



Mona Dajani
Global Leader of the
Renewable Practice
PILLSBURY

Green Hydrogen Business & Investment Models: 2021

July 20 - 21, 2021 | 8:30 AM - 3:55 PM PDT | Digital Access

All times Pacific Daylight Time

July 20, 2021:

8:30-8:50 am

Opening Remarks

8:50-9:10 am

Session 1: The “Funnel” to a Green Hydrogen Future: How Technologies and End Uses Are Coming Together to Open Up Opportunities

Green Hydrogen is positioned to become the “next big thing” in the energy transition. Green hydrogen has been proposed as a solution to numerous decarbonization problems, ranging from long-term energy storage to transportation to replacing natural gas in many applications. But to fully capitalize on its potential a number of technological and infrastructure developments are necessary. This session will provide an overview of the various players, technologies and applications involved.

- Current means of hydrogen production: understanding gray and blue hydrogen processes and economics
- Identifying potential end-use market segments and their sizes
- Understanding the technologies needed to supply green hydrogen
- What are major industrial players doing now?
- Bringing it together: what is the timeline for significant green hydrogen developments?
- Assessment of key priorities, risks and barriers to rolling out green hydrogen projects and business models

Presenter:

Mona Dajani, *Global Leader of the Renewable Practice*, PILLSBURY

9:10-9:20 am

Q&A

9:20-9:25 am

Break

9:25-9:50 am

Session 2: The Role of Hydrogen in Future Energy Systems—Seasonal Energy Storage

Hydrogen is an energy carrier that is flexible and could help to integrate renewable energy sources across a variety of energy sectors, including electricity, heating, transportation, and industrial sectors, among others. Hydrogen can be produced from fossil energy sources—through steam reforming of natural gas (SMR) and coal gasification—as well as from renewable generation—via renewable-driven electrolysis, biomass

gasification, or photo-electrolysis. In this section I explore the role of hydrogen in high or ultra-high renewable energy systems. First, I provide a short overview of the potential role of hydrogen technologies in the context of sector coupling and the integration of wind and solar photovoltaic power sources in energy systems. Then, I present the results of a case study on the techno-economic analysis of hydrogen-based seasonal energy storage in the Western U.S. power system with 24% to 61% of variable renewable power sources on an annual energy basis (up to 83.5% of renewable energy including hydro, geothermal, and biomass power sources).

Presenter:

Omar J. Guerra, Research Engineer, NREL

9:50-10:00 am

Q&A

10:00-10:05 am

Break

10:05-10:55 am

Session 3: **Understanding the Current Policy Drivers and Potential Incentive Programs for Green Hydrogen Projects**

As with many other nascent technologies, the initial large-scale deployment of green hydrogen will likely be driven both by government mandates and the availability of incentive programs. This session will explore the state, federal and international plans, programs and initiatives.

- Current decarbonization policy drivers and programs in California and other states
- The role of international initiatives to lower green hydrogen technology costs and develop projects
- What's happening in Europe, Asia and Middle East vis a vis policy drivers and incentives
- Emerging US federal initiatives and incentive programs
- The role of clean transportation initiatives
- Incentives for blending hydrogen and natural gas
- Where are the synergies between electric power and hydrogen?

Moderator:

Sheila Harvey, Partner, Energy Department, PILLSBURY

Panelists:

Traci Kraus, Director, Government Relations, CUMMINS INC.

Diane Moss, Founding Director, RENEWABLES 100 POLICY INSTITUTE

Tanya Peacock, Policy Expert, Hydrogen, SOUTHERN CALIFORNIA GAS COMPANY

Douglas Schultz, Director of Origination, Loan Program Office, US DOE

Bill Zobel, *Executive Director*, CALIFORNIA HYDROGEN BUSINESS COUNCIL

10:55-11:10 am

Q&A

11:10-11:40 am

Lunch Break

11:40 am-12:05 pm

Session 4: Scaling of Green Hydrogen Production, Storage, and Transportation Systems: A Review of Current and Future Challenges

- *Address challenges associated with electrolyzer manufacturing, balance of plant equipment costs, and project cost drivers, followed by a discussion of electrolyzer stack/system construction and automation of manufacturing, various balance of plant equipment cost impetuses, as well as project-level concerns with respect to electricity pricing, plant capacity factor, and the potential for oxygen recovery/sales.*
- *Review regulatory challenges such as: permitting, safety, pipeline injection, carbon tax, renewable energy credit, and grid ancillary services will also be summarized.*
- *Summarize with the path forward for overcoming these challenges via demonstration projects in addition to long-term project cost reductions.*

