U.S. Country Update

22nd IPHE Steering Committee (SC) Meeting

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Rome, Italy

All-of-the-Above Energy Strategy

*"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

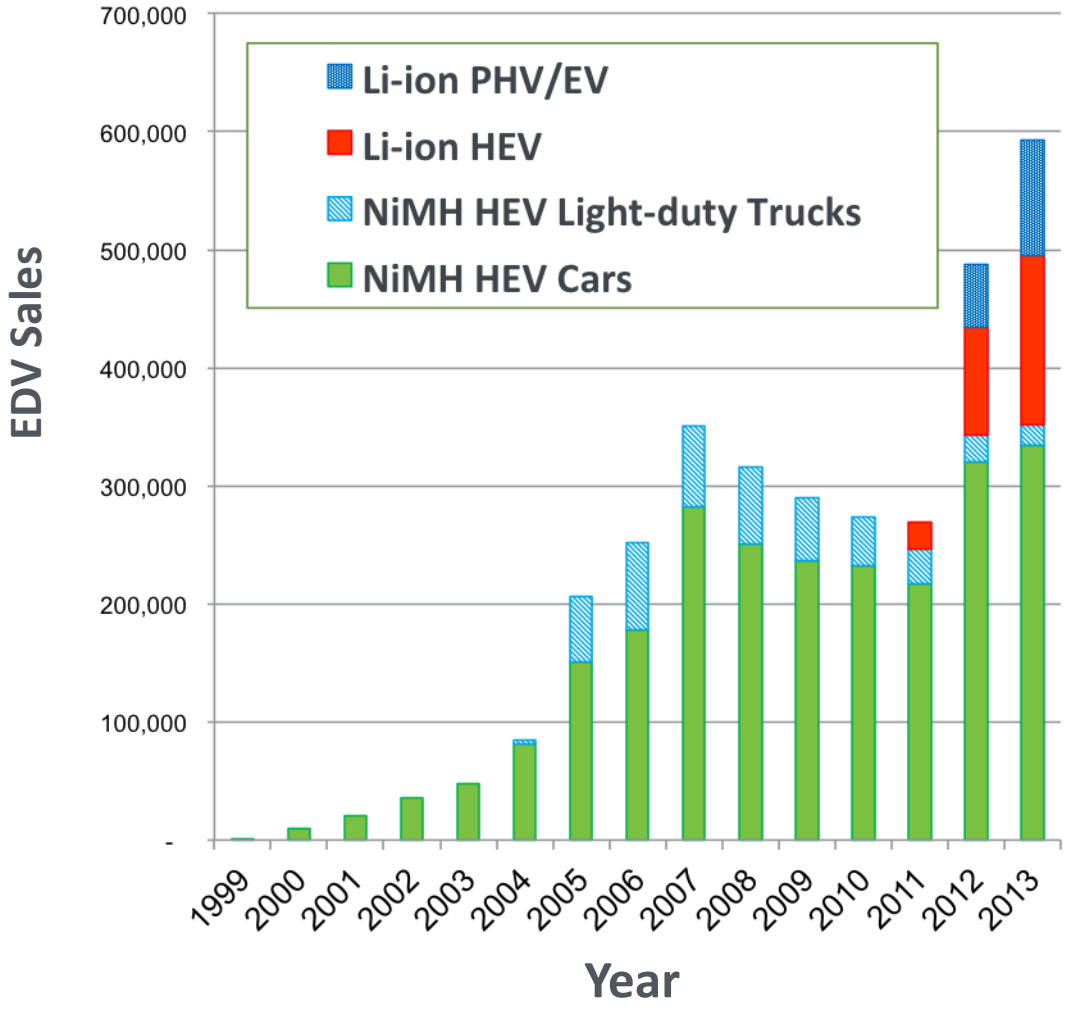
"As part of an all-of-the-above energy approach, fuel cell technologies are paving the way to competitiveness in the global clean energy market and to new jobs and business creation across the country."

