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# H2 Scale-up Market Activation

## Shell – EBI Workshop

March 13-14, 2020

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# Shell EBI Hydrogen Market Activation Workshop

## Objective

Frame the market/demand context to deploy competitive commercial scale 500t/d Hydrogen supply chain for US

## In Scope

- US region: Focus on **California market and Texas/Gulf coast** for supply/local market opportunities – **consider all sectors** LD & HD transport, industry, marine, data centers etc.
- Market activation - **Innovative partnership**/strategies to create H2 market demand
- Current US, California & Texas **policy , subsidies, regional differences** and advantages; future policy predictions
- **H2 supply chain economics** via various pathways

## Out of Scope

- Conventional H2 (Grey or Black)

# Day 1 Agenda & Highlights

9:10-9:30 am (PT) 11:10-11:30 am (CDT)	What is it all about? Objectives of the Workshop <b>Ajay Mehta and Joe Powell (Shell)</b>
9:30-9:55 am (PT) 11:30-11:55 am (CDT)	Hydrogen Scaling Opportunities <b>Sunita Satyapal (DOE)</b>
10:10-10:40 am (PT) 12:10-12:40 pm (CDT)	Hydrogen at Scale: What do we know about the alternative costs and options of hydrogen utilization through different channels <b>Mark Ruth (NREL)</b>
10:40-11:00 am (PT) 12:40-1:00 pm (CDT)	Prospects for Hydrogen in the Future Energy System <b>Joan Ogden (UC Davis)</b>
11:00-11:25 am (PT) 1:00-1:25 pm (CDT)	CA Policies and Attitudes Towards Hydrogen Technology <b>Clifford Rechtschaffen (CA Public Utilities Commission)</b>
	<i>Session 2: California Policies and Opportunities</i>
11:55-12:15 pm (PT) 1:55-2:15 pm (CDT)	The Value of Green Hydrogen / GHC <b>Janice Lin (Strategen Consulting)</b>
12:15-12:35 pm (PT) 2:15-2:35 pm (CDT)	Shell California / US <b>Arnab A. Chatterjee (Shell)</b>
12:35-12:55 pm (PT) 2:35-2:55 pm (CDT)	Blue H2 Value Proposition for California <b>Roger Aines (LLNL)</b>
12:55-1:15 pm (PT) 2:55-3:15 pm (CDT)	The Role and Potential of Hydrogen in California <b>Ben De Alba (CA Energy Commission)</b>

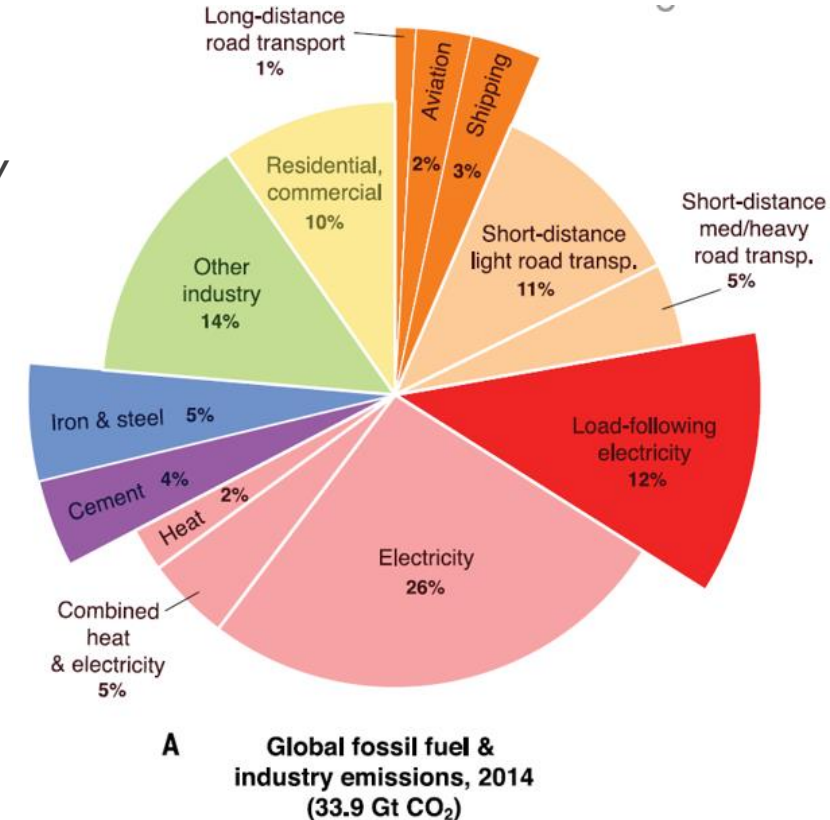
Energy future (Sky) scenario, shell new energies ambition & fit for hydrogen | Potential Opportunities for scale-up H2 supply chain  
DOE EERE hydrogen program has been sponsoring Hydrogen & Fuel Cell R&D for nearly 20 years – vision, programs & projects

Servicable consumption potential for hydrogen in US market is nearly 10 times existing market 107 MMT/year  
Difficult to abate sector represents 27% of GHG emissions, hydrogen plays a strong role but policy support needed to initiate ZEV mandates are mostly being filled by EVs, FCEV & H2 need cost reduction, H2 has better value proposition in MD/HD



Green H2 likely makes for an easy introduction than Blue, it always takes a “few” to change the game  
Shell’s global H2 footprint, focus on California LD & HD, need continued regulatory support  
What are the blue H2 options including domestic CCS. All you need to know about LCFS  
Maintain commitment for Hydrogen Highway – 100 stations, watch the global industry for next step, concerns around LD

# Day 1 Key Insights

- ❑ Decarbonization will create a significant market potential for Hydrogen in the US. Nearly 75% of that demand however is to come from Industry & energy storage
- ❑ Difficult to abate sectors namely Iron, steel, cement, aviation, marine, load following electricity etc. have few alternatives beyond Hydrogen
- ❑ LCFS is the leading regulation driving the US (Green & Blue) Hydrogen Industry
  - ❑ Current value nearly \$200/ton CO<sub>2</sub> (transport)
  - ❑ 2/3<sup>rd</sup> going out of state
  - ❑ 45Q nationwide helps but not nearly as significant
- ❑ Hydrogen & FCVs will need cost reduction – economy of scale play into both sectors
- ❑ LD (passenger cars) running out of favour in California facing stiff competition v/s EVs
- ❑ Subsidies from California state & DOE are instrumental to fill the current economic gap in H<sub>2</sub> economy
- ❑ Plenty of safe CCS potential in California state
- ❑ US Gulf Coast is a good location for Blue H<sub>2</sub>, however long distance H<sub>2</sub> transport solutions needed (Shipping or pipelines)



## Still some Gaps to address Today....

- I. US needs an overarching Policy environment to support H2 - Any examples?
  
- II. LCFS remains the key policy driver for Hydrogen, but it is for transport  
 What can be done to stimulate other H2 markets ?
  
- III. Significant economic gap between H2 supply cost v/s affordability (next best alternative)  
 Where are these gaps specifically both from demand & supply side?

