

# GenDrive®

## Trailblazing California H2 Highway

Jim Petrecky, Director of Product Management, June 2012

California Energy Commission

**DOCKETED**

**12-HYD-1**

TN # 66095

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**plug power®**

Today's Fuel Cells for proven, reliable power.

## What Is **GenDrive™** ?

### What are GenDrive Power Packs?

- Complete fuel cell engine in a box
- Superior alternative to industrial batteries in motive power equipment

### What do GenDrive Power Packs do?

- Replace batteries permanently
- Run on hydrogen gas and can be refueled in 5 minutes or less by vehicle operator at convenient self-service dispensers
- Produce clean power at constant voltage
- Run 1.5-2 times as long as a battery
- Produce no emissions except pure water vapor and heat

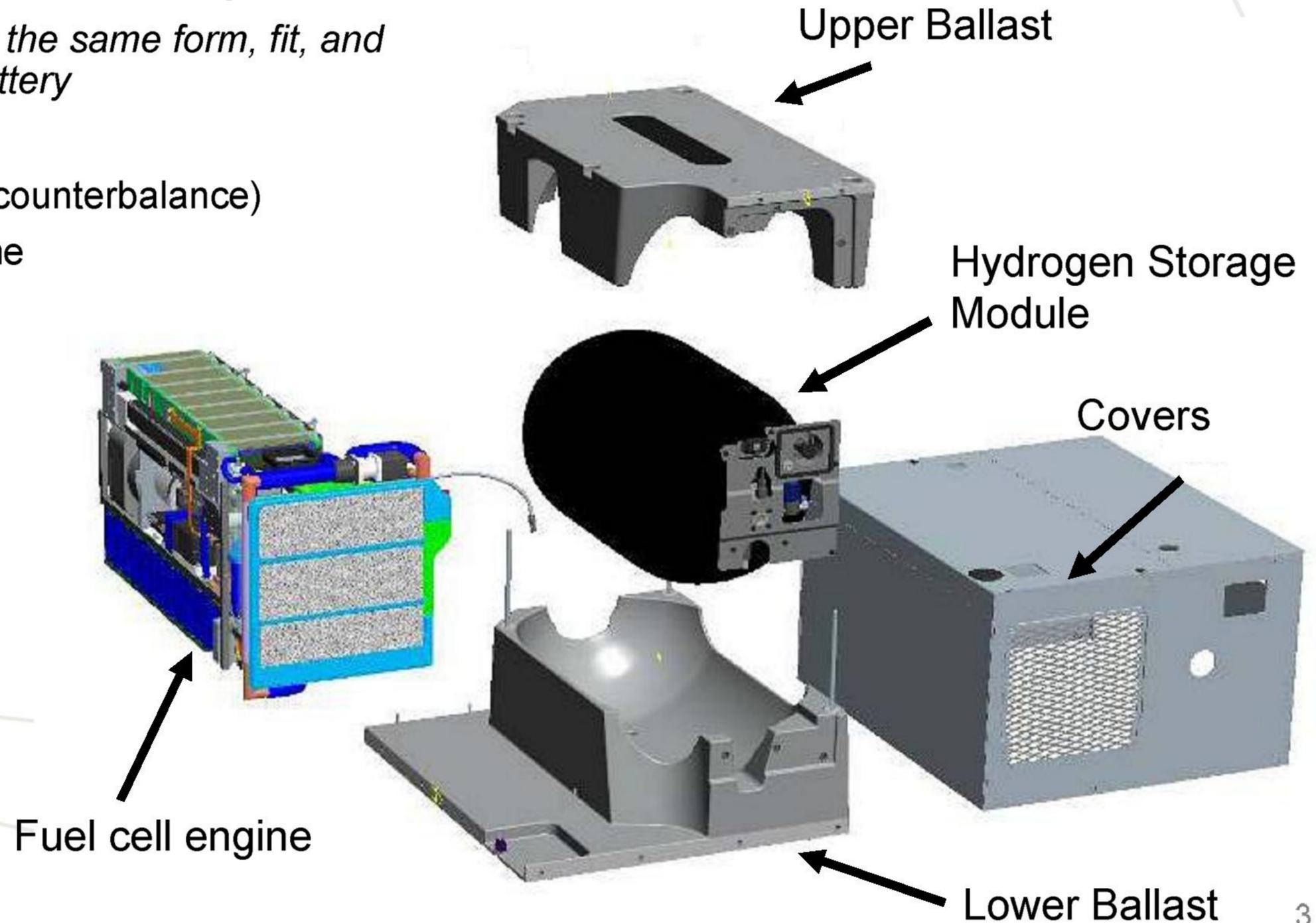


## High-level GenDrive Build

### Direct Replacement Of Battery

*Designed to meet the same form, fit, and function as the battery*

- Stack - power
- Ballast - weight (counterbalance)
- H2 Tank - run time



Today's Fuel Cells for proven, reliable power.



