The Green Hydrogen Opportunity in the South Bay

GREEN HYDROGEN COALITION

Supporting a resilient and inclusive approach to economy-wide decarbonization and pollution reduction

Presented to the South Bay Cities Council of Governments
Janice Lin, Founder and President of the Green Hydrogen Coalition
3/23/2023

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About the Green Hydrogen Coalition (GHC)

Mission

Facilitate policies and practices to advance the production and use of green hydrogen in all sectors where it will accelerate a carbon-free energy future

Approach: At-Scale Hub Development

Prioritize green hydrogen project deployment at scale; leverage multi-sector opportunities to simultaneously scale supply and demand

***The GHC is a tax exempt 501(C)(3) nonprofit organization.**

Green Hydrogen is Key to Ending the Fossil Fuel Era

Green hydrogen can be used across multiple hard-to-electrify sectors to decarbonize the South Bay and reduce pollution:

Industrial Applications

Heavy-Duty Trucking

Maritime Shipping

Aviation

Clean, Dispatchable Power

Agriculture

Mining

Long Duration, Seasonal Energy Storage

Plants make fuel from water and sun…
and so can we.

Electrolytic Green H2 is the strategic fuel for our generation

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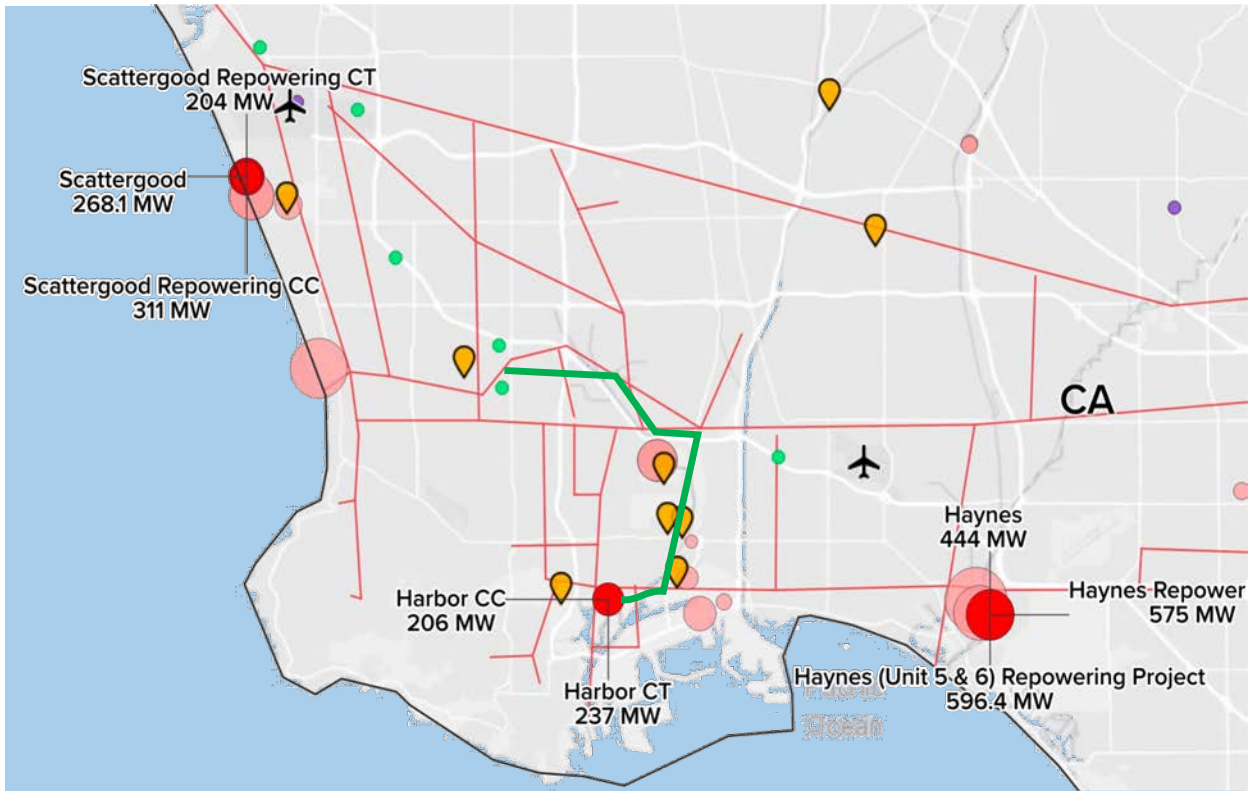
Hydrogen is a safe, nontoxic, GHG-free fuel that is already a globally traded commodity

