

H₂USA Update

**Department of Energy
Annual Merit Review Panel
Hydrogen Infrastructure
Thursday, June 19, 2014**

H₂USA

Mission Statement

The mission of H₂ USA is to promote the commercial introduction and widespread adoption of FCEVs across America through creation of a public-private collaboration to overcome the hurdle of establishing hydrogen infrastructure.

Goals

- Establishing necessary hydrogen infrastructure and leveraging multiple energy sources, including natural gas and renewables
- Deploying FCEVs across America
- Improving America's energy and economic security
- Significantly reducing greenhouse gas emissions
- Developing domestic sources of clean energy and creating jobs in the United States
- Validating new technologies and creating a strong domestic supply base in the clean energy sector

Signatories on the Letter of Understanding



U.S. Department of Energy



State of California



Northeast States for Coordinated Air Use Management



Air Liquide



American Gas Association



American Honda Motor Company



Argonne National Laboratory



California Fuel Cell Partnership



Association of Global Automakers



Center for Hydrogen Research



Chrysler Group LLC



Electric Drive Transportation Association



Fuel Cell & Hydrogen Energy Association



General Motors Holding LLC



Hydrogenics



Hyundai Motor America



ITM Power



Massachusetts Hydrogen Coalition



National Renewable Energy Laboratory



Mercedes-Benz



Nissan North America R&D



Toyota Motor North America



PDC Machines



Plug Power Inc.



Proton Onsite



Sandia National Laboratories



Savannah River National Laboratory



Pacific Northwest National Laboratory



SCRA



Nuvera



Linde North America



National Association of Convenience Stores



H₂USA Organization Chart

**Steering Committees
(Executive / Operational)**

Secretariat
(Administered by FCHEA)

**Locations Roadmap
Working Group**

- Identify and prioritize markets
- Market Modeling Methodology
- Clustering, destinations and locations
- Regulatory barriers (zoning)
- Station rollout timing

**Market Support and Acceleration
Working Group**

- Product launch and timeline
- Studies and whitepapers
- Codes and standards (non-vehicle related)
- Component development
- Cost reduction
- Public education
 - First-responders
 - State and local authorities
 - Opinion leaders
- Etc.

**Hydrogen Fueling
Station
Working Group**

- Specification, design, and deployment
- Fueling Resources
- Delivery
- Dispensing technology
- Reliability
- State and local Regulations
- Etc.

**Working GRP
Coordinating
(Chairs and
Vice Chairs)**

**Financing Infrastructure
Working Group**

- Private sector financing
- Government support
- Etc.

**H2FIRST
Coordination
Panel**

**H2FIRST
Leadership
NREL/SNL**

**Project
Team A**

**Project
Team B**

Market Support & Acceleration Working Group (MSAWG)

Chair - Bob Wimmer (Toyota)

Co-Chair - Genevieve Cullen (Electric Drive Transportation Association)

**Co-Chair - Will (Charles) James (US DOE, SCS)
Jay Keller – Alternate (Zero Carbon Energy Solutions)**

Staff Liaison – Jay Keller (H₂USA)

**H₂USA Full Participant Meeting
Washington Marriott Wardman Park Hotel
June 19, 2014**

MSAWG Objectives

- ▶ **Develop materials and resources for public and stakeholder education**
 - H₂USA, hydrogen infrastructure, business cases ...
- ▶ **Create out-reach resources for H₂USA**
 - Website
 - Frequently Asked Questions (FAQ)
 - Standard presentation slide deck
 - For use by H₂USA staff and Working Groups (WG)
- ▶ **Coordinate joint WG Task Force(s) to work on items of mutual concern – for example: RC&S**
- ▶ **Facilitate efforts to site H₂ fueling in Washington DC.**


