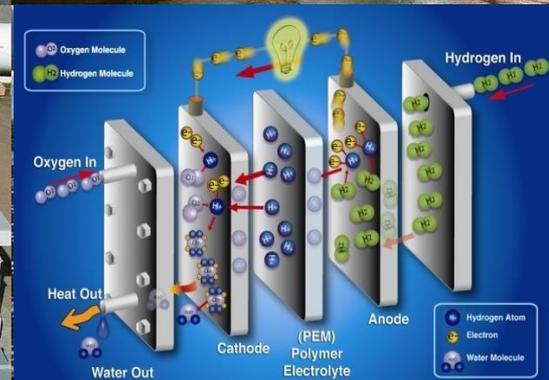


U.S Department of Energy Fuel Cell Technologies Office

U.S. DEPARTMENT OF
ENERGY | Energy Efficiency &
Renewable Energy



Getting to 2020 & Beyond

Grenoble, France

December 3, 2015

Dr. Sunita Satyapal

Director
Fuel Cell Technologies Office
U.S. Department of Energy



*“We’ve got to invest in a serious, sustained, **all-of-the-above energy strategy** that develops every resource available for the 21st century.”*

- President Barack Obama

*“As part of an all-of-the-above energy approach, **fuel cell technologies** are paving the way to competitiveness in the global clean energy market and to new jobs and business creation across the country.”*

*- Secretary Moniz,
U.S. Department of Energy*



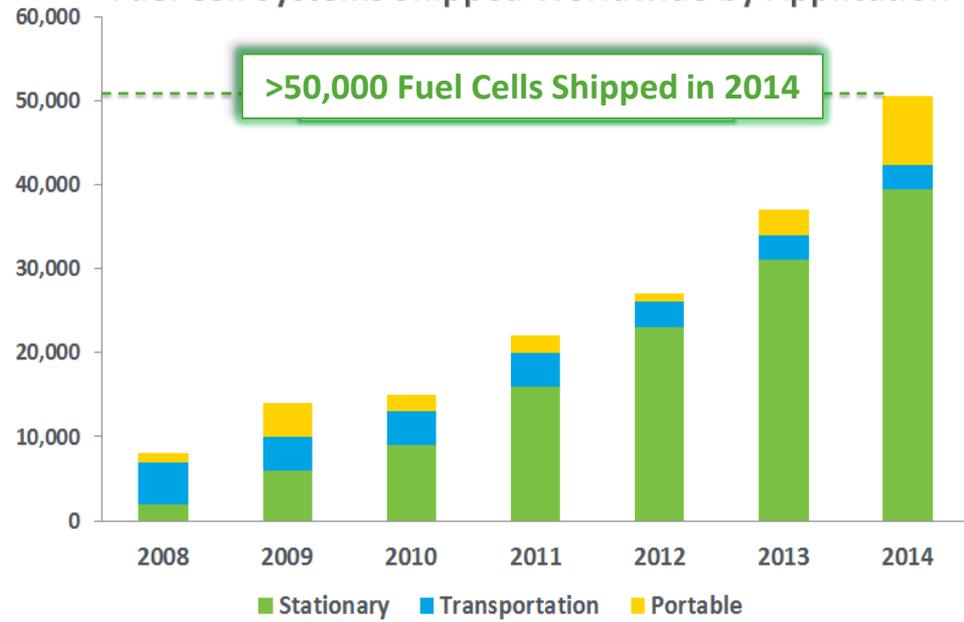
Secretary Moniz at DC Auto Show

Fuel Cells- An Emerging Industry

Recent FCEV Announcements



Fuel Cell Systems Shipped Worldwide by Application



Source: Navigant & E4tech

- Consistent **30%** annual growth since 2010
- Global market potential in 10–20 years:
 - 14 – \$31 billion/yr for stationary power
 - \$11 billion/yr for portable power
 - \$18 – \$97 billion/yr for transportation

DOE Activities Span from R&D to Deployment



1.

Research & Development

Cost Reductions

- **50%** for fuel cell systems
- **5x less** platinum
- **> 2x** increase in durability
- **80%** for electrolyzers

\$124/kW in 2006



2.