Today, 70 million tons of hydrogen are produced and consumed around the world*, and over 17 miles of H2 pipeline already exist in LA**

Key

- Hydrogen Pipeline
- Natural Gas Pipelines
- Gas Power Plants
- LADWP Power Plants
- Oil Refineries
- Airport
- Hydrogen Fuel Stations



*Source: IEA (2019), The Future of Hydrogen, https://www.iea.org/reports/the-future-of-hydrogen
**Source: Heydom, Edward (2013), California Hydrogen Infrastructure Project, Air Products and Chemicals, Inc., https://www.osti.gov/biblio/1068156
Note: Most H2 created and consumed globally is made from fossil fuels (not green). From a safety perspective, a molecule of green hydrogen is indistinguishable from fossil fuel derived.

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Northern California will utilize green hydrogen to develop the largest long duration energy storage project in the U.S.

Photo by Gabriel Tovar on Unsplash

This community-scale microgrid provides a fossil-free alternative to mobile diesel generators during broader grid outages. Details:

- **Location:** Calistoga
- **Capacity:** Minimum of 293 MWh, with capacity to expand to 700
  - This can power 2,000 homes for about 48 hours
- **Technologies utilized:** utility-scale battery, electrolyzer to create green hydrogen, hydrogen storage, fuel cell for electricity generation

See Press Release

Western AUS is home to the world's largest iron ore exporter, which provides 38% of the global supply

One of the major mining companies, Fortescue Metals Group, utilizes approximately 1 billion liters of diesel annually.

They will rely on green hydrogen and its derivatives to address 30% of their fuel use that cannot be addressed with electrification.

See Article

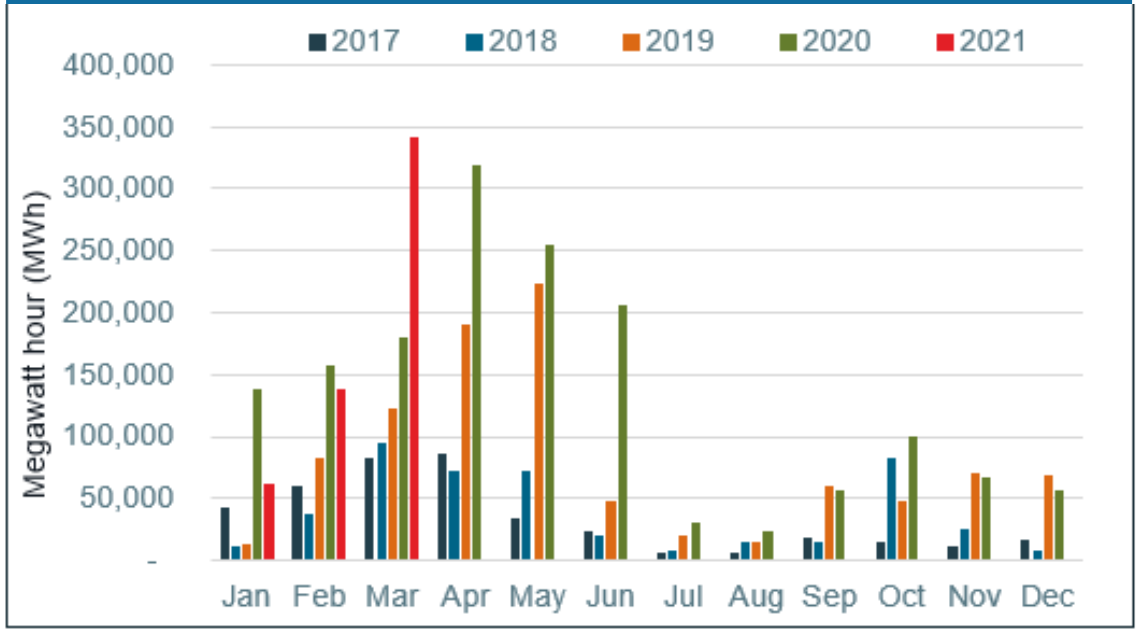
The largest GH2 project announced in the U.S. will be in North Texas