MSAWG Activities

- ▶ Outreach Task Force
 - Completed FAQ for H₂USA website
 - PowerPoint slide deck with FAQ foundation for use in:
 - Stakeholder briefings & education
 - Public briefings & educations
 - Posting on H₂USA public website
 - Increase visibility of FCEVs in the DC area
 - Enabling fueling station
 - Created internal and external [H₂USA website](#)

H₂USA FAQ Version # (2014-06-2)

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H₂USA

- ▶ H₂USA is a public-private partnership to:
 - Promote the commercialization and widespread adoption of hydrogen fueled Fuel Cell Electric Vehicles (FCEVs)
 - Reduce the hurdles to enable a hydrogen fueling infrastructure to support the deployment of FCEVs
- ▶ H₂USA membership is made up of a broad spectrum of participants including:
 - U.S. Department of Energy, automakers, fuel cell suppliers, materials and component manufacturers, energy companies, hydrogen suppliers, hydrogen production hardware companies, national laboratories, associations, NGOs and others. Visit [URL for more information](#).

H₂USA 

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MSAWG Activities

- H₂USA website

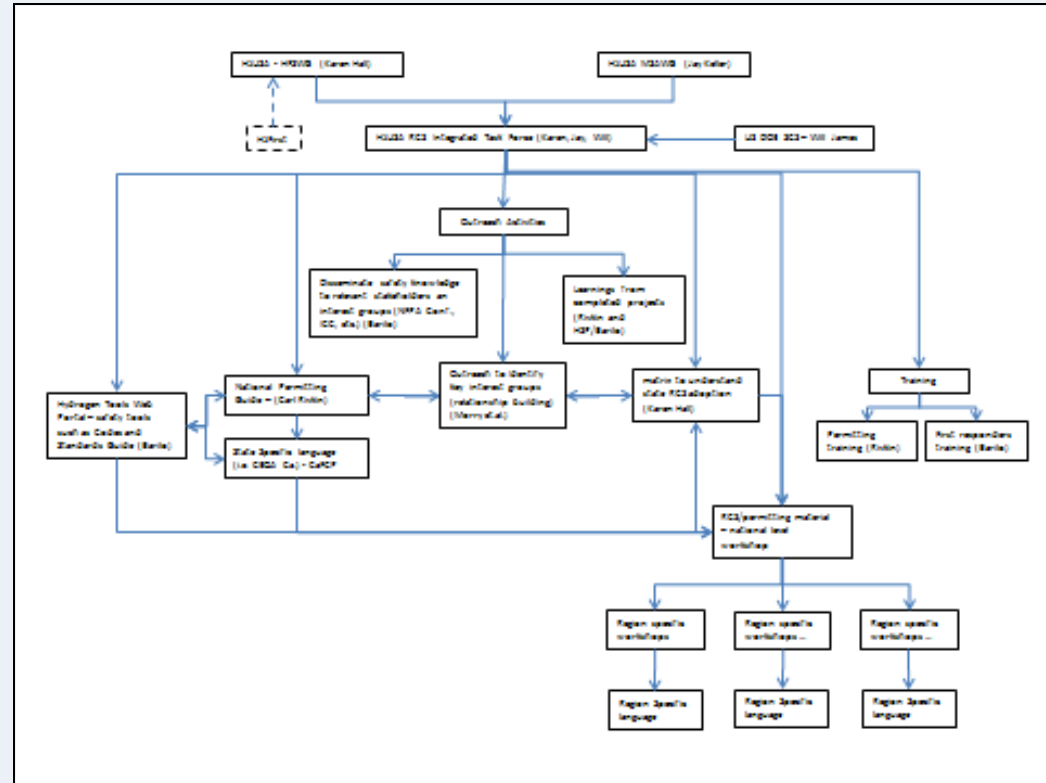
The screenshot displays the H2USA website interface. At the top, there is a browser window with several tabs open, including 'Gmail - RE: H2USA', 'Inbox Humor: Is', 'SAE Automotive', 'Hearing Aids Oak', and 'Home | H2USA'. The address bar shows '184.95.62.76'. Below the browser window is a dark navigation bar with a home icon, menu items (Dashboard, Content, Structure, Appearance, People, Modules, Configuration, Reports, Help), and user information ('Hello test', 'Log out'). A secondary bar contains 'Add content', 'Find content', and 'Edit shortcuts'. The main content area features the H2USA logo on the left and a navigation menu on the right with items: HOME, WHY HYDROGEN (Benefits of H2), STATUS (Progress made), OPPORTUNITIES (Business case for H2), and ABOUT (Who we are). A large image shows a hydrogen fueling station with three cars (a dark red sedan, a light blue car, and a white SUV) being refueled. Below the image is the text: 'Accelerating progress toward hydrogen fueling to meet public demand and support the introduction of fuel cell electric vehicles nationwide. [Join us >](#)'. At the bottom, there are four columns of content: 'Why Hydrogen' (with a bar chart icon), 'Status' (with a location pin icon), 'Opportunities' (with a book icon), and 'Mobile Apps' (with a smartphone icon). Each column has a short introductory paragraph.

