

# FCEVs and Hydrogen in California

Preparing for market launch



Catherine Dunwoody  
October 2012

**go**  
for the excitement

*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 H<sub>2</sub> stations
- ▶ 14 new/upgrade stations in development
- ▶ California is on track to have approx. 20 public H<sub>2</sub> stations by end of 2013



# Projected FCEVs in CA

<i>CaFCP survey of automakers</i>	Hundreds	Thousands	Tens of thousands
	Through 2013	2014	2015-2017
Total Passenger Vehicles	430	1,400	53,000

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



# Public H<sub>2</sub> stations in CA today



- ▶ Emeryville
- ▶ Burbank
- ▶ Torrance
- ▶ Newport Beach
- ▶ Irvine
- ▶ Fountain Valley
- ▶ West LA
- ▶ Thousand Palms



# H<sub>2</sub> 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



## A CALIFORNIA ROAD MAP

Bringing  
Hydrogen Fuel Cell Electric Vehicles  
to the Golden State

**COMMERCIAL LAUNCH OF FCEVS**  
EXPECTED AROUND 2015



**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



Stakeholders estimate 37 stations will be funded and operating in 2015, leaving a gap of 31 needed stations.

**\$65 MILLION**  
IN ADDITIONAL FUNDING NEEDED!



Stakeholders estimate 37 stations will be funded and operating in 2015, leaving a gap of 31 needed stations. Bridging this gap is essential to creating, building and maintaining confidence that California will be ready for the early commercial FCEV market.

Download A California Road Map at  
[www.cafcp.org/roadmap](http://www.cafcp.org/roadmap)

The California Fuel Cell Partnership is a collaboration of organizations that work together to promote the commercialization of hydrogen fuel cell electric vehicles.

By working together, we help ensure that vehicles, stations, regulations and people are in step with each other as the technology comes to market.



[www.cafcp.org](http://www.cafcp.org)

