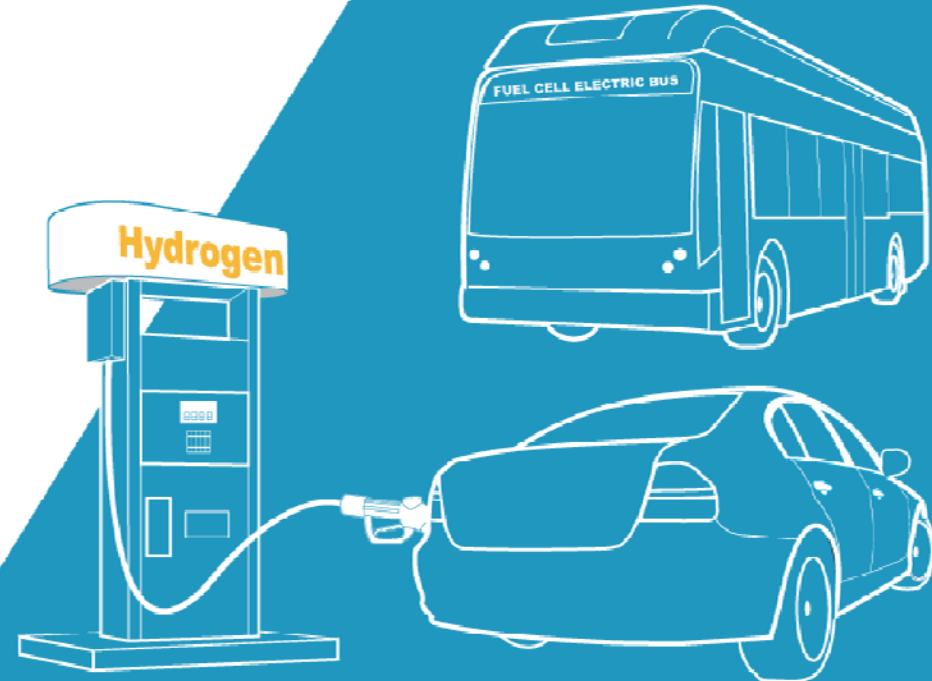
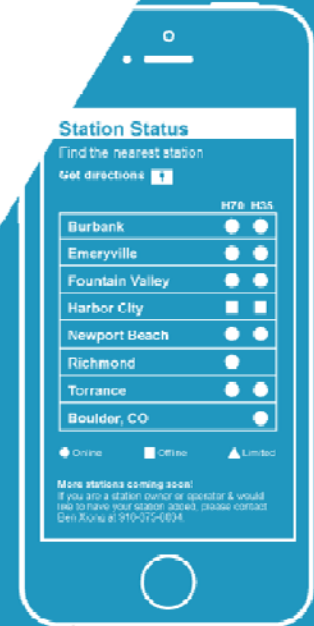


Medium- and Heavy-Duty Fuel Cell Electric Vehicle Action Plan

Final version

Amy Zimpfer
US EPA, Region 9

Executive Board meeting
April 19, 2016





Focus

Identify through industry consensus where technology is most viable and first steps should be taken to develop MD/HD FCEVs

Specific vehicle platforms

- 1 Medium-Duty FCEV platform: Class 4-6 package delivery
- 1 Heavy-Duty FCEV platform: Class 7-8 drayage trucks

