GenDrive®

Trailblazing California H2 Highway

Jim Petrecky, Director of Product Management, June 2012

California Energy Commission
DOCKETED
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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?

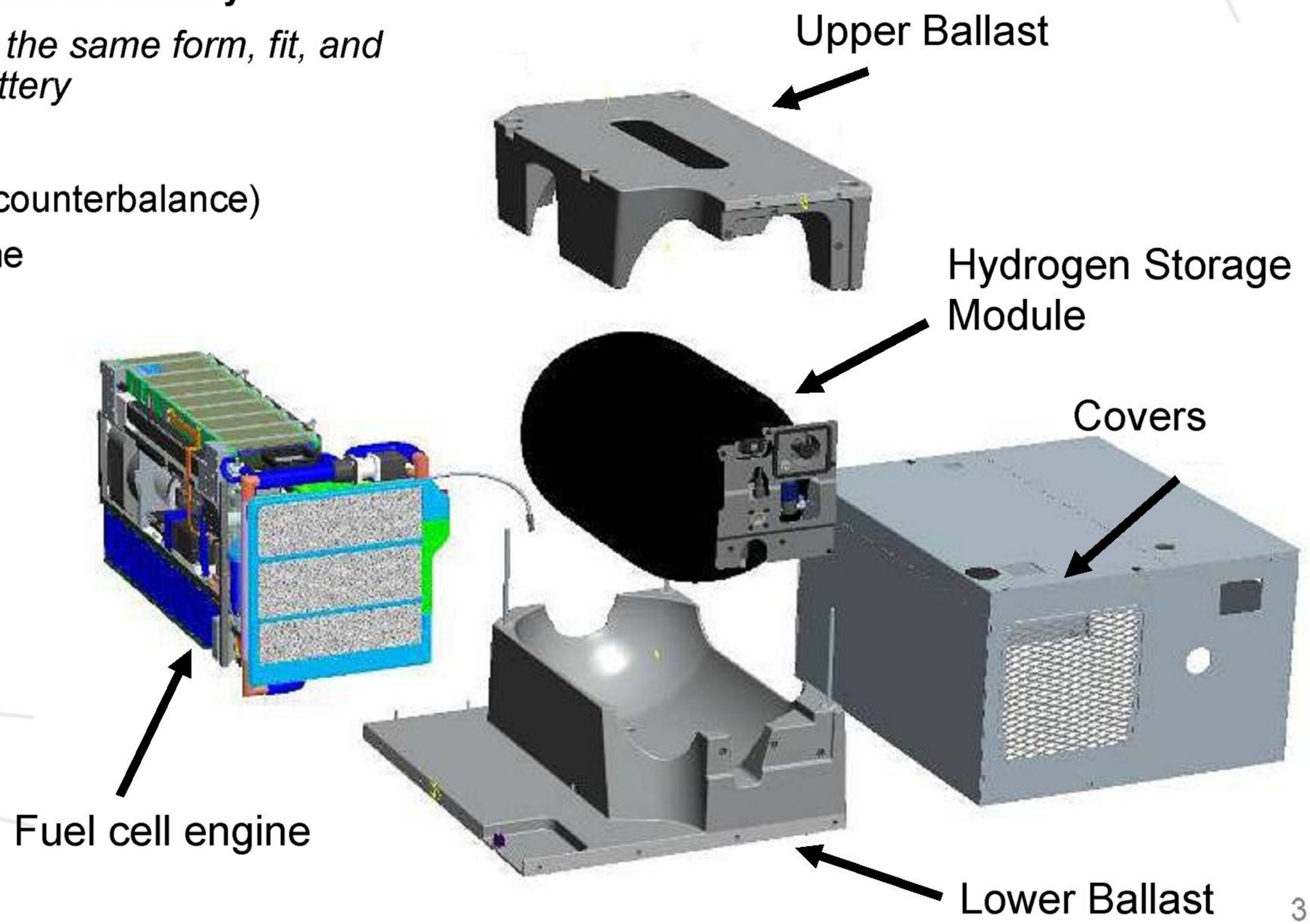
- Replace batteries permanently
- Run on hydrogen gas and can be refueled in 5 minutes or less by vehicle operator at convenient self-service dispensers
- Produce clean power at constant voltage
- Run 1.5-2 times as long as a battery
- Produce no emissions except pure water vapor and heat