- **Location:** Wilbarger County, Texas (by Oklahoma border)
- **Capacity:** 200 metric tons per day, including 1.4 GW of wind and solar generation
- **Owners:** AES, Air Products
- **Timeline:** Commercial operations begin in 2027
- **Impact:**
  - Climate: Over project lifetime, it is expected to avoid 50 million metric tons of CO2
  - Jobs: 1,300 construction jobs, 115 permanent operations jobs, and 200 transportation and distribution jobs

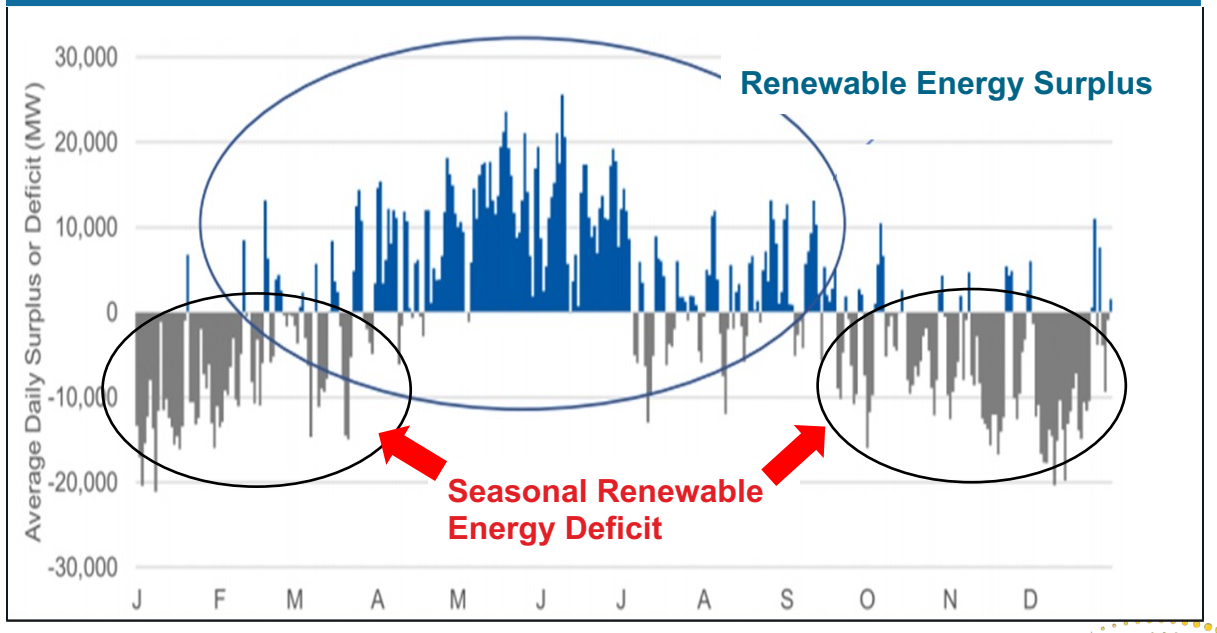
See Article; See Press Release.

Green hydrogen enables California to capture excess solar and wind to balance the grid, fully displacing natural gas to achieve 100% renewable energy

California Wind and Solar Curtailments Hit Record High in March 2021



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



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

In January, LA City Council unanimously passed a motion to move forward on design-build contracting to transition a power plant – which was deemed essential for reliability – from natural gas to green hydrogen (Scattergood Generating Station)

Green hydrogen enables California to capture excess solar and wind to balance the grid, fully displacing natural gas to achieve 100% renewable energy

EDF ENVIRONMENTAL DEFENSE FUND®
Finding the ways that work

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

Source: EDF, California needs clean firm power, and so does the rest of the world

LA100
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"

Source: NREL, LA100: Los Angeles 100% Renewable Energy Study

LA DWP Los Angeles Department of Water & Power
POWER STRATEGIC LONG-TERM RESOURCE PLAN
2022