Address MD/HD fueling infrastructure

Recognize commonalities between different MD/HD FCEV platforms

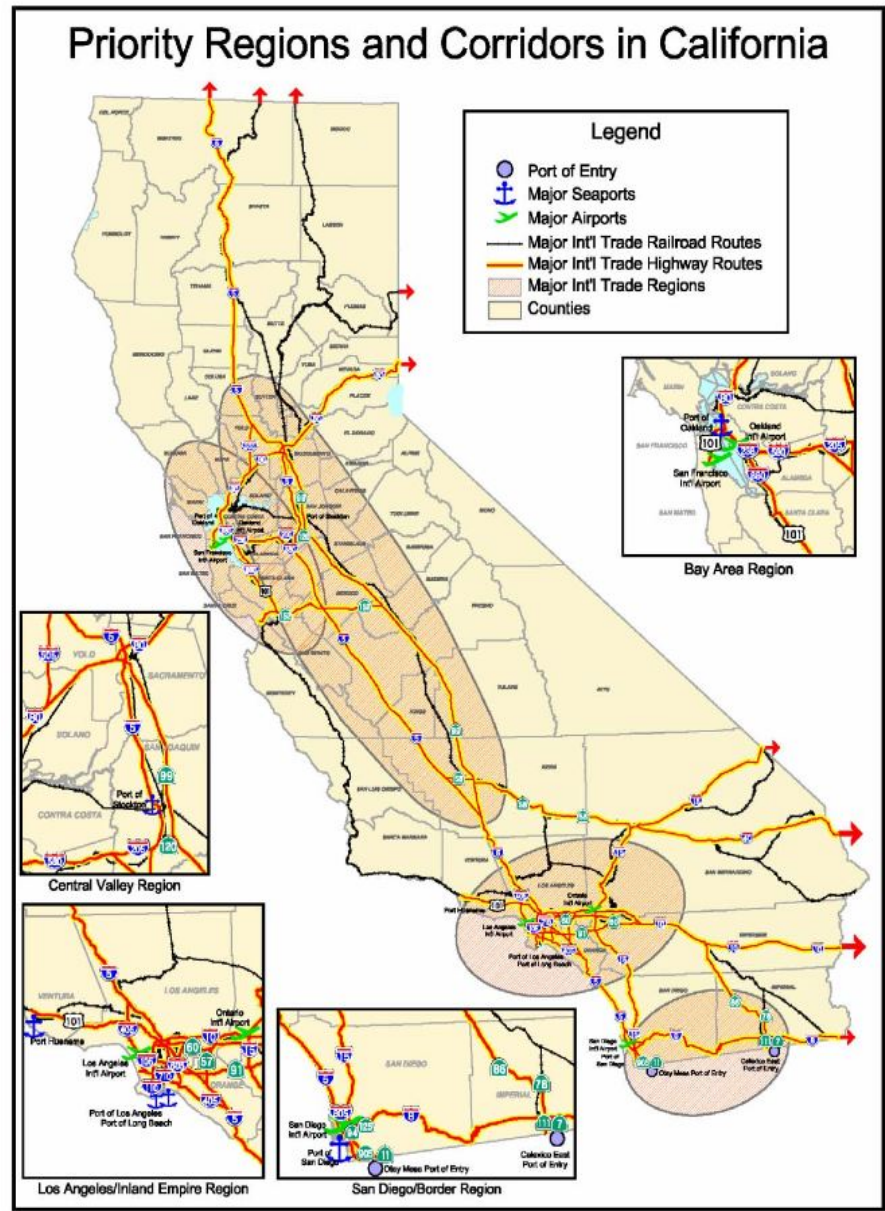


Source: Hydrogenics



Source: CTE

Snapshot of California



Source: CARB Goods Movement Action Plan (2007)



Vehicle Categories by Usage

Class 7/8 Tractors



Over the Road

- Younger Trucks; High Annual VMT
- Mostly higher average speed, highway driving



Short Haul/
Regional

- Between cities; Drayage; Day Cabs
- Includes second use trucks; trucks with smaller engines

Class 3-8 Vocational Work Trucks



Urban

- Cargo, freight, delivery collection
- Lower VMT; Lower Average speed; Lots of stop start



Rural/
Intracity

- Cargo, freight, delivery collection
- Higher VMT; Higher Avg speed; Combined urban/ highway