## Client List



Mercedes-Benz



# North American Sales

- **Repeat customers** from high profile companies form our sales base

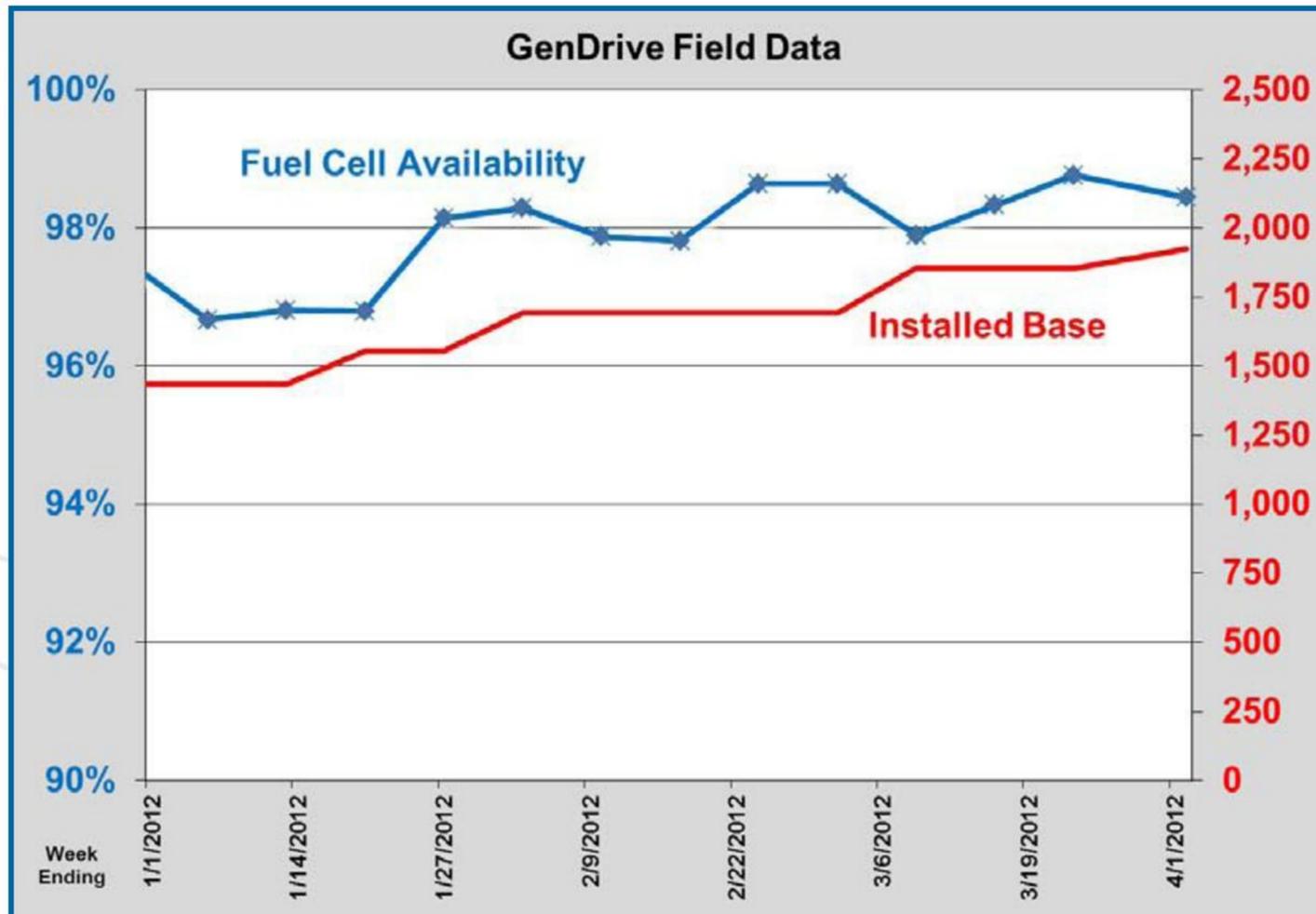
Plug Power GenDrive Sales History - North America							
#	Customer	Location	Total	#	Customer	Location	Total
1	AWG	Kansas City, MO	297	21	Proctor & Gamble	Oxnard, CA	49
2	AWG	Pearl River, LA	256	22	Sysco	Boston, MA	160
3	BMW	Greer, SC	91	23	Sysco	Canton, MI	30
4	Bridgestone	Graniteville, SC	24	24	Sysco	Front Royal, VA	100
5	Bridgestone	Morrison, TN	41	25	Sysco	Grand Rapids, MI	35
6	Central Grocers	Joliet, IL	231	26	Sysco	Houston, TX	105
7	Coca Cola	Charlotte, NC	40	27	Sysco	Long Island, NY	42
8	Coca Cola	San Leandro, CA	37	28	Sysco	Philadelphia, PA	95
9	CVS	Waverly, NY	59	29	Sysco	San Antonio, TX	113
10	DLA	Susquehanna, PA	22	30	Sysco	Riverside, CA	80
11	DLA	Fort Lewis, WA	20	31	Sysco	Los Angeles, CA	190
12	DLA	Tracey, CA	22	32	Stihl	Virginia Beach, VA	25
13	FedEx Freight	Springfield, MO	35	33	UNFI	Sarasota, FL	67
14	Kimberly Clark	Graniteville, SC	27	34	Wal-mart	Wash. CH, OH	254
15	Kroger	Compton, CA	161	35	Wal-mart	Calgary, Alberta	71
16	Mercedes	Tuskaloosa, AL	72	36	Wal-mart	Cornwall, Ontario	155
17	Nestle Waters	Dallas, TX	32	37	Wegman's	Pottsville, PA	136
18	Newark Farmer's	Newark, NJ	193	38	Whole Foods	Landover, MD	61
19	Proctor & Gamble	Alexandria, LA	45	39	Winco Foods	Modesto, CA	184
20	Proctor & Gamble	Greensboro, NC	129				
<b>Total North American Sales</b>							<b>3657</b>