MSAWG Activities

Codes & Standards Task Force

- Integrating RCS activities to develop station permitting guides (H₂USA, DOE, FCHEA)

- Creating a joint task force between HSWG and MSAWG to coordinate Regulations Codes and Standards (RCS) and Permitting activities.



MSAWG Activities

- ▶ ~2 year refueling station requested in DC by H₂USA.
- ▶ National Park Service (NPS) and DOE FCTO working on interagency plan
- ▶ Operational 1st Qtr. 2015 (Target)
- ▶ Two sites evaluated:
 - E. Potomac Park (constrained)
 - Brentwood NPS maintenance facility (selected)
- ▶ Brentwood advantages:
 - 24 x 7 security
 - Room for tube trailer(s) & dispenser
- ▶ Next Steps:
 - Letter from FCTO to NPS for:
 - refueling frequency
 - personnel access
 - fuel truck specifics
- ▶ DOE POC – Pete Devlin

Two views of the selected site



MSAWG Activities

- ▶ **MSAWG identified the need for a project management tracking tool to coordinate and track H₂USA WG activities**
 - Selected a web based tool

The screenshot displays a Smartsheet project management tool interface. The main view is a Gantt chart showing project tasks, their durations, start and finish dates, and completion percentages. The tasks are organized into several categories, including EDTA Conf Participation, H2USA presentation, Georgetown Climate Center, and ATVM Office Meeting. The interface includes a navigation sidebar on the left, a search bar at the top, and a status bar at the bottom.

Task Name	Duration	Start	Finish	% Complete	Assign To	Comm	Stat	Predecessors
EDTA Conf Participation	40	02/03/14	03/28/14	5%	G. Cul			
Define objectives and role	20	02/03/14	02/28/14	10%	MSAV			
Prepare materials	20	03/03/14	03/28/14	0%				
H2USA presentation	60	03/03/14	05/23/14	7%	J. Kell			
WGs define presentation themes	10	03/03/14	03/14/14	10%				
Develop presentation strawman(s)	15	03/03/14	03/21/14	0%	MSAV			
Collect slide graphics	26	03/03/14	04/07/14	10%	MSAV			
Develop draft slides	31	03/14/14	04/25/14	10%				
Circulate to WG Chairs for comment	10	04/28/14	05/09/14					
Finalize slides	11	05/09/14	05/23/14					
Update as needed	158	05/26/14	12/31/14					
Georgetown Climate Center					G. Cul			
ATVM Office Meeting	40	02/24/14	04/18/14		B. Wir			
Confirm H2USA participants	15	02/24/14	03/14/14					
Contact ATVM Office & propose meeting	5	03/03/14	03/07/14					
Hold meeting	10	03/17/14	03/28/14					52, 53
H2USA define next steps	15	03/31/14	04/18/14					54
Temporary H2 Refueling in DC	60	03/03/14	05/23/14					
Hardware	60	03/03/14	05/23/14					
ID hardware suppliers	20	03/03/14	03/28/14					
Contact suppliers - define	20	03/31/14	04/25/14					