# 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

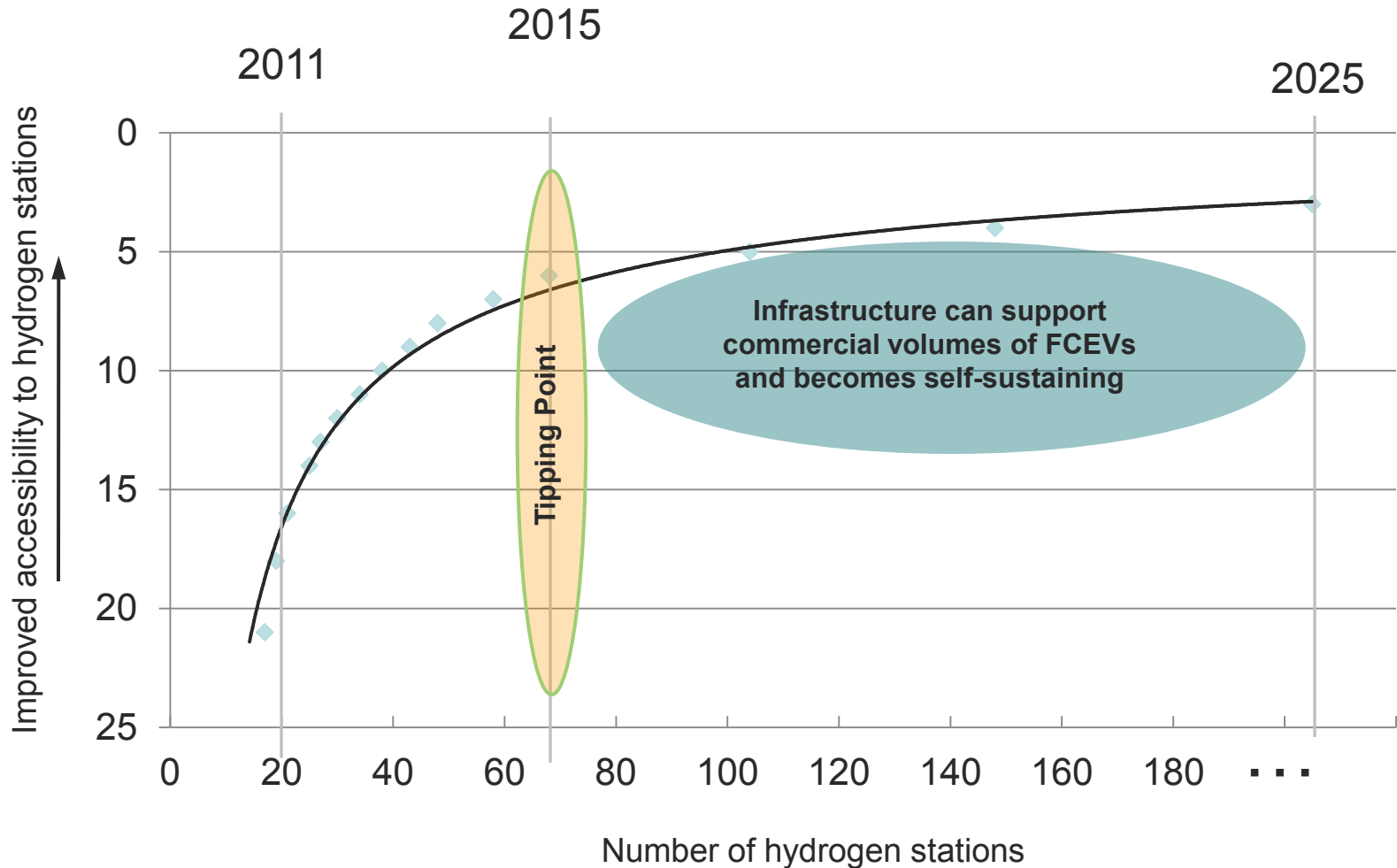


Chart courtesy of National Fuel Cell Research Center at UC Irvine

# How many stations?

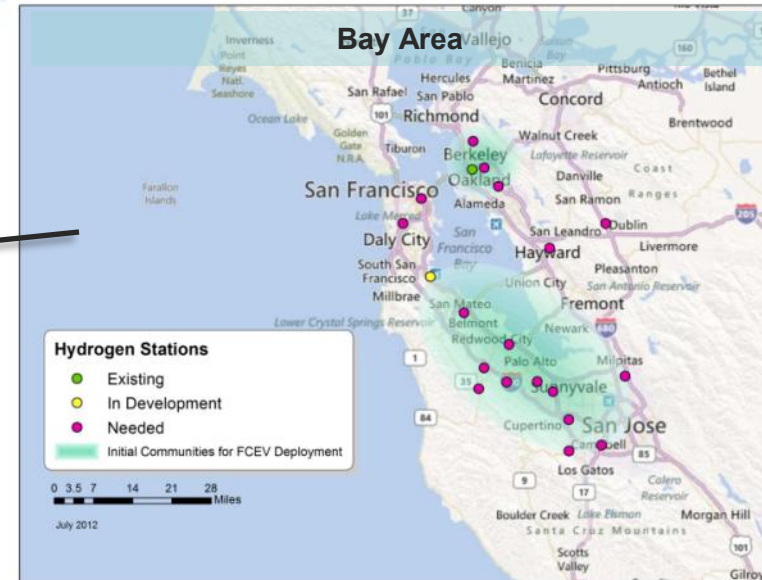
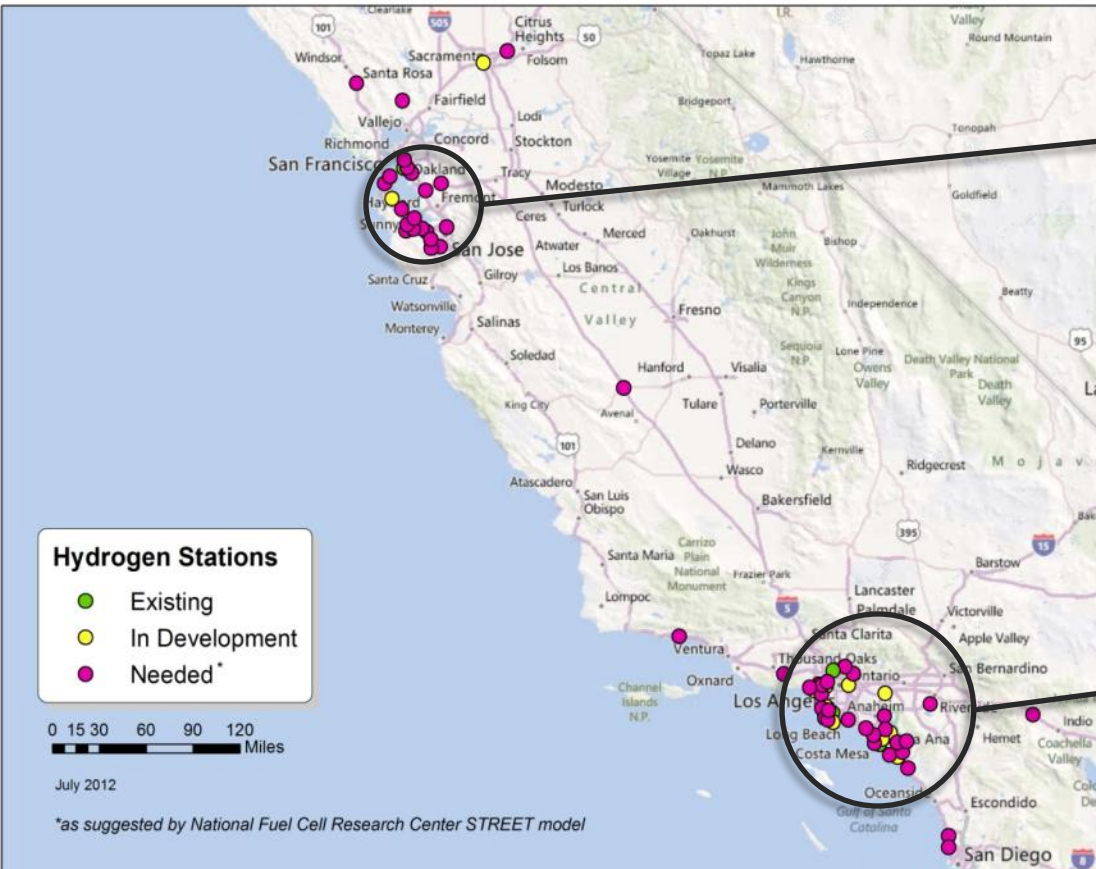
- ▶ OEMs identified need for 68 stations by 2016
  - Balances coverage and capacity utilization
  - Supports 20,000 FCEVs
- ▶ 45 stations in cluster communities
  - UC Irvine STREET model
- ▶ 23 connector and destinations that seed new clusters
  - Based on travel patterns, OEM marketing information