- Secretary Moniz,
U.S. Department of Energy

Secretary Moniz at DC Auto Show

Growth in Electric Drive Vehicle Sales

U.S. Electric Drive Vehicle Sales, by Technology (1999-2013)



2013 Sales Set Record

- **46 EDV models were available for sale**
  - 575,000 Sales
- **~97,000 PEVs Sold. The top 6 models represent 95% of the sales :**
  - Volt (23,094)
  - Leaf (22,610)
  - Model S (19,400)
  - Prius PHEV (12,088)
  - Cmax Energi (7,154)
  - Fusion Energi (6,089)
- **Over 3.1 million EDVs on the road Jan.1, 2014**

Office of Energy Efficiency & Renewable Energy

Sustainable
TRANSPORTATION

Renewable
ELECTRICITY GENERATION

Energy Saving
HOMES, BUILDINGS, & MANUFACTURING

Sustainable Transportation Sector

Sustainable TRANSPORTATION

- Transportation Efficiency
- Diverse Fuel Sources
- Domestic & Renewable

Hydrogen and Fuel Cells

Vehicles

Bioenergy

National Energy Goals & Climate Action Plan

Net Oil Imports

↓ **50%** by 2020

GHG Emissions

↓ **17%** by 2020

↓ **>80%** by 2050

Hydrogen & Fuel Cell Budget

Key Activity	FY 2014 ($ in thousands) Approp.	FY 2015 ($ in thousands) Request
Fuel Cell R&D	32,422	33,000
Hydrogen Fuel R&D	34,467	36,283
Manufacturing R&D	2,879	3,000
Systems Analysis	3,000	3,000
Technology Validation	6,000	6,000
Safety, Codes and Standards	6,909	7,000
Market Transformation	2,841	3,000
NREL Site-wide Facilities Support	1,000	1,700
SBIR/STTR	3,410	TBD
Total	$92,928	$92,983

Office	FY 2014
EERE	$93M
Basic Science[2]	$20M to $25M
Fossil Energy, SECA	$25M
ARPA-E[3]	$33M

FY14 DOE Total:
~$175M

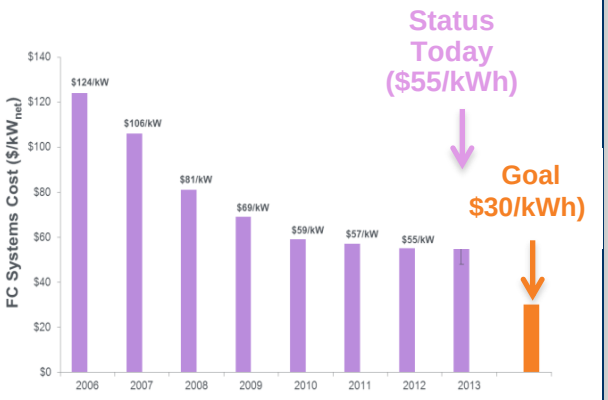
Consistent R&D funding request and appropriations in recent years

DOE Activities Span from R&D to Deployment

Research & Development

- *50% reduction since 2006*
- *80% electrolyzer cost reduction since 2002*

Fuel Cell System Cost*



**At 500,000-unit production*

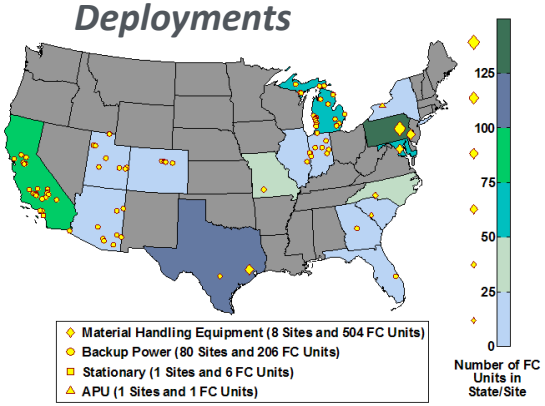
Demonstration

- *>180 FCEVs*
- *25 stations*
- *3.6 million miles traveled*
- *World's first tri-gen station*

(250 kW on biogas, 100 kg/d H2 produced)

Deployment

- *Government Early Adoption* *(DoD, FAA, California, etc.)*
- *Tax Credits: 1603, 48C*
- *~1,600 fuel cells deployed*
- *DOE Recovery Act & Market Transformation Deployments*



DOE's RDD&D activities are enabling commercialization of fuel cells

FCEVs are on U.S. Roads Now!