Investment & Finance Working Group

▶ Incentives Task Team

- Developed, distributed, solicited and received responses to DOE's RFI
- NREL organized and consolidated key RFI strategy into five recommended financial scenarios
- NREL developed analysis methodology and reporting metrics for subsequent scenario analysis
- Based on input from I&F WG, NREL is further analyzing each scenario to determine viable strategies

▶ Leadership Task Team

- Outreach to the Investment Community
 - Developed potential investor contact list
 - Made multiple presentations about H2USA to investment professionals
 - Successfully recruited one investment company professional to join H2USA and the Investment & Finance WG
- Expanded the capabilities of the WG
 - Developed an Investment & Finance Glossary of Terms
 - Invited an investment professional to speak at June 11th WG meeting

HFSWG – Charter & Scope

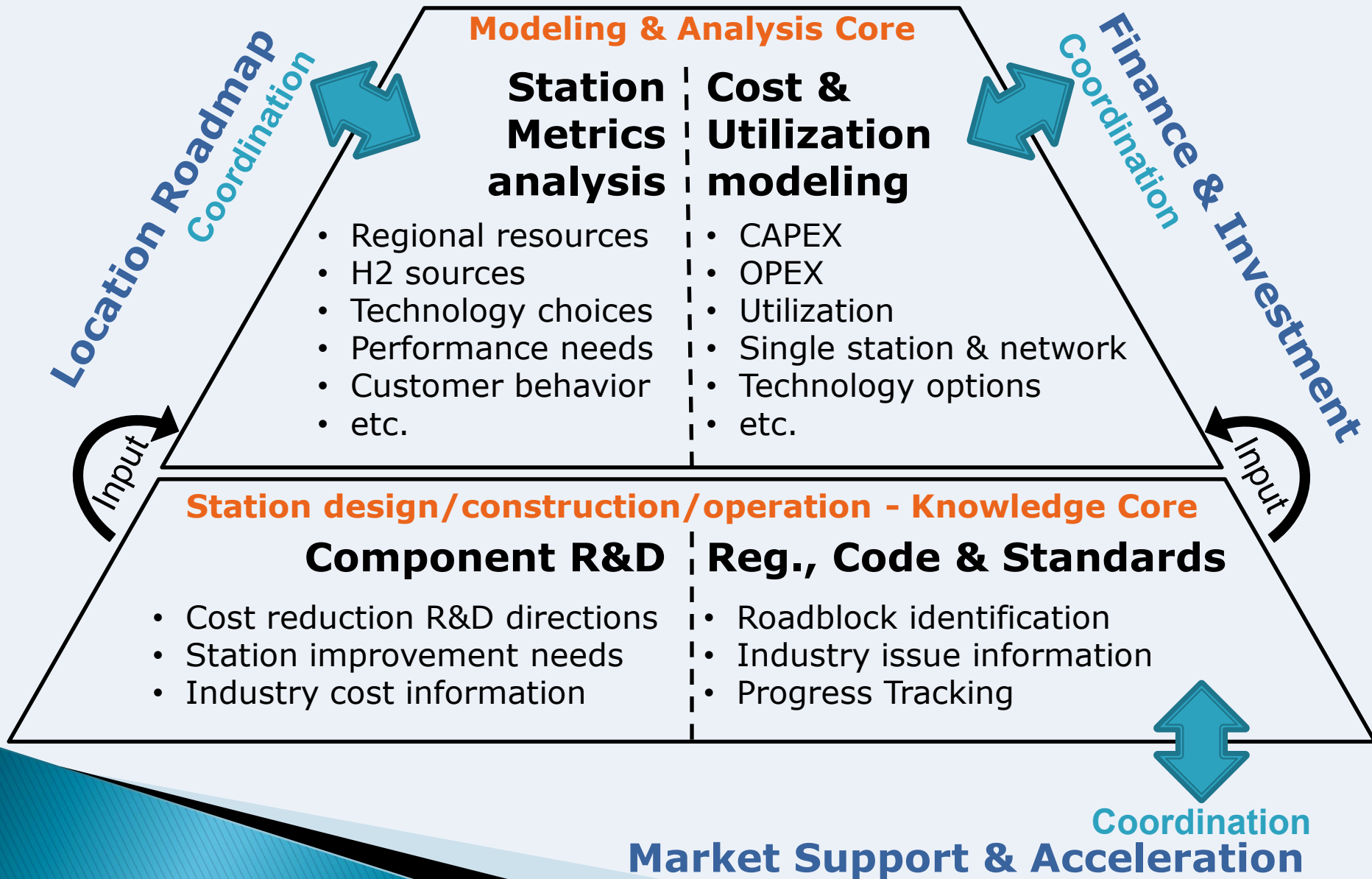
- ▶ **Conduct technical activities that support actionable and economical H2 station deployment plans for individual regions of the USA**
- ▶ **Scope of Activity:**
 - Investigate station cost & utilization issues
 - Facilitate station equipment improvement component R&D efforts
 - Address improvements and barrier removal in regulations, codes & standards
 - Coordinate on regional station metrics information