Demonstration

Forklifts, back-up power, airport cargo trucks, parcel delivery vans, marine APUs, buses, mobile lighting, refuse trucks

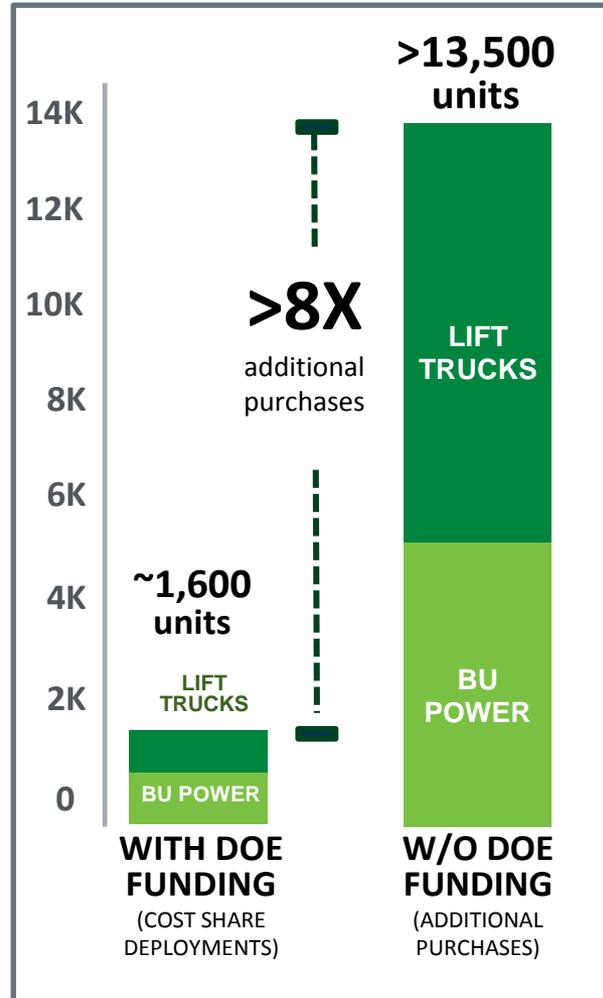
>215 FCEVs, **30** stations,
5.7M miles traveled

World's first tri-gen station



3.

Deployment



How do we get to 2020 and beyond?

Policies

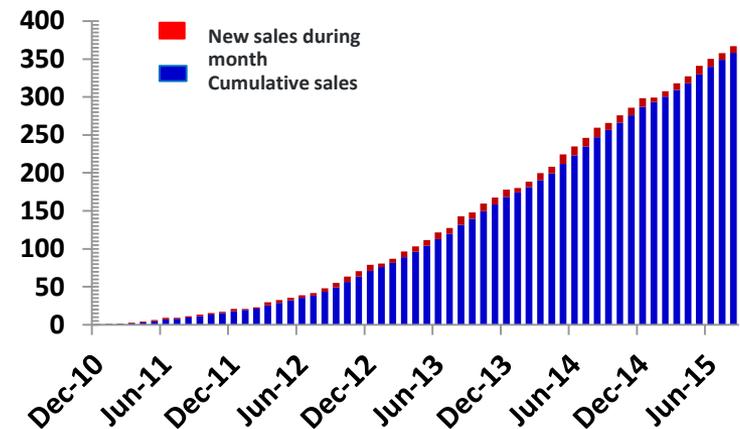
Examples

- **Climate Action Plan**
 - **>80% GHG reduction by 2050**
 - **Net oil imports cut by half by 2020**
- **Zero Emission Vehicle (ZEV) Mandate, 8 State agreement**
 - **3.3M ZEVs by 2025**
- **CAFE Standards**
 - **~55 mpg by 2025**