Just Announced Publicly- Toyota Mirai FCV

1st commercially available FCEV for sale in the US

Toyota Mirai Fuel Cell Vehicle

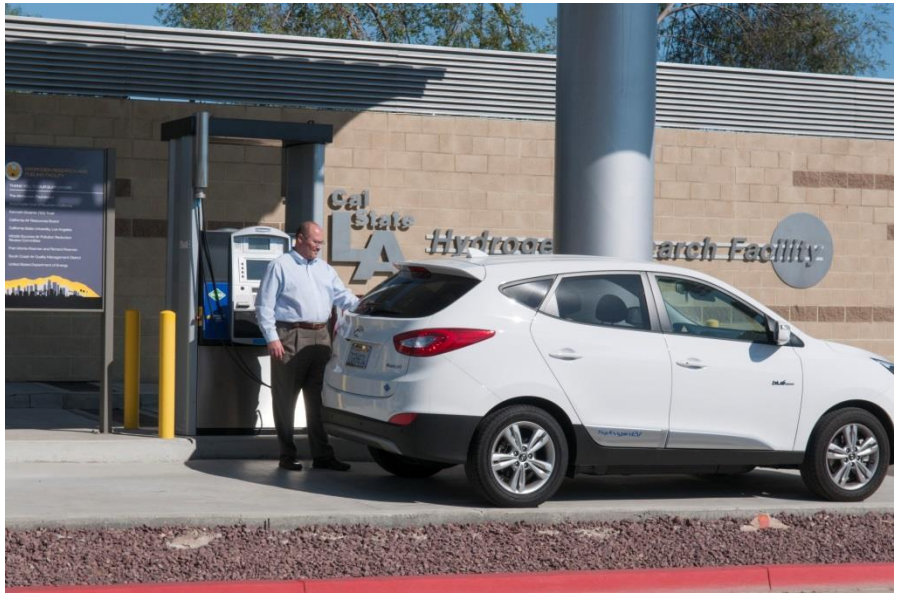
Deputy Secretary of Energy,
Daniel B. Poneman
test driving Hyundai Fuel Tucson

OEMs bringing fuel cells to showrooms and driveways

First Commercial Hydrogen Fueling

First station qualified for commercial sale of hydrogen

- **5% accuracy certificate**
- **2nd station soon to be announced**
- **Audi/Volkswagen performed several fuelings of Audi and Passat FCEVs**
- **60 kgH_2/day; Hydrogenics electrolyzer**
- **700 bar fast-fill capability; Quantum dispenser**
- **Station grid-tied and powered by 100% renewables**



California State University-Los Angeles (CSULA) hydrogen station first in the world and the U.S. to commercially sell hydrogen per kilogram.

H_2 Infrastructure Development and Status at National and State Level

Nationwide

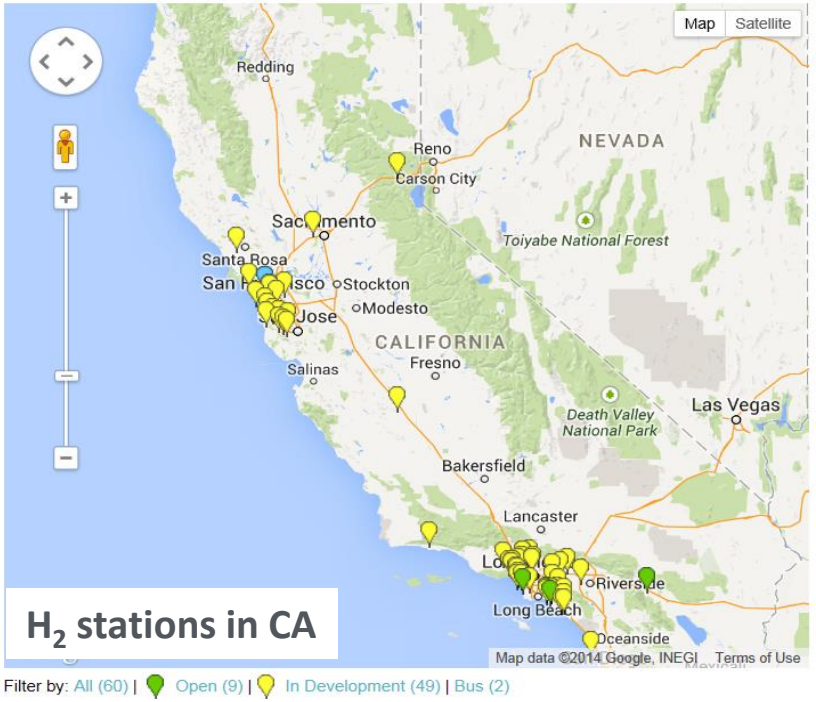
- **1500 mi.** of H_2 pipeline
- **>9M** metric tons produced/yr
- **~50 stations** (~10 public)

Other States

- **8-State MOU Members:** CA, CT, NY, MA, MD, OR, RI and VT
- **MA, NY, CT:** Preliminary plans for H_2 infrastructure and FCEVs deployment in metro centers in NE states.
- **Hawaii:** Public access refueling infrastructure on Oahu by 2020