Mindset:

No academic studies.

Directly serve the needs of those working to deploy H2 stations

Internal HFSWG Task Team Structure



HFSWG Members

Analysis	Stations	Regions	Users
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As Proxy
for
Customers



HONDA
The Power of Dreams



NISSAN



Mercedes-Benz



New Members



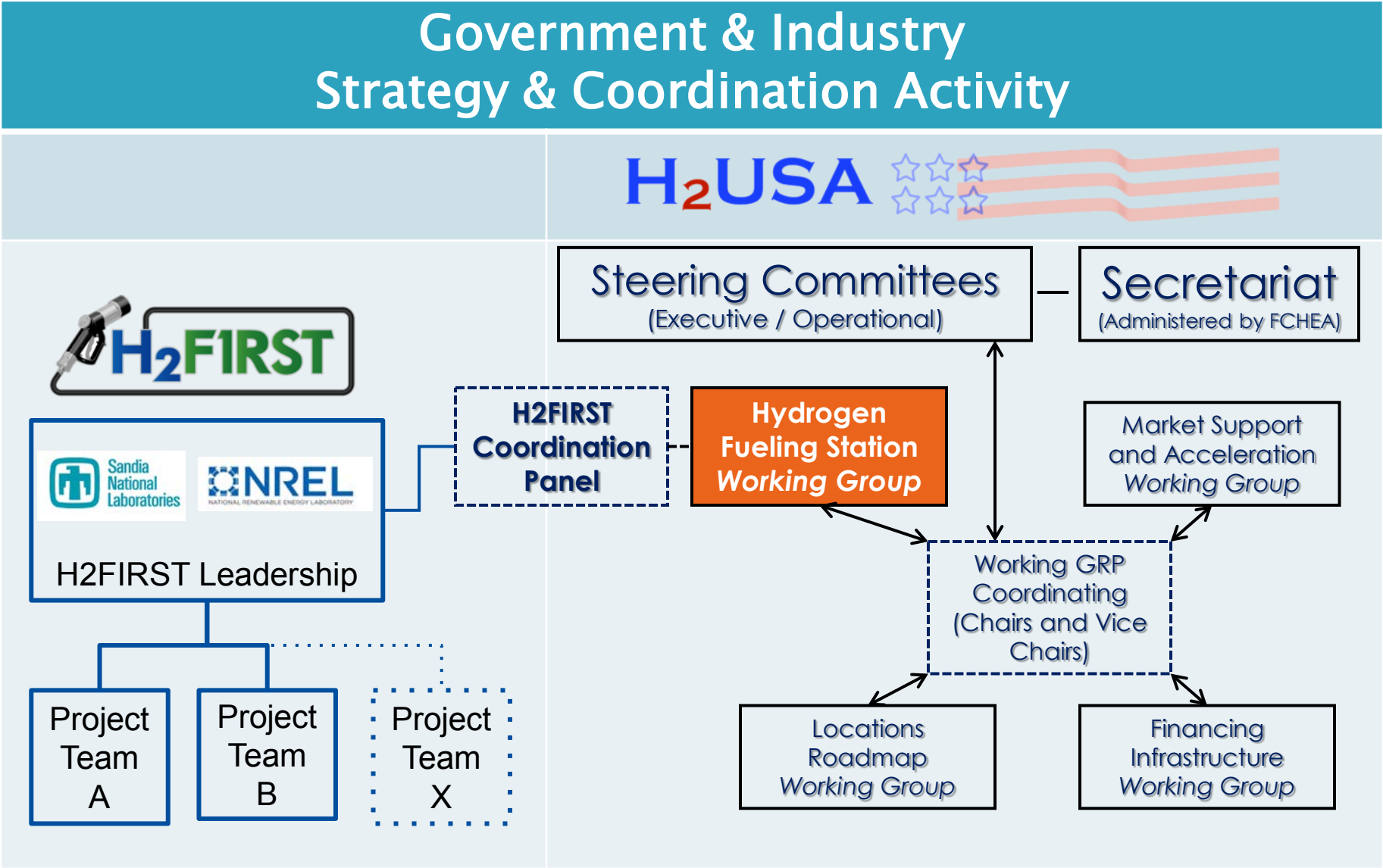
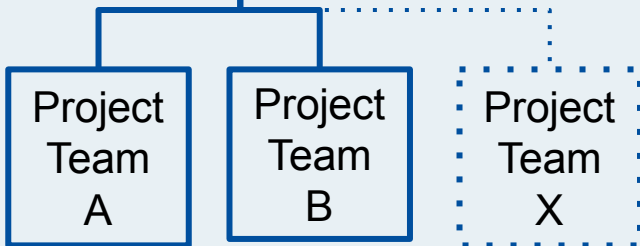
H2FIRST Resource