Work site
support

- Utility trucks, construction, etc.
- Lots of idle time; Lots of PTO use

Class 2B/3



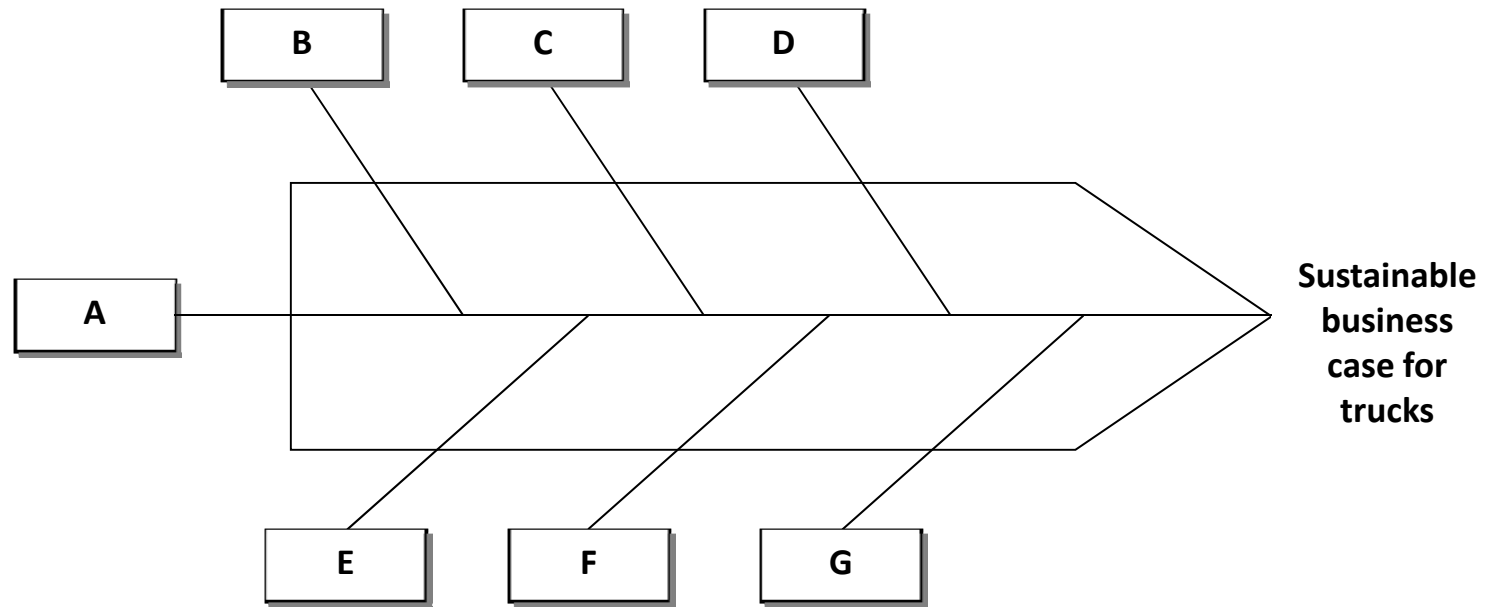
Pickups/
Vans

- Commercial use; Automotive OEMs & volumes

Source: CalHEAT



Business Case for FC Trucks



- A. Meets customer requirements
- B. Favorable operating environment
- C. Regulatory stability for product planning
- D. OEM essentials
 - i. Essential enablers
 - ii. Revenue to sustain operations
 - iii. Return on investment + profit

- E. Incentives support the path to sustainable sales
- F. Accessible and affordable fueling
- G. Go/no-go milestone



Recommendations

Government and industry stakeholders collaboratively

- Codes and standards gap assessment study for trucks and fueling infrastructure
- CAFCP stakeholder engagement needed to assess fueling needs to facilitate an optimal operational experience for truck operators
- Assume 7-15 years for new truck platform development when setting development and deployment targets.
- Fleet operational data collection is essential for comparison, feasibility assessments and decision making, and should be a basic requirement for all government funded truck projects.
- Achievement of cost targets may require several iterations to find the optimal platform configuration for each truck vocation.



Recommendations (2)

Federal government

- Continue efforts that improve hydrogen fuel production and distribution processes with the goal of fuel cost reduction
- Support Fuel Cell Electric Bus (FCEB) Centers of Excellence to prove out cost reduction and hydrogen fueling requirements for large fleets
- Perform studies for FCEV technology in trucks to understand the total cost of ownership and the potential for cost reduction
- Perform studies to assess the cost of H2 infrastructure for trucks
- Perform consumer studies with truck users and operators
- Establish targets for MD & HD FCEV funding efforts
- Document lessons learned from natural gas fueling infrastructure for trucks



Recommendations (3)

State government

- Fund MD & HD H2 fueling infrastructure projects in priority regions
 - Urgency to establish MD & HD H2 fueling infrastructure by mid-2017 per planned rollout of existing MD & HD FCEV projects.
- Use FCEB Centers of Excellence to prove out infrastructure and fuel cost reduction, and develop expertise and understanding about H2 fueling for large fleets
- Assess zero emission vehicle credit concept or long term incentive strategy for MD & HD ZEVs to encourage truck integrators and OEMs to invest in the RD&D.
- Build understanding of the truck manufacturing product development process.
- Collaboration with federal programs as part of national FC truck strategy.
- Establish targets for MD & HD FCEV funding efforts, considering long term environmental goals.
- Incorporate technology transition stages that are sufficiently long to facilitate ROI if/when considering regulations to stimulate demand for M/HD ZEVs.



Recommendations (4)

Industry stakeholders

- Provide market realistic information about technology requirements, operational cycles, supplier expectations, etc.
- OEMs should consider developing and offering electrified MD & HD truck chassis with warranty
- Station implementers and stakeholders should generate test data on MD FCEVs fueling at passenger FCEV retail fueling stations
- Develop SAE J2601/2 TIR “Fueling Protocol for Gaseous Hydrogen Powered Heavy Duty Vehicles” to the level of a full standard and/or address the current gap in fueling codes and standards
- Consider developing a RASIC (Responsible, Approve, Support, Inform, and Consult) process to establish the roles of key resources for MD & HD FCEV product feasibility and project assessment.
- Reliability of MD/HD FCEVs to be proven - cost per mile of freight unit transported is important
- Transfer the lessons learned from FCEBs operations to truck vocations
- Engage private investment community
- Evaluate drayage truck procurement financing and/or business models to facilitate sharing of technology risk among end users