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



Client List

Walmart

Good things come from Sysco

BMW

Associated Wholesale Grocers

Coca-Cola Bottling Co. Consolidated

Whole Foods Market

FedEx Freight

P&G

Mercedes-Benz

Kimberly-Clark

Wegmans

WinCo Foods

Centrella Since 1917

Bridgestone Firestone

unfi Driven by Nature

Coca-Cola

Genco

Lowe's

CVS pharmacy

Kroger

North American Sales

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

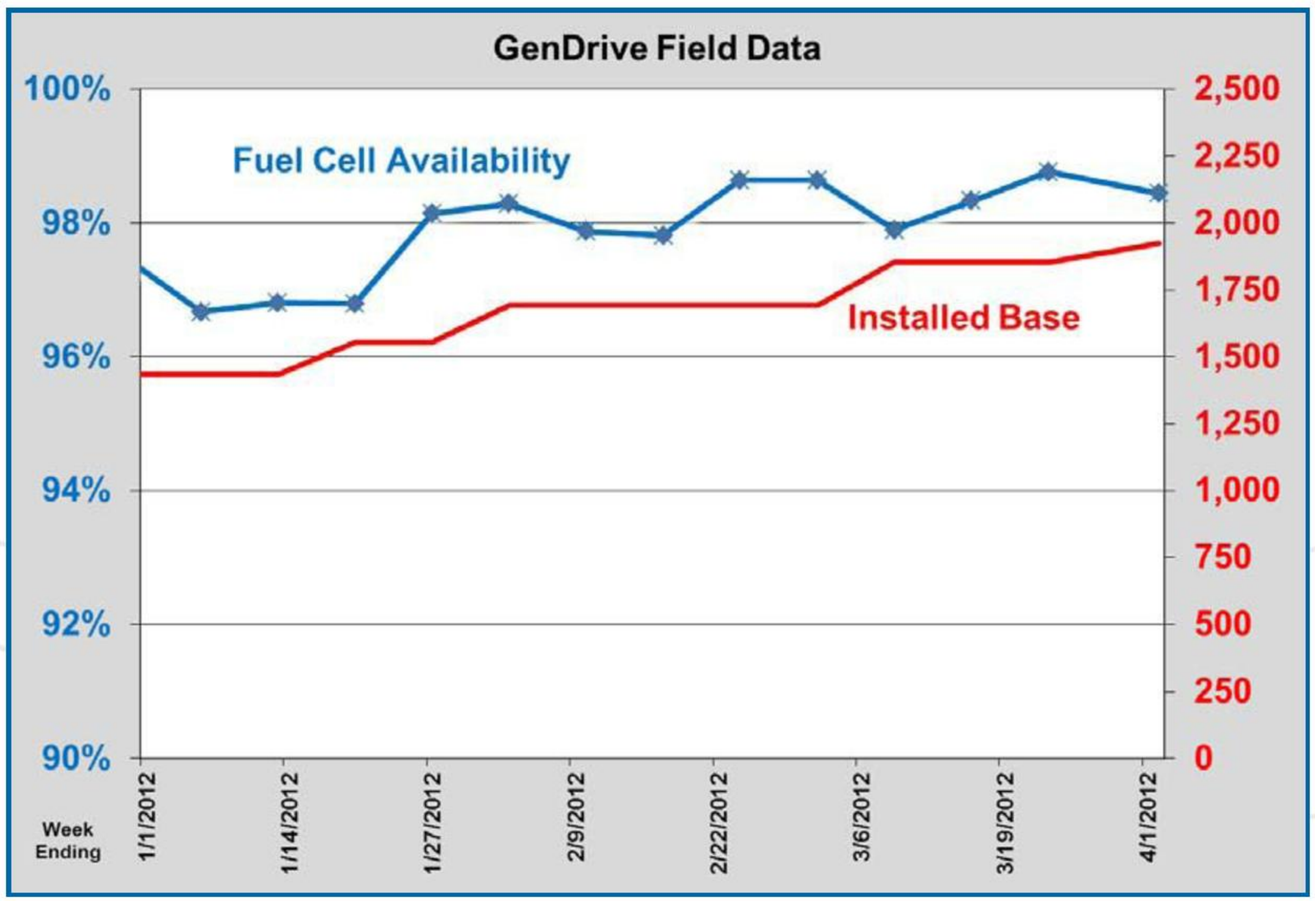
Plug Power GenDrive Sales History - North America							
#	Customer	Location	Total	#	Customer	Location	Total
1	AWG	Kansas City, MO	297	21	Proctor & Gamble	Oxnard, CA	49
2	AWG	Pearl River, LA	256	22	Sysco	Boston, MA	160
3	BMW	Greer, SC	91	23	Sysco	Canton, MI	30
4	Bridgestone	Graniteville, SC	24	24	Sysco	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				
						Total North American Sales	**3657**