Government & Industry Strategy & Coordination Activity



Steering Committees
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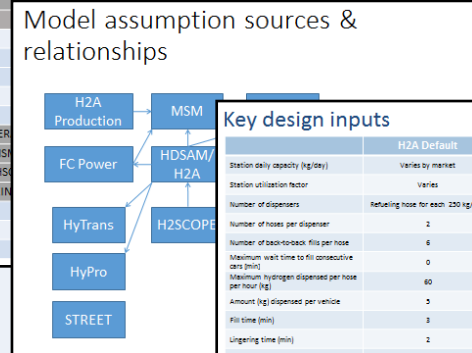


Cost & Utilization Modeling Activity

- ▶ Reviewed Cost & Utilization modeling tools
- ▶ Developing Near-term modeling assumptions

Model Applicability

Scenario	Production	Transport / Delivery	Station	Dispensing	Car
	H2A Production				
	FC Power				
HyPro					
			SER		
			MSR		
			HS		
			EIN		
HyTrans					
STREET					



Key design inputs

	H2A Default	Comments
Station daily capacity (kg/day)	Varies by market	Maximum design capacity
Station utilization factor	Varies	This is the actual daily dispensed amount/ daily demand used for using station components
Number of dispensers	Refueling hose for each 120 kg/day	
Number of hoses per dispenser	2	
Number of back-to-back fills per hose	6	
Maximum wait time to fill consecutive cars (min)	0	
Maximum hydrogen dispensed per hose per hour (kg)	60	
Amount (kg) dispensed per vehicle	3	
Fill time (min)	3	
Lingering time (min)	2	
Freezing temperature (°C)	-40	
Average number of fills per day	Varies by station capacity and utilization	
Maximum number of fills per day	20% above average	Accounts for increase in demand on Fridays and during summer
Backup compressor	yes	
Required land area (m ²)	Varies by station capacity and code requirement	

▶  Activity started

◦ Reference Stations

- Improve station components and design by identifying gaps and generating example designs through industry feedback and modeling

Component R&D Activity

- ▶ Questionnaire of station operators to identify specific issues for H2USA support and summarize exiting DOE funded projects.