California

- **100 stations** - Goal
- **>~$70M** awarded
- **~$100M** planned through **2023**



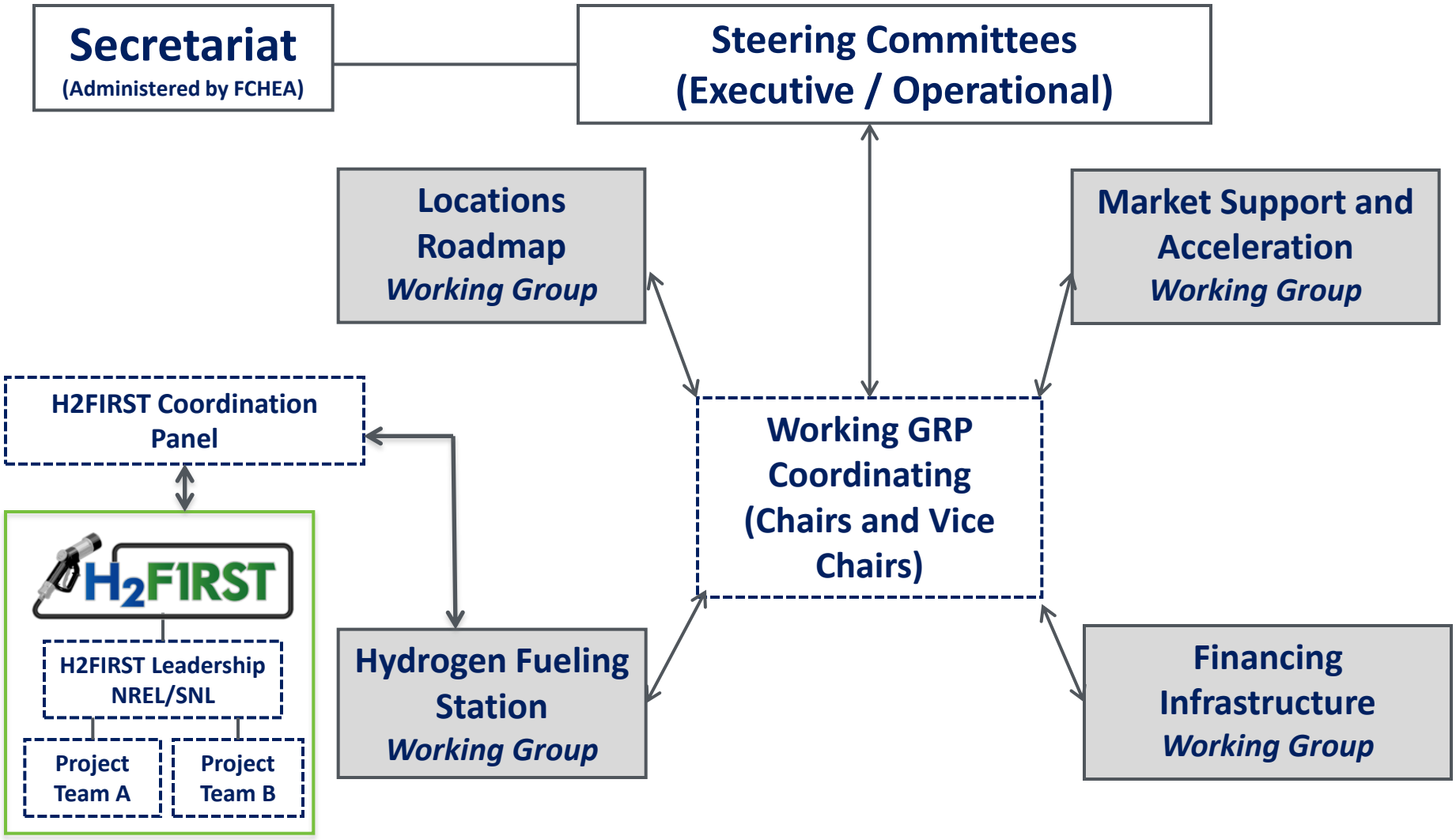
H_2 stations in CA

California, NE States and Hawaii have H_2 infrastructure efforts underway

H_2USA Public-Private Partnership to address H_2 Infrastructure Challenges

3X increase in partners and growing since 2013

4 H_2USA Working Groups



4 working groups with H2FIRST as a project that supports H2USA mission

Tax Credits and Other Incentives

CAFE Standards

- Fuel economy requirements
- ~55 mpg for cars and light-duty trucks by Model Year 2025

