

Exhibit to Agenda Item #1

Provide the Board with external and internal presentations followed by a panel discussion on **Green Hydrogen and Biofuels programs.**

Board Strategic Development Committee and Special SMUD Board of Directors Meeting

Tuesday, June 7, 2022, scheduled to begin at 5:30 p.m.

Virtual Meeting (online)

Green hydrogen can play a unique role in replacing diesel and fossil fuels where there are no alternate solutions:



**Heavy-Duty
Trucking**



**Maritime
Shipping**



Port Operations



Aviation



Agriculture



Industrial Applications



Mining



To adopt a sustainable fueling option, diesel users must have visibility into low-cost, high-volume supply

"Access to predictable, large volumes of green hydrogen at less than \$3/kg is a gamechanger. If this were the case, we could accelerate our transition from diesel to green hydrogen fuel cell-based equipment in under two years"

- Scott Schoenfeld, (former) General Manager Fenix Marine Services

About Fenix Marine Services:

- The #2 by volume terminal operator in the Ports of LA/LB
- Accounts for ~13% of activity in the ports and ~4% of all retail goods in the US
- Utilizes 175,000 gallons of diesel per month that can be displaced by green H2

Scale & infrastructure can accelerate the realization of this low-cost green hydrogen economy

Infrastructure and Economies of Scale



Cost of Green Hydrogen



It all starts with scaled, bankable offtakers

Example: HyDeal España, the world biggest green hydrogen hub, started with big hydrogen users in steel, ammonia, and other industrial sectors



‘Green hydrogen is now competitive with fossil fuels’ | ArcelorMittal among offtakers at massive 7.4GW project in Spain



System details:

- Total installed capacity:
 - 9.5 GW of solar power
 - 7.4 GW of electrolysis by 2030
- Offtake: 6.6 million tons of green hydrogen over 20 years
- Application: Production of steel, ammonia, fertilizer, and other products
- Production Timeline: Starts in 2025

To get started in CA, we need visibility into scaled offtakers

We evaluated 4 potential scaled green hydrogen market uses that could drive scale as the first offtakers, enabling adoption from other sectors:



Oil Refineries
(largest gray H₂
users in CA today)



Ammonia
Production
(none in CA)



Steel
Manufacturing
(none in CA)