Kano Survey of Station Operators **H₂USA**

The stations working group focused on current station operators to find the issues that concern them the most.

Attribute	Preference	Quantitative measure
Mean time to repair	Must Have/Linear	2 hours max outage
Equipment standardization	Exciter	Dispensers
Fill Time	Linear/Exciter	<5 minutes
Back to Back Fills	Linear	5-20 fills
Metering Accuracy	Linear	<3% error
Chiller Reliability	Linear	1 year desired service interval
Dispenser Reliability	Linear	6 months desired service interval
Controls Reliability	Linear	6 months desired service interval
Onsite Production Reliability	Linear	1 year desired service interval
Sensor Reliability	Linear	6 months desired service interval
Fitting/Valve Reliability	Linear	3 months-3 years desired service interval



Developing scope & funding strategy

- **Fuel Contamination Detector**

- Develop cost effective, deployable, inline fuel quality system

- **Research Dispenser**

- Cost reduction and reliability improvements through component and fueling technique enhancements

- **Station Acceptance**

- Accelerate station acceptance by developing, validating and implementing test methods and hardware for capacity and performance testing of commercial hydrogen stations


Reg, Code & Standard Activity

- ▶ Developed Layman's overview of codes & standards for new website

A Guide to Regulations, Codes
& Standards

H2USA Presentation
December 12, 2013

- ▶ Working on matrix of adopted codes in early FCEV launch markets of interest to H2USA

- ▶  Developing scope & funding strategy

- **Technical Assistance**

- Flexible, responsive, team of technical experts and facilities to solve urgent/unexpected challenges for hydrogen stations

HFSWG Future Directions

Task Team	Upcoming Activity	H2USA 2020 Goals
Cost & Utilization	Provide near-term station economic information for planning & investment activity	Stations being Commissioned & Profit model is sound
Component R&D	Catalyze & support H2FIRST activities to lower costs and make improvements	
Station Metrics	Work with Location Roadmap group on regional planning	Multiple Markets/Clusters have stations developed
Reg, Code & Std	Facilitate improvements & adoption of latest codes to support station deployment	

Locations Roadmap Working Group

- ▶ **Automaker Surveys/OEM priorities**
 - Developed and distributed survey and transmittal letter for OEM data
 - Developed procedure for secure transmittal of data
- ▶ **Identify Market Potential**
 - Identified metropolitan statistical areas and urban areas through US
 - Identified existing hydrogen users, providers, fleets in northeast US
 - Developed series of maps for New York, Massachusetts, and Connecticut as examples of preliminary roadmaps
 - Analyzed data to identify potential regional deployment of FCEVs and hydrogen refueling infrastructure

H2USA Timeline

▶ 2015

- Image of Vehicle Volume is Communicated

▶ 2020

- Multiple OEM's Deploying Vehicles
- Multiple States are Adopting FCEVs
- Multiple Markets/Clusters are Developed
- Multiple Investors are Funding Stations
- Profit Model is Sound for Station Developers
- Profit Model is Sound for Independent Station Owners

Examples of WG Activities

▶ 2014

- SmartSheet Input Sharing – Target Q2
- Creation of Tool Box – Target Q2
- Key Elements for Business – Target Q2
 - Customer Demographics, State motivation, etc.
- Website / Outreach Material - Target Q2
- OEM Market Decisions Made – Target Q3
- State / Local Outreach – Target Q3 and Q4
- Fueling Capability in DC Metro Area – Target Q4
- Event Planned at LA Auto Show
- Situational Analysis

Thank You