Need continued market transformation funding to prove productivity. Government investment yields repeat business, as shown by our sales log.

# GenDrive Field Performance

Plug Power GenDrive Installed Base Run Hours		
Unit Type	Total Operating Days	Estimated Run Hours
AGV (Automated Guided Vehicles)	36,308	481,810
Class 1 Sit-down Counterbalanced	138,791	1,541,483
Class 2 Reach / Order Picker	178,201	1,533,172
Class 3 Pallet Truck	515,743	3,862,356
<b>Total</b>	<b>869,043</b>	<b>7,418,821</b>

Over 7 million Hours of Run Time



2,104 Units @  
98.5% Availability  
*(June 2012 Update)*

## Truck Refrigeration Units (TRU's)

Customer are demanding a solution that reduces noise and emissions.

### Problem: Diesel Engines

- Regulations are getting stricter, forcing higher capital costs and/or costly retrofits. (inspections, registration)
- Ideal delivery time is late at night and early morning
- However, local noise restrictions limit delivery times
  - Can't turn engine off
    - Elevated temps lead to expensive food spoilage

### Solution: Fuel Cell

- More deliveries with less trucks - reduction in fleet size
- Shorter, more productive runs - deliveries during low traffic times
- Current GenDrive customers already have the hydrogen infrastructure
- Lower operating expenses