# Building a statewide network



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

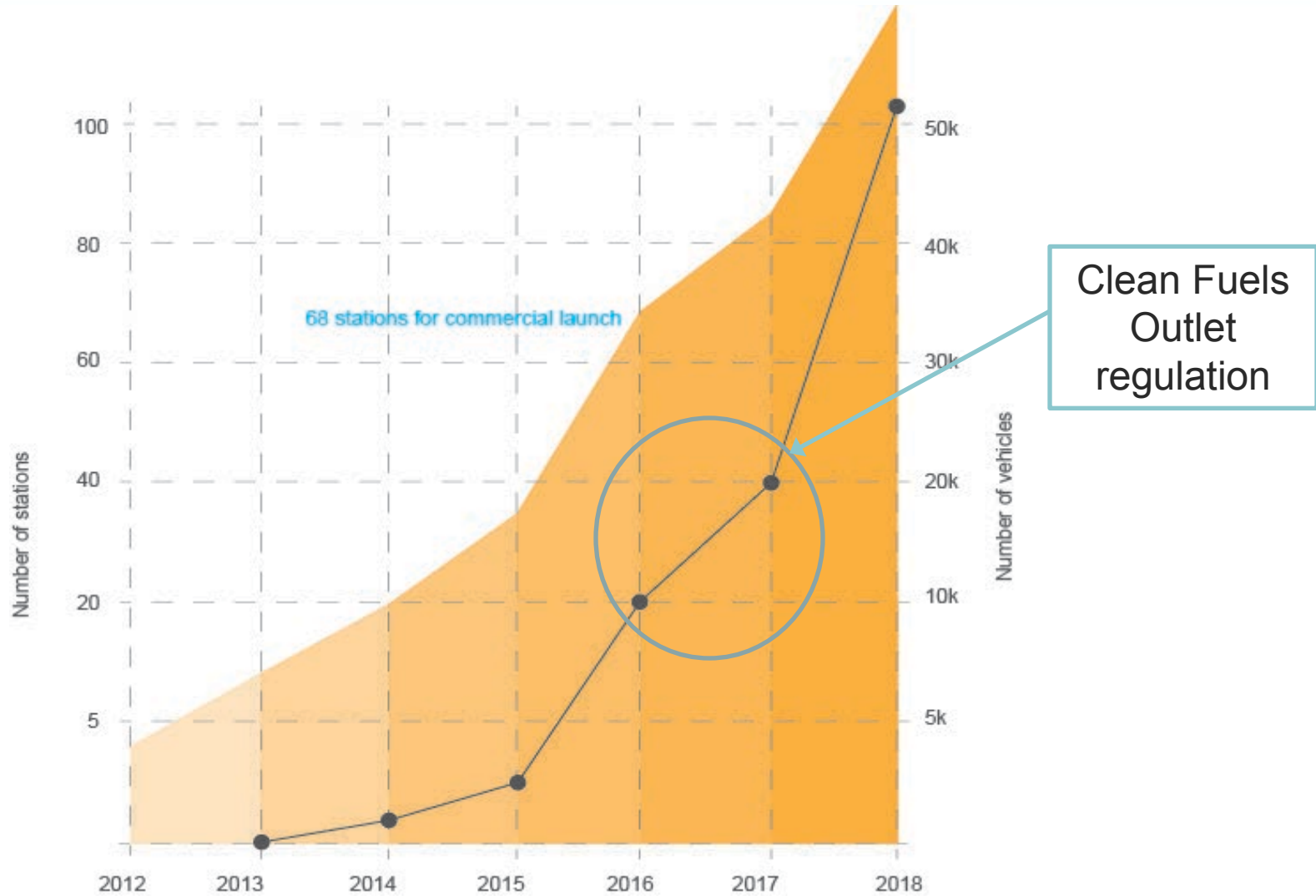


# Projected station deployment

Year	Start of Year (Station Total)	Added Stations	Number of FCEVs in CA	Expected Station Design Capacity [kg/day]
<b>2012</b>	4	9	312	Up to 100
<b>2013</b>	13	7	430	100
<b>2014</b>	20	17	1389	100-500
<b>2015</b>	37	31	<i>5,000-15,000</i>	100-500
<b>2016</b>	68	<i>Market Needs</i>	<i>10,000-30,000</i>	500
<b>2017</b>	>84	<i>Market Needs</i>	53,000	500
<b>2018</b>	>100	<i>Market Needs</i>	>53,000	>500