Co-Presenters:

Dr. Leanne Bloor, *Consultant, Energy Storage and Hydrogen Services*, BLACK & VEATCH

Jonathan Cristiani, *Advanced Power Fuels Engineer*, BLACK & VEATCH

12:05-12:15 pm

Q&A

12:15-12:20 pm

Break

12:20-1:15 pm

Session 5: Assessing Green Hydrogen Production Technologies, Including State-of-the-Art in Electrolyzer Technology Development

Developing more efficient and economic electrolyzers is critical to enabling widespread adoption of green hydrogen. There are a number of different electrolyzer technologies in various stages of development. This session will review the current state of technology: its costs and performance now, and what might be projected in the future.

- Review of currently available electrolyzers: types, performance, economics
- How are they being applied?
- Research directions and near-term expectations for improvements

Moderator:

Mona Dajani, *Global Leader of the Renewable Practice*, PILLSBURY

Panelists:

Jonathan Cristiani, *Advanced Power Fuels Engineer*, BLACK & VEATCH

Peter Luessen, *Director of Hydrogen Product Line Management*, MITSUBISHI POWER AMERICAS

Chris Norris, *Director, Business Development, New Energy Business (Hydrogen)*, SIEMENS ENERGY CANADA LIMITED

Elina Teplinsky, *Partner, Energy Department*, PILLSBURY

1:15-1:30 pm

Q&A

1:30-1:35 pm

Break

1:35-2:00 pm

Session 6: Addressing Safety Concerns: Hydrogen and Fuel Cell Training for Responders and AHJ's

This talk will describe first responder and AHJ outreach and education for hydrogen and fuel cells, updates to the information, and describe the resources available.

Presenter:

Jennifer Hamilton, *Program Manager: Safety, Education, Codes and Standards*, CAFCP (CALIFORNIA FUEL CELL PARTNERSHIP)

2:00-2:10 pm

Q&A

2:10-3:10 pm

Virtual networking

July 21, 2021:

8:30-9:10 am

Session 7: Fireside Chat: An Offtaker's Perspective on Initial Deployment of Green Hydrogen Projects and Programs

Many policymakers, utilities, developers and investors are looking to investigate the potential feasibility of green hydrogen. Where should they begin? What lessons have been learned from pilot projects? This fireside chat will discuss what has been learned in one of the earliest green hydrogen pilot projects and explore what the first steps should be going forward.

Interviewer:

Mona Dajani, *Global Leader of the Renewable Practice*, PILLSBURY

Interviewee:

Gregory Huynh, *IPP Operating Agent*, LADWP

9:10-9:15 am

Break

9:15-10:10 am

Session 8: Assessing Emerging Green Hydrogen Business Models 1: Integrating Hydrogen in Wind, Solar and Hybrid Projects

Developers and investors are looking at emerging opportunities to produce green hydrogen as part of wind, solar, and hybrid projects. While the need for long-term energy storage and clean fuels is becoming ever more evident, evaluating the best ways to economically produce and establish revenue streams isn't. Should hydrogen production be added to offshore or onshore wind projects, solar + storage or other hybrid projects? This session will explore the possible business models and examine project economics and risks.

- What options are being explored now?
- Assessing potential revenue streams
- What scale of output is needed for the renewable source?
- Assessing the impacts of hydrogen transportation and storage issues on project viability

Moderator:

Mona Dajani, *Global Leader of the Renewable Practice*, PILLSBURY

Panelists:

Chris Buckland, *Technical Director*, LIGHTSOURCE BP

Michel Carreau, *Global Director, Hybrid Power and Green Hydrogen*, HATCH

Olivier Machet, *Senior Vice President, Development*, ENGIE HYDROGEN INTERNATIONAL

André Pina, *Associate Director for Hydrogen Strategy & Origination*, EDPR

Finbar Sheehy, *Senior Director, Finance & Technology*, 8MINUTE SOLAR ENERGY

10:10-10:25 am

Q&A

10:25-10:30 am

Break

10:30-11:25 am

Session 9: Assessing Emerging Green Hydrogen Business Models 2: Mobility

One of the most exciting potential uses of green hydrogen is in the transportation sector. This area is seeing increasingly a focus of decarbonization policies, but converting long-haul trucking fleets and maritime vessels are facing probably insurmountable challenges by using EV lithium battery technologies. This panel will explore the prospects for potential green hydrogen business models in transportation, and examine the economics vis-à-vis EV technologies.