Innovation & Deployment

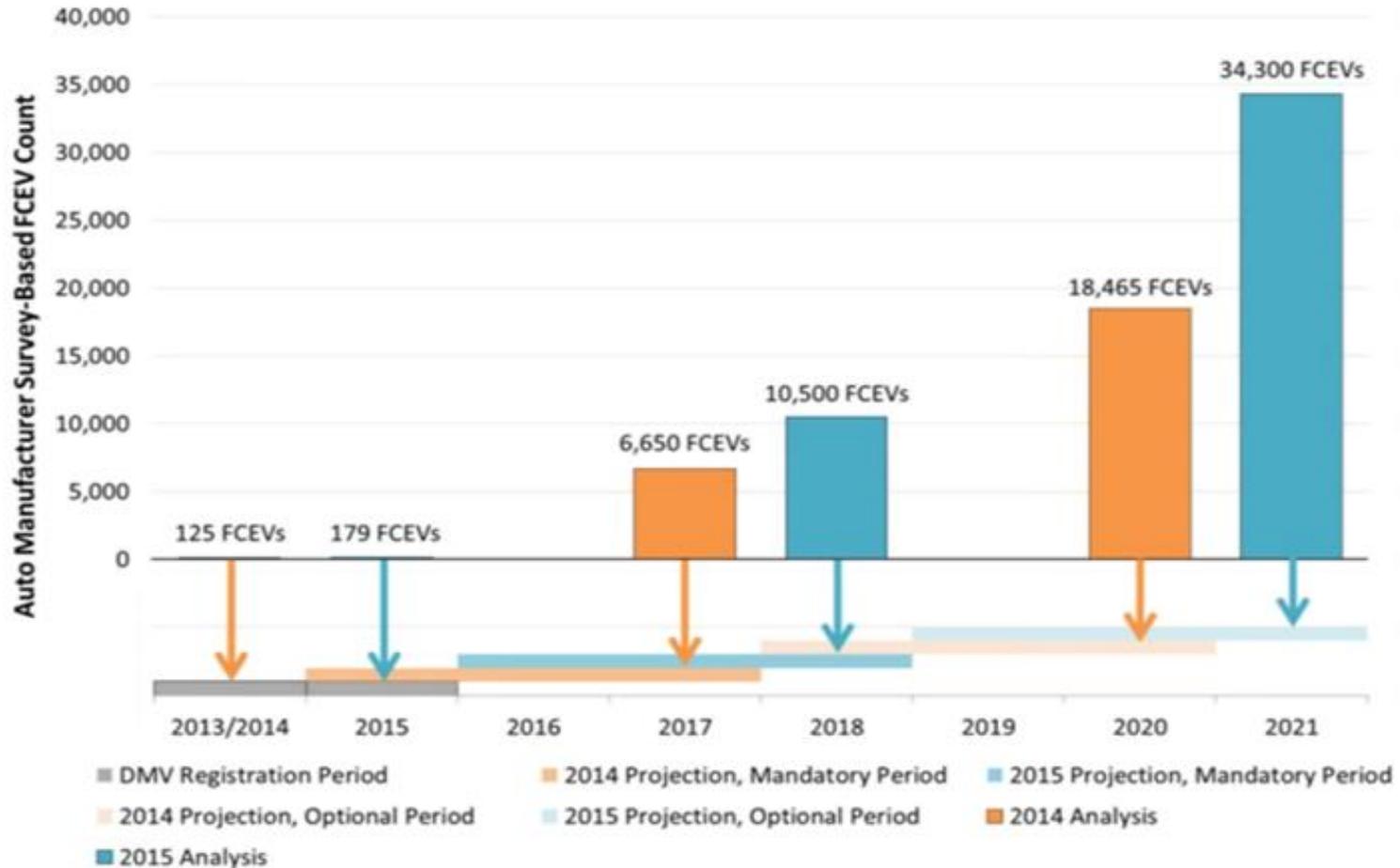
U.S. PEV Sales Growing

(in thousands)



> 350, 000 PEVs on US roads

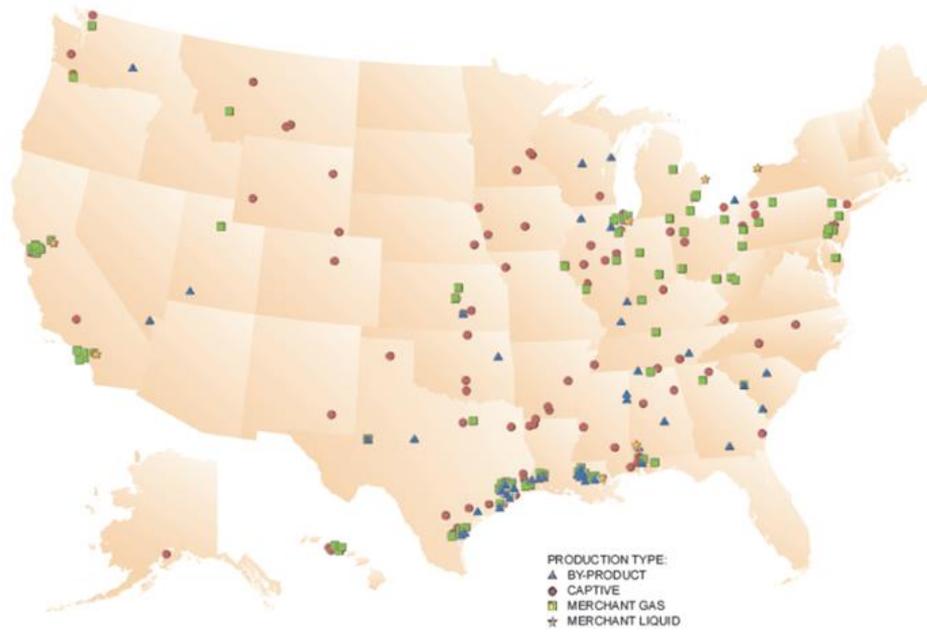
Post-2018 FCEV deployment is anticipated *to accelerate* more rapidly than previously projected



