

Hydrogen Economy Workshop

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Presented May 13 2020

Berkeley Shell EBI conference

Overview

- Background
- Motivation
- EBI
- Supply chain design
- Program
- conclusion

About me

- Economist of agriculture and natural Resources
- Specializing in Technology adoption, Supply change, Risk Management and Policy
- Do not pretend to be a chemist – interested in how technologies are developed and implemented to solve
 - Social and
 - Business Challenges

Challenge of Mitigating Climate Change

- Humanity is challenge to reduce GHG emission
- Strategies
- Renewable electrification
 - Solar, Wind, Hydro
 - Yet storage is a problem –for awhile
 - Constraints on use for various forms of transport and various application
 - Steel-making
 - Concrete production
- Renewable Fuels
- Reduced GHG emission of fossil fuels during a transitional period
 - Carbon storage and sequestration

Clean Hydrogen can be a major answer to the challenge

- Can be produced from renewable sources
- Can be produced using renewable energy utilizing fossil fuels as feedstock and carbon storage
- Can complement Electrification in solving a. Social challenge
- Can utilize existing assets effectively
- Hour challenge: how to implement this option

The EBI



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Innovations in Supply Chain Educational/Industrial Complex

Step	University	Start-up	Multi-national
Discovery	***	**	*
Development	*	***	**
Commercialization		**	***
Marketing		**	***

- Universities have Offices of Technology Transfer, who sell rights to patents and may help faculty start companies
- Multinationals may take over start-ups
- Multinationals have relative advantage in products that require investment in testing
- Different countries have different innovation supply chains

Innovation and Supply Chain Review

- Innovation is new ways to do things
 - A new product
 - New market
 - Example – new technology (Cell phone, Crispr,)
 - Growing flowers in Kenya
- The people who control an innovation need to establish a supply chain
- To decide –
 - scale-how big
 - Structure- what to do in house – what to buy or contract
 - Growth-where to go- how to evolve
- Objective
 - Max expected profit subject to constraint
 - Constraints
 - Policy
 - Technology
 - Demand - market

Shell problem

- Investment in Hydrogen supply mostly for the California Market
 - Technology
 - Regulation
 - Demand
 - Partners

May 13. Morning

8:30-9:10 am (PT)	Session 1: Introduction
10:30-11:10 am (CDT)	Welcome and Virtual Orientation, Conference Overview Roundtable Participant Introduction - Name and Organization Jotsu Liao (Shell), David Zilberman (UC Berkeley / EBI)
9:10-9:30 am (PT)	What is it all about? Objectives of the Workshop
11:10-11:30 am (CDT)	Ajay Mehta and Joe Powell (Shell)
9:30-9:55 am (PT)	Hydrogen Scaling Opportunities
11:30-11:55 am (CDT)	Sunita Satyapal (DOE)
9:55-10:10 am (PT)	TX Lunch Break
11:55-12:10 pm (CDT)	
10:10-10:40 am (PT)	Hydrogen at Scale: What do we know about the alternative costs and options of hydrogen utilization through different channels
12:10-12:40 pm (CDT)	Mark Ruth (NREL)
10:40-11:00 am (PT)	Prospects for Hydrogen in the Future Energy System
12:40-1:00 pm (CDT)	Joan Ogden (UC Davis)
11:00-11:25 am (PT)	CA Policies and Attitudes Towards Hydrogen Technology
1:00-1:25 pm (CDT)	Clifford Rechtschaffen (CA Public Utilities Commission)
11:25-11:55 am (PT)	CA Lunch Break
1:25-1:55 pm (CDT)	

May 13 afternoon

	Session 2: California Policies and Opportunities
11:55-12:15 pm (PT)	The Value of Green Hydrogen / GHC
1:55-2:15 pm (CDT)	Janice Lin (Strategen Consulting)
12:15-12:35 pm (PT)	Shell California / US
2:15-2:35 pm (CDT)	Arnab A. Chatterjee (Shell)
12:35-12:55 pm (PT)	Blue H2 Value Proposition for California
2:35-2:55 pm (CDT)	Roger Aines (LLNL)
12:55-1:15 pm (PT)	The Role and Potential of Hydrogen in California
2:55-3:15 pm (CDT)	Ben De Alba (CA Energy Commission)
	Session 3: Break out Discussions
	Group 1: California Policies and Attitudes towards Hydrogen Technology
1:15-2:10 pm (PT)	David Zilberman (UC Berkeley / EBI)
	Group 2: The Role and Potential of Hydrogen in California
3:15-4:10 pm (CDT)	Tim Olson (CA Energy Commission)
	Group 3: Blue H2 Value Proposition for California
	John D. Coates (EBI)
2:10-2:40 pm (PT)	Break Out Sessions' Summary Presentations (10 min / group)
4:10-4:40 pm (CDT)	Plenary
	Day 1 Close-out
2:40-3:10 pm (PT)	Highlights and Summary, Feedback for Day 1
4:40-5:10 pm (CDT)	Joe Powell (Shell), David Zilberman (UC Berkeley/EBI)

May 14 Morning

8:30-9:00 am (PT)	Introduction, Welcome and Virtual Orientation, Day 1 Summary
10:30-11:00 am (CDT)	Nikunj Gupta (Shell)
9:00-9:20 am (PT)	Session 1: Outside the US
11:00-11:20 am (CDT)	Germany Heavy Duty Roadmap
9:20-9:40 am (PT)	Wolfgang Warnecke (Shell)
11:20-11:40 am (CDT)	Roadmap Examples - Germany, Japan, UK
9:40-9:45 am (PT)	Joe Powell (Shell)
11:40-11:45 am (CDT)	Break
9:45-10:05 am (PT)	Session 2: Texas and Gulf Coast
11:45-12:05 pm (CDT)	H2 at Scale Texas
10:05-10:25 am (PT)	Mike Lewis (UT-Austin)
12:05-12:25 pm (CDT)	Hydrogen & CCS Opportunities in the US Gulf Coast
10:25-10:30 am (PT)	Brett Perlman (Center for Houston's Future)
12:25-12:30 pm (CDT)	Q&A
10:30-10:45 am (PT)	TX Lunch Break
12:30-12:45 pm (CDT)	

May 14 afternoon

10:45-11:05 am (PT)	Session 3: Industries and Services
12:45-1:05 pm (CDT)	Opportunities to Use Hydrogen in Concrete Production Paulo Monteiro (UC Berkeley)
11:05-11:25 am (PT)	Data Centers
1:05-1:25 pm (CDT)	Mark Monroe (Microsoft)
11:25-11:45 am (PT)	Hydrogen Demand in Iron, Steel and Co-gen Applications
1:25-1:45 pm (CDT)	Max Wei (LBNL)
11:45-11:50 am (PT)	Q&A
1:45-1:50 pm (CDT)	
11:50-11:55 am (PT)	Break
1:50-1:55 pm (CDT)	
11:55-12:15 pm (PT)	Hydrogen in Lift Trucks, Forklifts Commercial Markets
1:55-2:15 pm (CDT)	Tim Cortes (Plug Power)

Thanks for joining us

- We start a dialogue and hope to make the world better