Initial findings confirm that reliability requires firm, dispatchable power provided by combined-cycle and combustion turbine generating units in the LA Basin

Source: LADWP, Strategic Long-Term Resource Plan (Draft)

Benefits of Green Hydrogen for Los Angeles

1. Green hydrogen can be even cheaper than fossil fuels
2. The green hydrogen economy will create tens of thousands of jobs for a just clean energy transition
3. Green hydrogen will provide tangible improvements to air quality, subsequently improving public health in the South Bay

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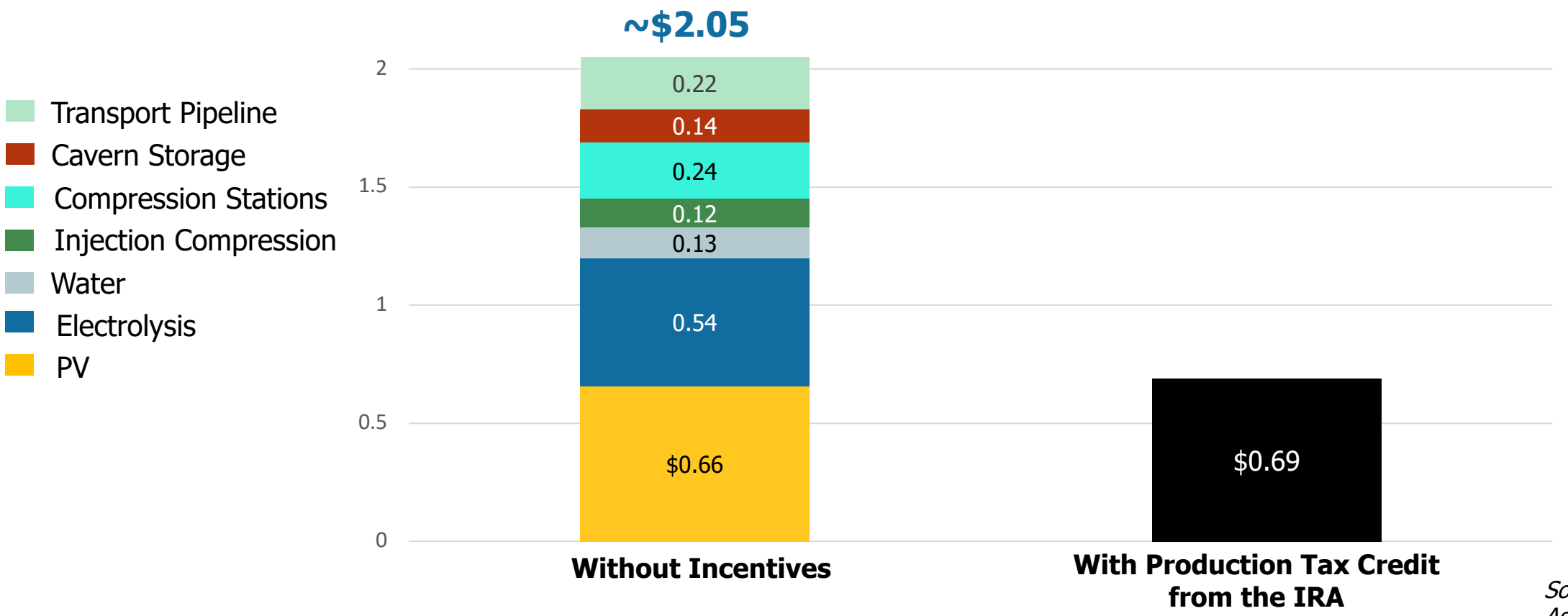
Key Benefit 1