H₂ Infrastructure Status

Nationwide

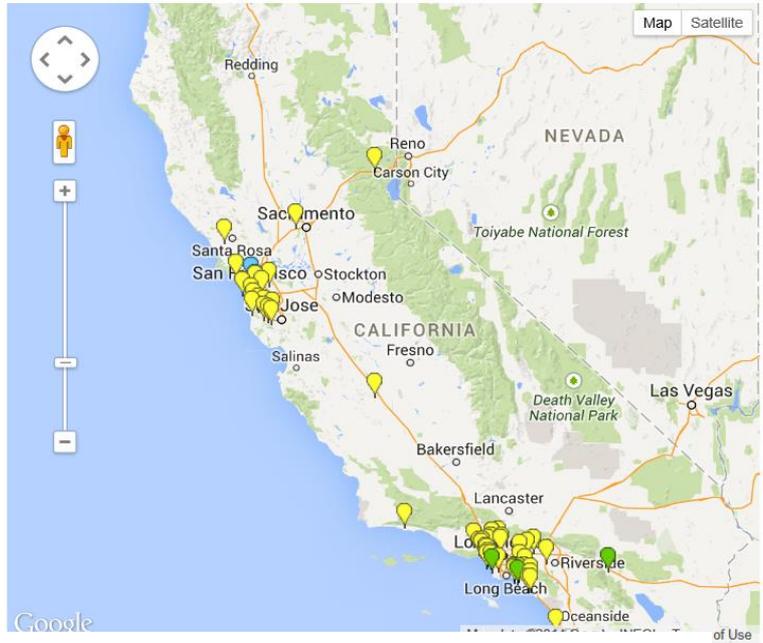
- **1600 mi.** of H₂ pipeline
- **~10M** metric tons produced/yr
- **~50 stations** (~10 public)



Centralized H₂ Production Facilities (source: NREL)

States

- **CA- 100 stations, ~\$100M** planned through 2023
- **Northeast states, Hawaii actively pursuing strategies**



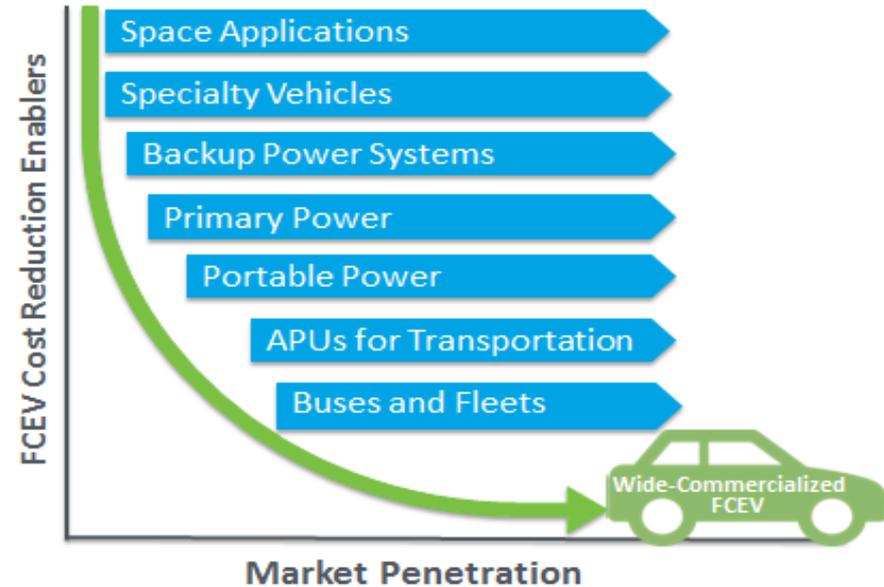
H₂ stations in CA (source: CAFCP)

H₂ from natural gas available in many states

Early Market Strategies Increase Volume

Early Markets enable:

- Fuel cell **cost reduction**
- Robust **supply base**
- Emerging **infrastructure**
- Customer **acceptance**



Early Markets Applications Recently Deployed in the U.S.



Fuel Cell Tow Trucks



Fuel Cell Bus Fleets



Forklifts



Backup Power

H₂USA: Public-Private Partnership

H₂USA

Partners



~ 45 Partners in 2015

Mission

To address hurdles to establishing hydrogen fueling infrastructure, enabling the large scale adoption of fuel cell electric vehicles

Structure

4 Working Groups coordinated by the Operations Steering Committee

H₂USA's Working Groups



More than 45 partners working towards adoption of FCEVs and H₂

- Early infrastructure rollout
- Hydrogen from renewables/low carbon resources
- Cost reduction & performance to drive market penetration

Key focus areas to enable long term goals



“It is literally true that you can succeed best and quickest by helping others to succeed”

- Napoleon Hill

Thank You

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