ZEV Mandates

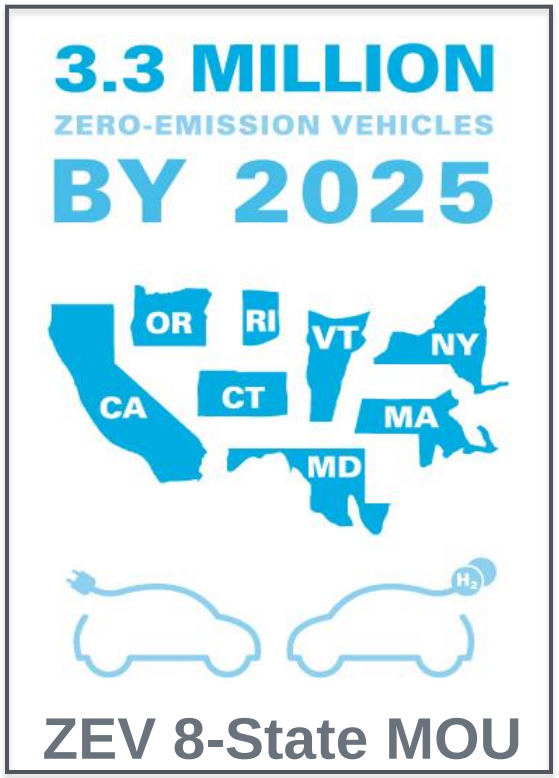
- Drives industry investment in BEVs and FCEVs

FCEV Tax Credit

- $4,000 (Federal, expires Dec 2014)
- States can have additional incentives
  - E.g. $5,000 (California)

Hydrogen

- Infrastructure Tax Credit (expires on Dec 2014)
  - 30% of cost, not to exceed $30,000
  - Previous $200K expired



Incentives are critical for market deployment of FCEVs and H_2 Infrastructure

H2 Refuel H-Prize

H2refuel
U.S. Department of Energy

$1 million competition for on-site home and community-scale H_2 fueling systems.

1st Year
Teams form and submit designs

2nd Year
Selection of finalists and testing

Late 2016
Technical and cost analysis to select winner

Award
$1M

Promoting H_2 fueling system development in the community
Visit http://hydrogenprize.org/

H_2 Safety Codes and Standards Education Efforts

- Trained **>30,000** first-responders and code officials on hydrogen safety and permitting through on-line and in-classroom courses
- Trained **>12,000** teachers
- Developed H2Tools portal

Hydrogen Tools App for iPad/iPhone

1,130

downloads as of 11/2014)

www.eere.energy.gov/hydrogenandfuelcells/codes/

Implementing safety practices and procedures to ensure the safe operation, handling, and use of hydrogen and fuel cell technology

11th Annual Hydrogen Student Design Contest

What

- Contest to develop innovative hydrogen fueling station business and financing models

The Hydrogen Education Foundation's
Hydrogen Student Design Contest
www.HydrogenContest.org

Who

- Undergraduate and graduate students worldwide

When

- Early Registration by Dec 8, 2014
- Jan 16, 2015- Deadline to register and to submit abstracts

Contest is now open at www.hydrogencontest.org

IPHE Special Topic Questions

What have been the most valuable aspects or outcomes of IPHE?

- Information Sharing
  - *E.g. Country updates*
- RCS WG Activities
  - *E.g. Round robin testing, RCS coordination*
- Networking Opportunities
  - *Contacts from countries*

What is your greatest need that can be addressed through IPHE?

- Higher level visibility and communication-*e.g. Clean Energy Ministerial, Paris UNF-CCC, etc*.
- Greater collaboration especially on infrastructure, policies and sharing best practices
- Education and outreach activities

IPHE Special Topic

List top 3 actions/next steps to be undertaken through IPHE.

- Ministerial level meeting with industry stakeholders
- Flagship documents and visibility – webinars, *blogs, twitter, Facebook, wiki*
- Accountability and responsiveness among country representatives

List at least 1 specific action you would be willing to support.

- Education and outreach initiatives to increase emphatic public support for FCEV deployment and public awareness

Example

- Public RFI (Request for Information/Survey) to solicit ideas from the H_2 and Fuel Cell community & feed into IPHE decision making
- Host more webinars, etc.

Additional IPHE Actions

- Stronger WG participations
- Educational Event – (E.g. Shell-Eco Marathon)
- Centralized database with H_2 infrastructure data for country members
- Reinstate Awards for greater IPHE visibility and promoting stakeholders


“Coming together is a beginning,
staying together is progress
and
working together
is success”
- Henry Ford

Thank You

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