Green hydrogen at scale can be **even cheaper than fossil fuels**

HyBuild LA Scenario: Levelized Cost of Delivered Green Hydrogen in 2030



Source: Corporate Value Associates Analysis for HyBuild LA, 2022

1 kg GH2 is approximately equal in energy value to 1 gallon of gasoline

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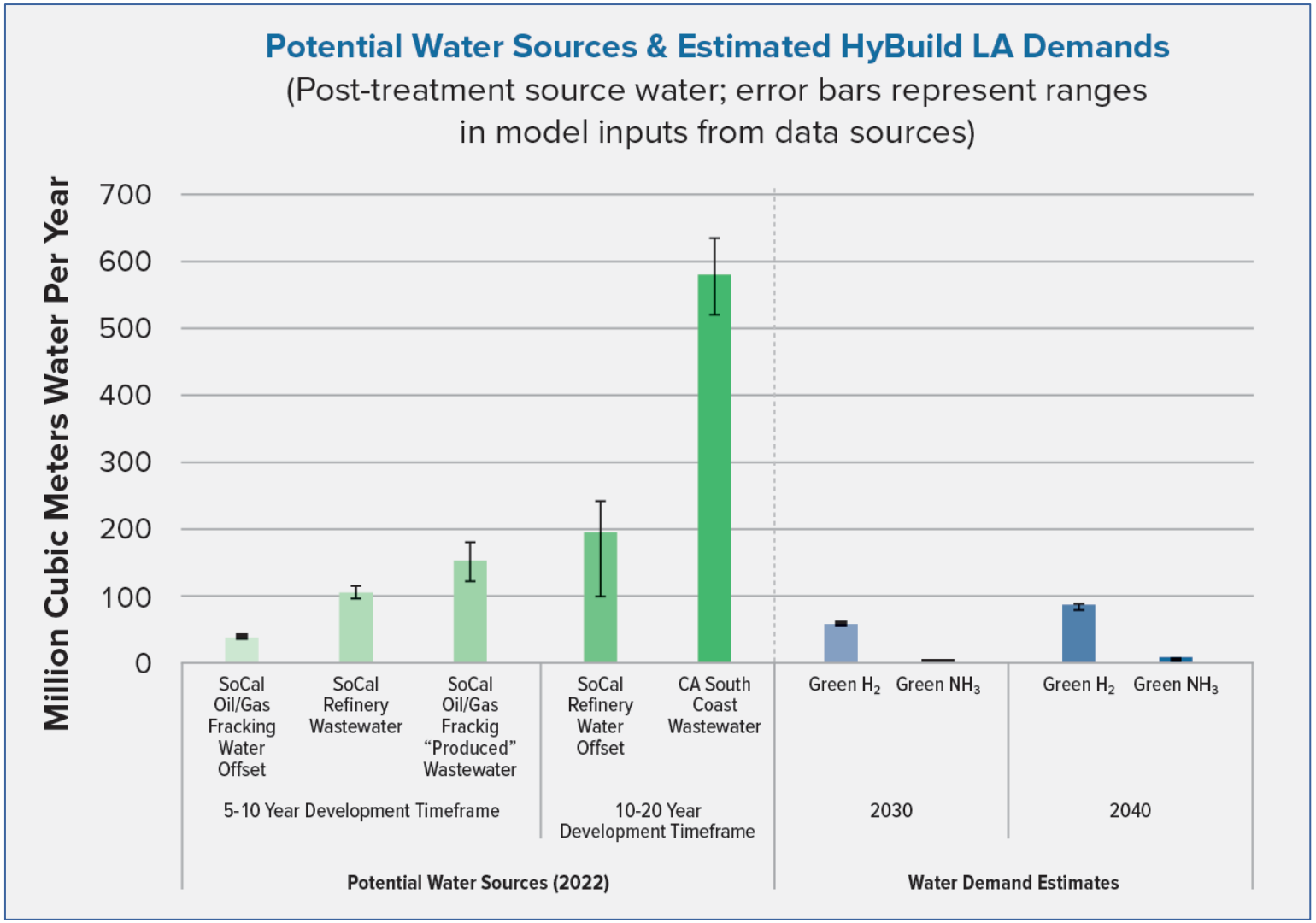
Key Learning 1a

Electrolytic green hydrogen demand for LA can be fully met with wastewater sources for $0.07 – $0.13 per kg GH2. This demand for recycled water will help drive needed investment in this infrastructure