Market: 200,000 TRU's domestically

## Truck Refrigeration Units (TRU's)

### Development

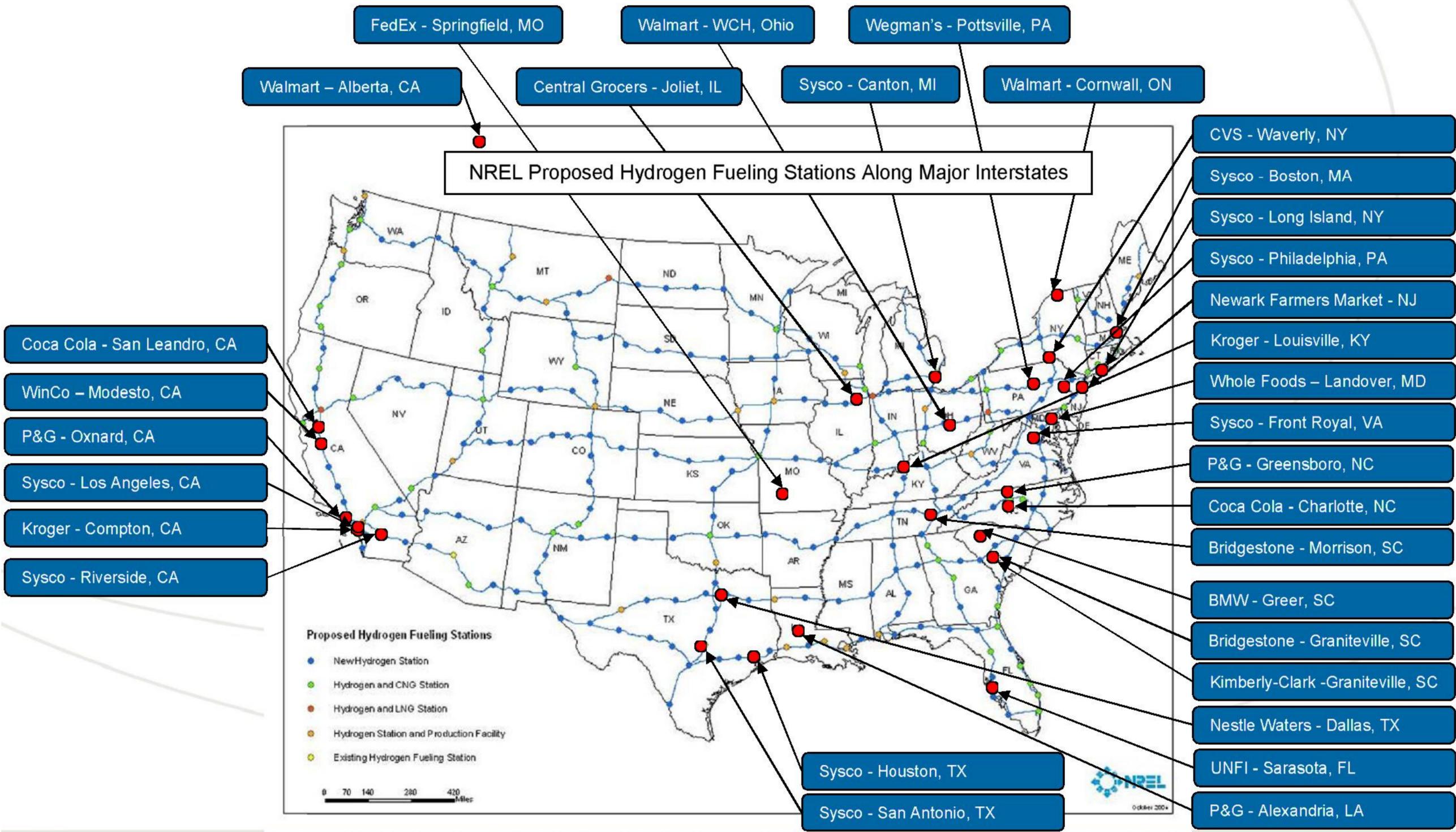
- 25 kW system
- 80V DC to 460VAC motor for interconnect between systems
- Total Development Requirement: \$3 million
- Development: 6 months, team of 5 engineers
- Earliest Demo: mid-2013

### Risks:

- Structural Integrity: Shock and vibe testing (on-road app)
- Environment: subzero temp, salt spray, and local airborne containments (air inlet)
- Limitation in Fuel Storage: can't meet H2 equivalent of 50 gallons diesel
  - 10 kg is about 2.8 feet in diameter and 3-1/2 feet long and cost about \$10k
- Limitation in Operations:
  - Yes: hub and spoke operations
  - No: multi-day runs