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





# 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

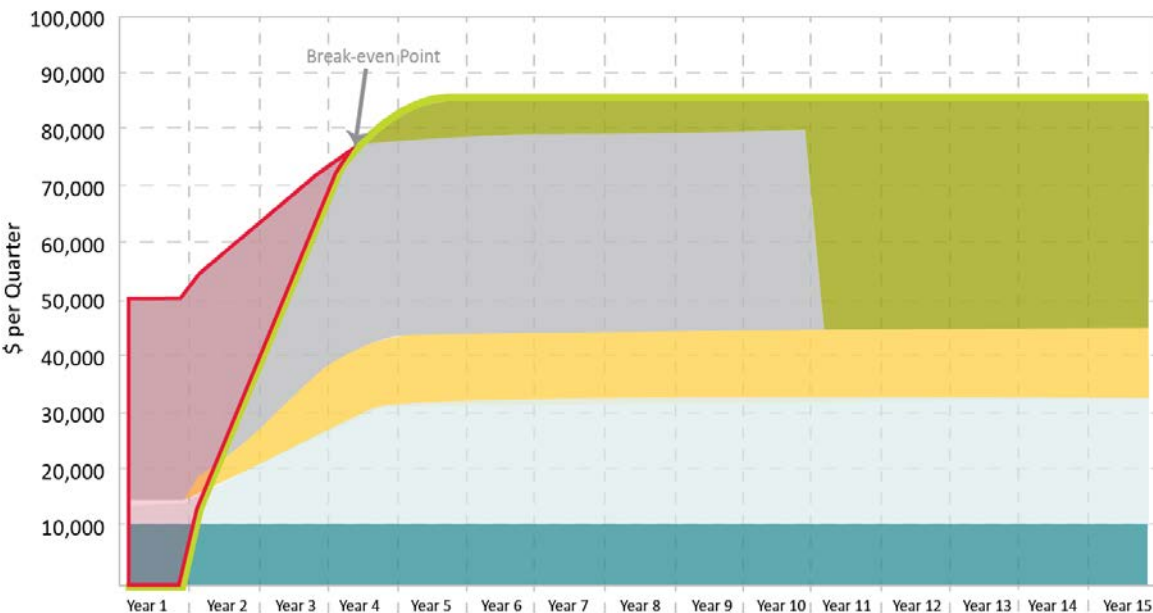


# EIN Cash Flow Model

- Offers a station-level view
  - Allows user to consider multiple scenarios

SYSTEMIC IMPACTS												
1. Number of vehicles Ramp up												
62	Station	1	2	3	4	5	6	7	8	9	10	11
63	Station	1	2	3	4	5	6	7	8	9	10	11
64	Station	1	2	3	4	5	6	7	8	9	10	11
65	Station	1	2	3	4	5	6	7	8	9	10	11
66	Station	1	2	3	4	5	6	7	8	9	10	11
67	Station	1	2	3	4	5	6	7	8	9	10	11
68	Station	1	2	3	4	5	6	7	8	9	10	11
69	Station	1	2	3	4	5	6	7	8	9	10	11
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97	Station	1	2	3	4	5	6	7	8	9	10	11
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99	Station	1	2	3	4	5	6	7	8	9	10	11
100	Station	1	2	3	4	5	6	7	8	9	10	11

SCREENING AND SCORING												
2	Screen and scoring	Location (x,y,z)	Qualifications of the Applicant	Market Transformation and Viability	Project Implementation and Readiness	Station Score	(Use a station performance score)					
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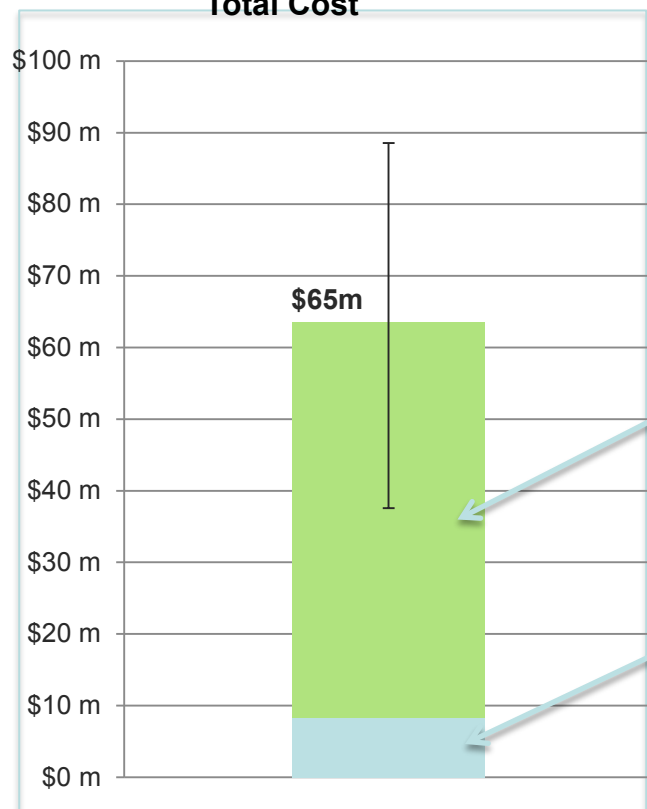
**Legend**

- Gross Margin (Revenues: Cost of H2, Taxes & fees)
- Loan Payments - Total
- Profit
- Credit Card Expenses
- O&M Costs
- Other Expenses
- Negative Cash Flow

# How much does it cost?

## ▶ Incentives cover negative cash flow as market grows

Cash Flow Support:  
Total Cost



**\$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.*

- New Stations (Cash Flow Support)
- Existing Stations (O&M Support)

# 68 Hydrogen stations provide...

## ▶ Coverage

- Fueling opportunities

## ▶ Confidence

- Automakers build volume
- Customers purchase FCVs

## ▶ Commercial

- To launch market and build capacity





**go** in minutes

*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](http://www.cafcp.org/go)



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Daimler  
General Motors  
Honda  
Hyundai  
Nissan  
Toyota  
Volkswagen

### **TECHNOLOGY**

AFCC

### **GOVERNMENT**

CA Energy Commission  
CA Air Resources Board  
South Coast AQMD  
US EPA  
US DOE  
US DOT

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Air Liquide  
Air Products  
Ballard Power Systems  
CDFA  
CEERT  
EIN  
Hydrogenics  
ITS – UC Davis  
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NFCRC – UC Irvine  
NREL  
Powertech Labs  
Praxair  
Sandia National Labs  
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