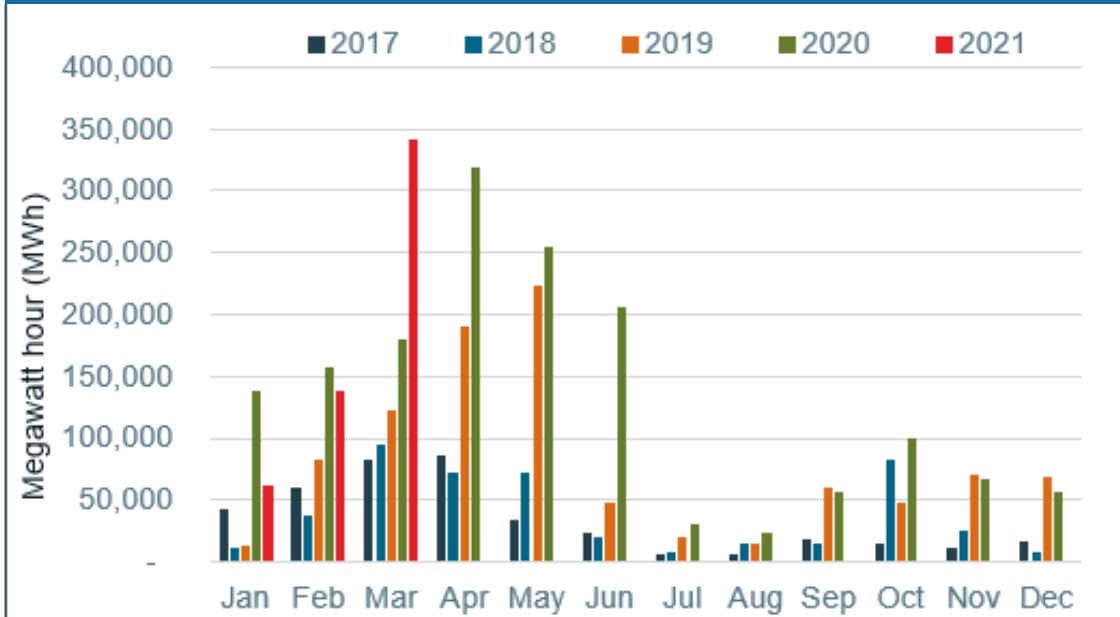


Clean, Dispatchable
Power Generation

The power sector can have an outsized impact in catalyzing the green hydrogen economy, all while addressing the need for a clean, dispatchable fuel.

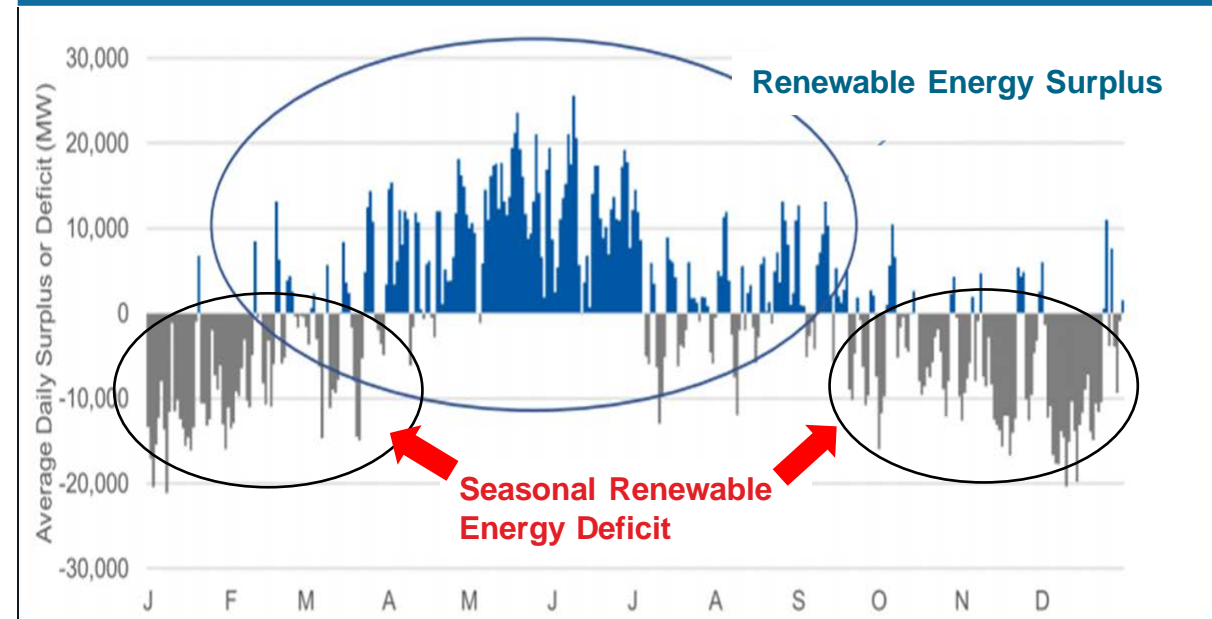
Long-duration energy storage allows California to capture otherwise wasted solar and wind to fully displace of natural gas in the power sector

California Wind and Solar Curtailments Hit Record High in March 2021



Data Source: California Independent System Operator (Compiled April 2021)

100% Renewable Energy Scenario in California Signals a Huge Need for Long Duration Energy Storage



Studies show that to meet California's 100% renewable energy future reliably, the power sector will need clean, firm power



Identified the need for 25-40 gigawatts of “clean firm power”, or power that can replace the existing gas fleet

- Ran 3 different optimization models to quantify costs of many different future scenarios to accomplish SB100 by 2045
- Detailed models of the future of California's power system all show that California needs multi day and ultimately seasonal carbon-free electricity sources that don't depend on the weather.