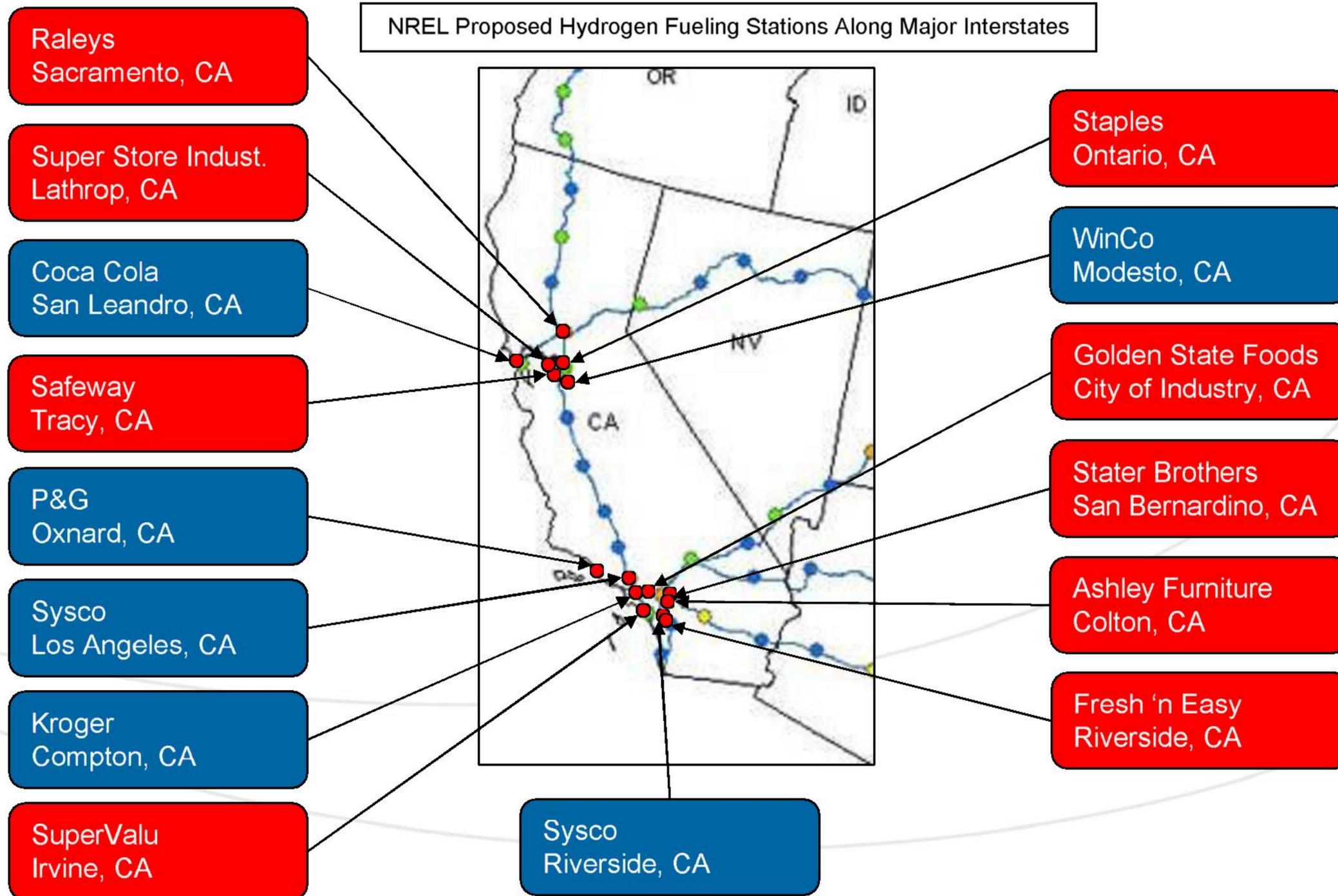


# Trailblazing the Hydrogen Highway



# CALIFORNIA Current Customers and Opportunities

## Trailblazing the Hydrogen Highway



## Bundling TRU's and Forklifts

**Issue:** H2 pricing is the largest inhibitor to fuel cell adoption.

**Solution:** TRU's use about 10 to 12x what forklifts use, which drives down H2 pricing.

Reefer Trucks: An Enabler for Fuel Cell Commercialization			
			
		→	
Forklift Trucks	Units	Forklifts	TRU's
Number of Units	#	140	140
Avg H2 Usage per Truck	kg / day	1.25	10
Total H2 Consumed per Day	kg / day	175	1,400
<b>Fleet H2 Consumption</b>	<b>kg / day</b>	<b>175</b>	<b>1,575</b>
Monthly Service Charge	\$ / month	\$20,000	\$35,000
Monthly H2 Consumption	kg / month	5,250	47,250
Molecule Cost	\$ / kg	\$5.50	\$5.50
Total Monthly Expenses	\$	\$48,875	\$294,875
<b>All In H2 Cost</b>	<b>\$ / kg</b>	<b>\$9.31</b>	<b>\$6.24</b>
<b>Reduction in H2 Cost</b>	<b>\$ / kg</b>	<b>\$3.07</b>	<b>33.0%</b>
<b>Annual Savings for Forklifts</b>	<b>\$</b>	<b>\$139,630</b>	