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
Total	**869,043**	**7,418,821**

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.

Market: 200,000 TRU's domestically

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

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 feel long and cost about $10k
- Limitation in Operations:
    - Yes: hub and spoke operations
    - No: multi-day runs

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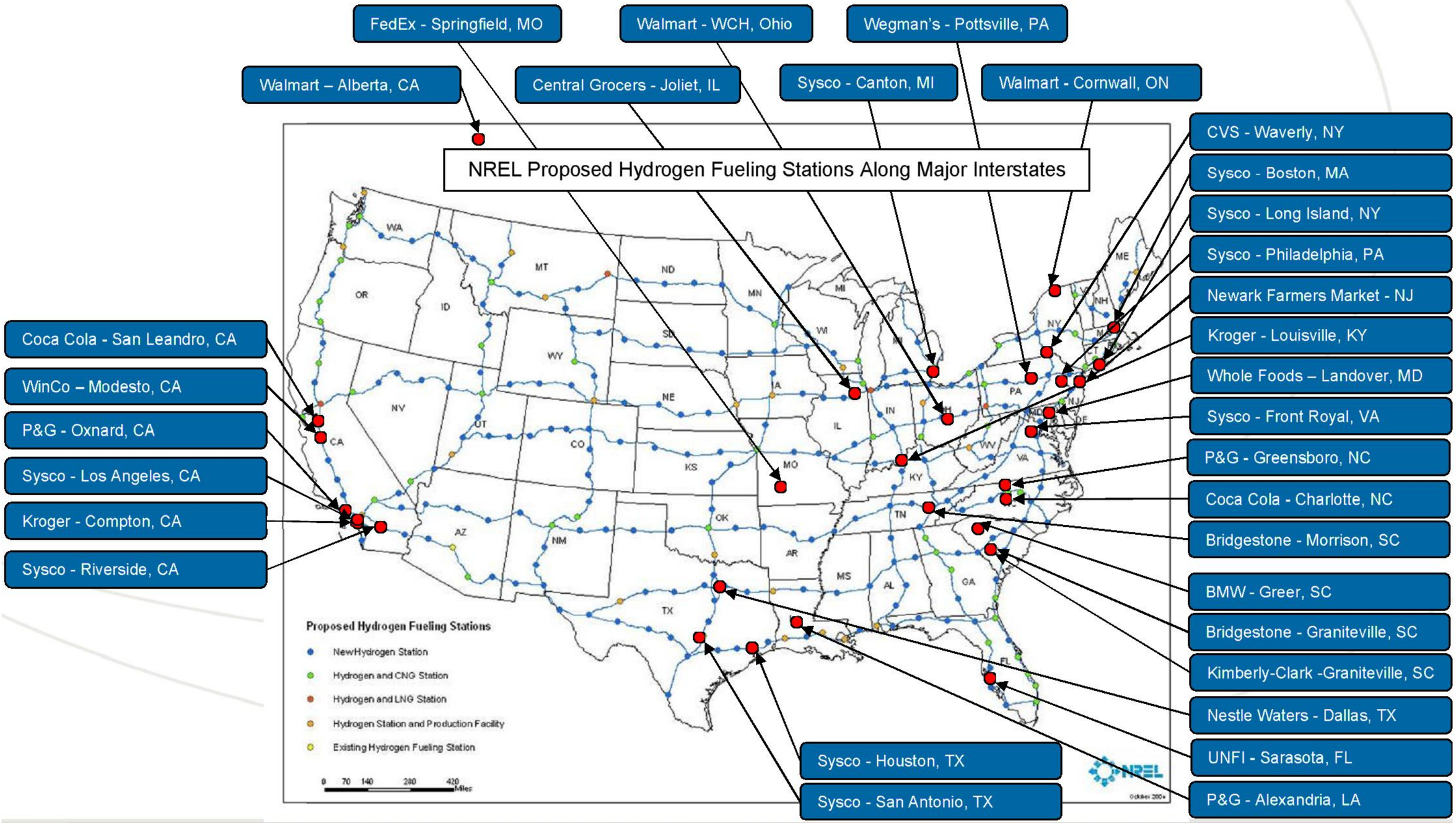
Trailblazing the Hydrogen Highway