The Los Angeles 100% Renewable Energy Study

Called out the need for firm capacity that can “come online within minutes, and can run for hours to days”

- Modeled 100 million ultra high-resolution simulations for Los Angeles to accomplish 100% renewable energy by 2035
- Called out green hydrogen as a viable, scalable, seasonal storage solution to address seasonal mismatches in supply and demand, and to replace various services currently provided by in-basin natural gas plants

Non-combustion options to reaching 100% renewable electricity will be costly and inefficient



An alternate scenario with solely wind, solar, and batteries would require building out nearly 6x the power generating capacity.

Issue	With Clean Firm Power	Without Clean Firm Power
Cost for Generation and Transmission <i>California transmission and distribution costs are currently about 9 cents/kWh</i>	~9 cents/kWh	~15 cents/kWh
New Storage <i>Largest battery facility now being built is 0.6 GW /2.4 GWh. CA expects to have 2 GW battery capacity in 2021</i>	New short-term battery power capacity 20 -100 GW	160 GW
	New short-term battery energy storage capacity 100-800 GWh	1000 GWh
Solar and Wind Capacity <i>Entire U.S. electric generating capacity is ~1100 GW</i>	25 – 200 GW	470 GW
Land Use <i>CA land area is ~164,000 sq miles</i>	625- 2500 sq miles	6250 sq miles
Transmission Infrastructure <i>CA currently has ~ 15 million MW-miles of transmission</i>	2 – 3 million MW-Miles	~9 million MW Miles

Repurposing gas infrastructure, such as turbines, will make the clean energy transition more affordable



Existing turbines can already combust a hydrogen blend (5%-30%) without significant changes to equipment.

Major OEMs like GE, Mitsubishi, and Siemens are supporting these upgrades for blending and have announced roadmaps to 100% hydrogen capable turbines.



This provides opportunities to retrain and transition the skilled energy workforce in California.

California is poised to become a global export leader in green hydrogen, driving further job and economic potential for the State.

Power generation is not the end-game for green hydrogen...



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...however, it can serve as a platform to help achieve near-term scale and cost reduction of green hydrogen, accelerating displacement of fossil fuels in California's top polluting sectors

Update on our Green Hydrogen Hub Effort: HyDeal Los Angeles

An initiative to accelerate progress by bringing together...

- key ecosystem stakeholders, starting with multi-sectoral offtakers
- in strategically targeted locations, beginning in SoCal
- to plan and develop the competitive, high-volume supply chain necessary
- to achieve <\$2/kg mass-scale delivered green hydrogen for large offtakers



HyDeal LA Phase 1 Objective and Scope/Approach

Objective:

Scope



1. Identify multi-sectoral offtakers in the LA Basin, prioritizing areas with highest pollution near Port of LA and LB
2. Determine where mass-scale green hydrogen could be produced from water and renewable electricity (wind and solar) via electrolysis
3. Evaluate alternative transport and storage solutions for lowest cost alternative:
 - Pipeline infrastructure
 - Electric transmission infrastructure

Approach

Only commercially available technology/solutions were evaluated

System plan including cost assumptions and commercial terms leveraged work from HyDeal Ambition/Europe study

Phase 2 builds on our previous work to expand our vision and co-create the path forward on a foundation of environmental justice



Community Impacts

- Engage with key stakeholders to solicit input on areas of interest, opportunity, and concern
- Conduct Air Quality Analysis and develop strategies to ensure net AQ benefits
- Assess economic development and job creation impacts

Infrastructure and Offtake

- Update regional hydrogen offtake potential to include mobility & transport applications
- Explore water availability, use, consumption & purification (grey water recovery) study
- Begin to create a “no regrets” infrastructure roadmap

Policy and Regulatory

- Identify policy & regulatory barriers, and funding opportunities
- Develop innovative policy/programs to value and compensate GH2
- Engage with local, state, and regional government (incl. coordination with WGHI)

Project Management

- Manage external stakeholder engagement, communications, and media
- Produce final report and take-aways
- Coordinate findings to support government funding applications