- What are the transportation applications being explored? Role of green hydrogen for:
 - EVs/Personal transportation
 - Fleet operations
 - Shipping

- How do the operational characteristics of hydrogen map to potential applications?
- How might green hydrogen take advantage of emerging clean transportation policies and incentives?

Moderator:

Mona Dajani, *Global Leader of the Renewable Practice*, PILLSBURY

Panelists:

Abas Goodarzi, *CEO*, US HYBRID

Jason Goodhand MBA, B.E.Sc, *Global Business Lead – Energy Storage*, DNV ENERGY SYSTEMS CANADA INC.

Eddy Nupoort, *Director of Sales and Business Development, North America*, NEL HYDROGEN

Lauren Skiver, *CEO/General Manager*, SUNLINE TRANSIT AGENCY

11:25-11:40 am

Q&A

11:40 am-12:10 pm

Lunch Break

12:10-1:15 pm

Session 10: **Evaluating Current Infrastructure Capabilities and the Investments Needed to Support Large-scale Green Hydrogen Deployment**

While it is clear that enormous opportunities await to both produce and utilize green hydrogen, many business models will depend on improving existing infrastructure or developing new infrastructure to achieve success. Using existing gas pipelines and other means of transportation to handle the output of initial production projects will be vital to their initial success, but more widespread adoption will require investments in hydrogen transportation, storage and other infrastructure. This session will examine the capabilities of existing gas infrastructure to support hydrogen, and assess what types and levels of investments will be needed to support full scale deployment of green hydrogen.

- Impacts of blending hydrogen with natural gas in pipelines:
- What is possible with the current pipeline systems?
- Storage: what are the options and what is needed?
- Scalability—How large do production projects need to get?

Moderator:

Mona Dajani, *Global Leader of the Renewable Practice*, PILLSBURY

Panelists:

Andrew Hegewald, *Gas Business Development Manager*, DOMINION ENERGY

Sheldon Kimber, *CEO & Co-Founder*, INTERSECT POWER

Michael J. Tritt, *President*, LANE POWER & ENERGY SOLUTIONS, INC.

1:15-1:30 pm

Q&A

1:30-1:35 pm

Break

1:35-2:35 pm

Session 11: Green Hydrogen Economics—What Are the Tipping Points, and What Will the Impacts Be on Investment?

While many entities are launching their first green hydrogen projects, more widespread deployments will greatly accelerate when further economic and infrastructure improvements enable the financing of projects. It is vital that investors understand where these tipping points lie in order to capitalize on a rapid uptick as has been seen in areas like wind, solar and storage. This session will take a deep dive on the economic tipping points for large-scale deployments and their impacts on project viability.

- Cost and efficiency of electrolyzers
- Impacts of renewable power cost curve reductions
- Cost and availability of storage facilities
- How many fueling stations will be needed to enable transportation business models? And what will the costs be to roll those out?

Moderator:

Mona Dajani, *Global Leader of the Renewable Practice*, PILLSBURY

Panelists:

Ali Amirali, *Senior Vice President*, STARWOOD ENERGY GROUP GLOBAL, INC.

Liz Mettetal, *Senior Managing Consultant*, ENERGY AND ENVIRONMENTAL ECONOMICS

Elizabeth Minchew, *Associate Operations Officer*, IFC

Simon Osipov, *Vice President*, MORGAN STANLEY

Jason Rowell, *Global Hydrogen Technology Leader*, BLACK & VEATCH MANAGEMENT CONSULTING, LLC

2:35-2:50 pm

Q&A

2:50-3:00 pm

Break

3:00-4:00 pm

Session 12: Office Hours: Interactive Live Zoom Session

This Interactive Live Zoom Session at the class conclusion allows you to get your most pressing questions answered, and to interact with Master Class Instructors in real time.

Moderator:

Mona Dajani, *Global Leader of the Renewable Practice*, PILLSBURY

Panelists:

Andrew Hegewald, *Gas Business Development Manager*, DOMINION ENERGY

Additional Panelists to be Announced

4:00

Virtual Conference adjourns