FCEVs and Hydrogen in California

Preparing for market launch

Catherine Dunwoody
October 2012
Fun to drive, long range, quick fill, zero emission, incredible efficiency. No wonder people are smiling...
Progress to date

- >200 FCVs & FCBs today
- >4 million road miles
- 8 public H₂ stations
- 14 new/upgrade stations in development
- California is on track to have approx. 20 public H₂ stations by end of 2013
### Projected FCEVs in CA

*For competitive reasons, detailed volume assessments have not been provided during 2015-2017.*

**CaFCP survey of automakers**

<table>
<thead>
<tr>
<th></th>
<th>Hundreds</th>
<th>Thousands</th>
<th>Tens of thousands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Through 2013</td>
<td></td>
<td>2014</td>
<td>2015-2017</td>
</tr>
<tr>
<td>Total Passenger</td>
<td>430</td>
<td>1,400</td>
<td>53,000</td>
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<tr>
<td>Vehicles</td>
<td></td>
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</tbody>
</table>
Public $\text{H}_2$ stations in CA today

- Emeryville
- Burbank
- Torrance
- Newport Beach
- Irvine
- Fountain Valley
- West LA
- Thousand Palms
H$_2$ stations coming by 2013

- Beverly Hills
- Diamond Bar (upgrade)
- Harbor City
- Hawthorne
- Hermosa Beach
- Irvine (upgrade)
- Irvine North
- Laguna Nigel
- Los Angeles
- San Francisco
- Santa Monica
- West LA
- West Sacramento
- Westwood
California ZEV Action Plan

- By 2015: California major metropolitan areas “ZEV-ready” with infrastructure and streamlined permitting
- By 2020: California ZEV infrastructure can support up to 1 million vehicles
- By 2025: Over 1.5 million ZEVs in California
We’ve learned

- Stations must come before vehicles
- People want fuel near home, work and in weekend destinations
- Stations must be customer friendly
- Six minutes is the target maximum travel time
  - For early market clusters
CaFCP Roadmap

Bringing Hydrogen Fuel Cell Electric Vehicles to the Golden State

COMMERCIAL LAUNCH OF FCEVS
EXPECTED AROUND 2015

Zero-emissions
250-400 mile range
Minutes to refuel
Domestically produced hydrogen

THE NETWORK:
CLUSTERS
CONNECTORS
DESTINATIONS

“Consumers need CONFIDENCE in a hydrogen fueling network”
Initial station deployments will focus on geographic clusters in key markets with additional stations connecting these clusters into a regional network.

68 STATIONS NEEDED TO LAUNCH THE early FCEV MARKET

$65 MILLION in additional funding needed!

Download A California Road Map at www.caftp.org/roadmap
Five clusters to launch market

- Santa Monica and West Los Angeles
- Torrance and nearby coastal cities
- Southern coastal area of Orange County
- Berkeley
- South San Francisco Bay area
Locations based on

- Demographic information
- Individual OEM market assessments
- California Energy Commission/Air Resources Board Vehicle Survey
- Hybrid and alt fuel vehicles registrations
- Geographic distribution of Clean Vehicle Rebate Program
Access to stations

Chart courtesy of National Fuel Cell Research Center at UC Irvine
How many stations?

- OEMs identified need for 68 stations by 2016
  - Balances coverage and capacity utilization
  - Supports 20,000 FCEVs

- 45 stations in cluster communities
  - UC Irvine STREET model

- 23 connector and destinations that seed new clusters
  - Based on travel patterns, OEM marketing information
Building a statewide network

Map of 68 Hydrogen Fueling Stations: Existing, In Development and Needed

Hydrogen Stations
- Existing
- In Development
- Needed

*as suggested by National Fuel Cell Research Center STREET model

Bay Area
Los Angeles Area

July 2012
## Projected station deployment

<table>
<thead>
<tr>
<th>Year</th>
<th>Start of Year (Station Total)</th>
<th>Added Stations</th>
<th>Number of FCEVs in CA</th>
<th>Expected Station Design Capacity [kg/day]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>4</td>
<td>9</td>
<td>312</td>
<td>Up to 100</td>
</tr>
<tr>
<td>2013</td>
<td>13</td>
<td>7</td>
<td>430</td>
<td>100</td>
</tr>
<tr>
<td>2014</td>
<td>20</td>
<td>17</td>
<td>1389</td>
<td>100-500</td>
</tr>
<tr>
<td>2015</td>
<td>37</td>
<td>31</td>
<td>5,000-15,000</td>
<td>100-500</td>
</tr>
<tr>
<td>2016</td>
<td>68</td>
<td>Market Needs</td>
<td>10,000-30,000</td>
<td>500</td>
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<tr>
<td>2017</td>
<td>&gt;84</td>
<td>Market Needs</td>
<td>53,000</td>
<td>500</td>
</tr>
<tr>
<td>2018</td>
<td>&gt;100</td>
<td>Market Needs</td>
<td>&gt;53,000</td>
<td>&gt;500</td>
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Note: The OEM Survey only requested years 2015-2017 as a single entry. While the numbers of FCEVs in 2015 and 2016 are not generated in the survey, an estimate value has been used based on a likely roll-out scenario. Based on questions during the CEC Workshop, this table has been adjusted to illustrate an estimated range.
Stations and vehicles

Clean Fuels Outlet regulation
Funding goals

Ensure we can build out the 68 station network
• 37 stations already in process or expected to be funded
• 31 more stations needed by January 2016

Keep all stations operating as vehicle volume grows

Analysis shows $65M additional incentives needed
EIN Cash Flow Model

- Offers a station-level view
- Allows user to consider multiple scenarios
How much does it cost?

Incentives cover negative cash flow as market grows

$65m needed to enable commercial launch in California (68 Stations*):

- 31 New Stations (Cash Flow Support)
- 37 Existing or Planned Stations (O&M)

*68 Stations provides the “coverage” needed to support customers in early launch markets.
68 Hydrogen stations provide...

Coverage
- Fueling opportunities

Confidence
- Automakers build volume
- Customers purchase FCVs

Commercial
- To launch market and build capacity
In a hurry? Filling with hydrogen is fast and easy. And with range comparable to gasoline vehicles, you’re fueling only when empty, thirsty or ready to wash the car.

www.cafcp.org/go
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