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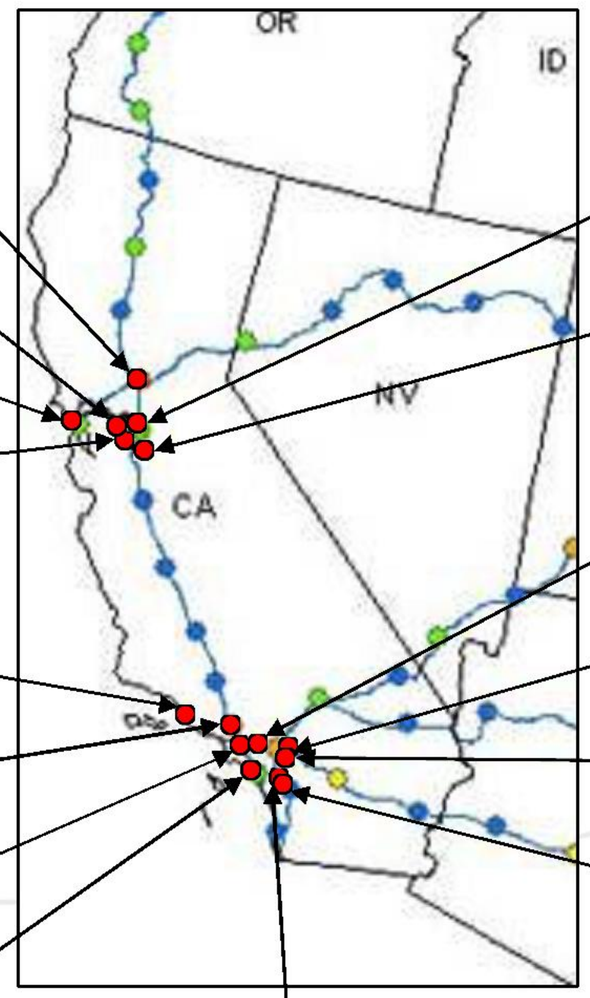
CALIFORNIA Current Customers and Opportunities

Trailblazing the Hydrogen Highway

NREL Proposed Hydrogen Fueling Stations Along Major Interstates



Raleys
Sacramento, CA

Super Store Indust.
Lathrop, CA

Coca Cola
San Leandro, CA

Safeway
Tracy, CA

P&G
Oxnard, CA

Sysco
Los Angeles, CA

Kroger
Compton, CA

SuperValu
Irvine, CA

Sysco
Riverside, CA

Staples
Ontario, CA

WinCo
Modesto, CA

Golden State Foods
City of Industry, CA

Stater Brothers
San Bernardino, CA

Ashley Furniture
Colton, CA

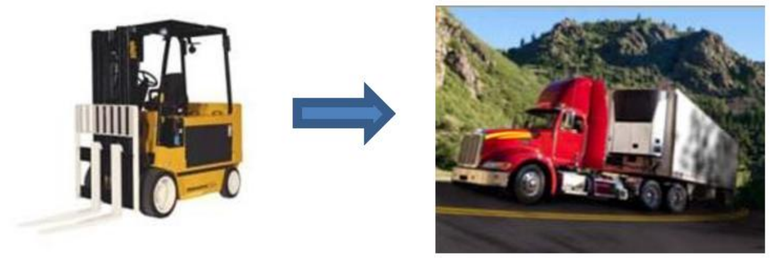
Fresh 'n Easy
Riverside, CA

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	Forkfifts	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
Fleet H2 Consumption	**kg / day**	**175**	**1,575**
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	$294,875
All In H2 Cost	**$ / kg**	**$9.31**	**$6.24**
Reduction in H2 Cost	**$ / kg**	**$3.07**	**33.0%**
Annual Savings for Forklifts	**$**	**$139,630**	