Source: Pacific Northwest National Labs Analysis fror HyBuild LA, 2022

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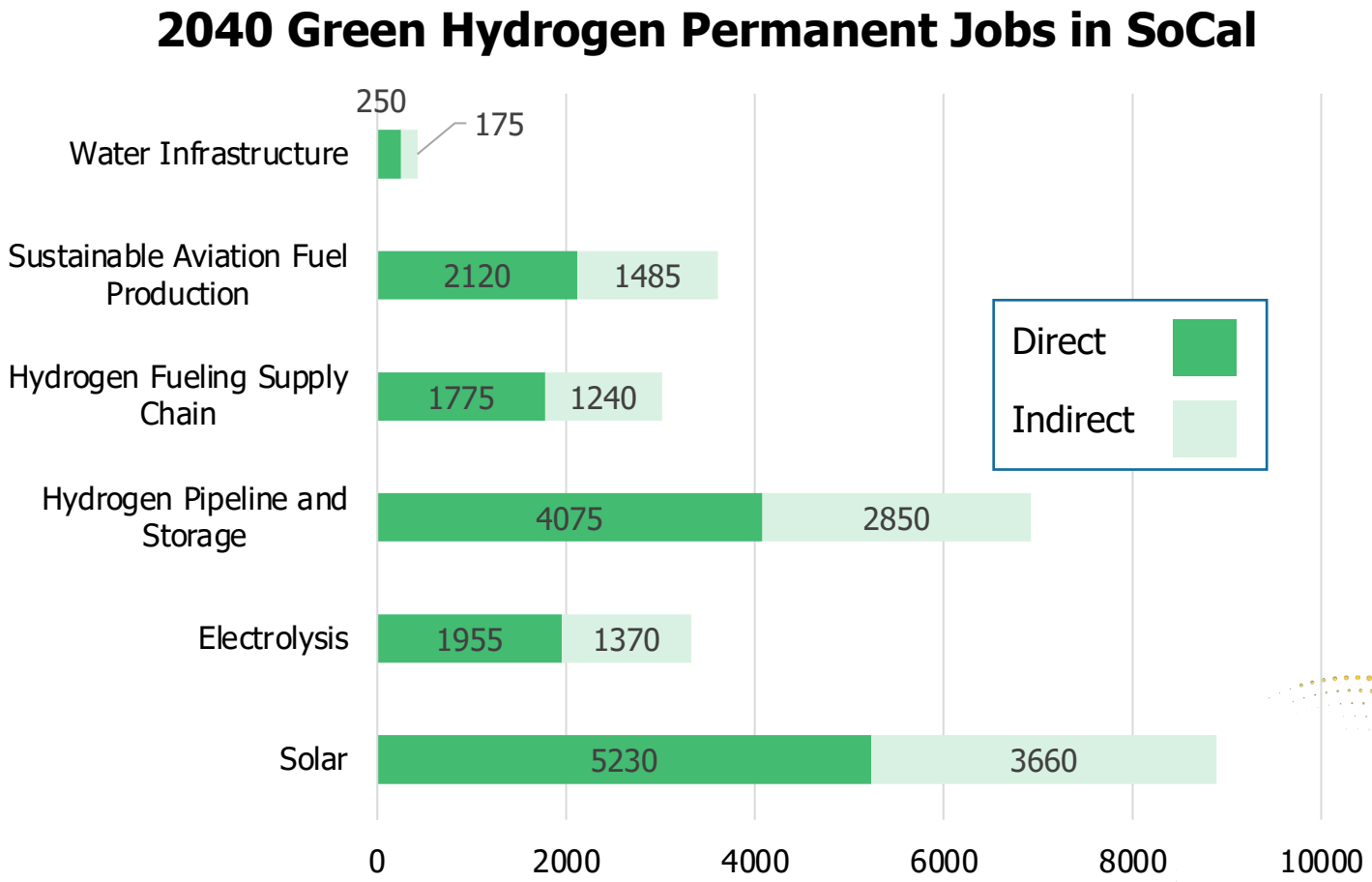
Key Learning 2

Green hydrogen economy for LA will create tens of thousands of diversely skilled, family-sustaining jobs in the LA Basin

In a study conducted by the University of California – Irvine, even conservative estimates show that green hydrogen will create diversely skilled jobs in even higher quantities (26,185 jobs) than incumbent fossil fuel sectors (22,400 jobs).



Source: University of California, Irvine Analysis for HyBuild Los Angeles, 2022

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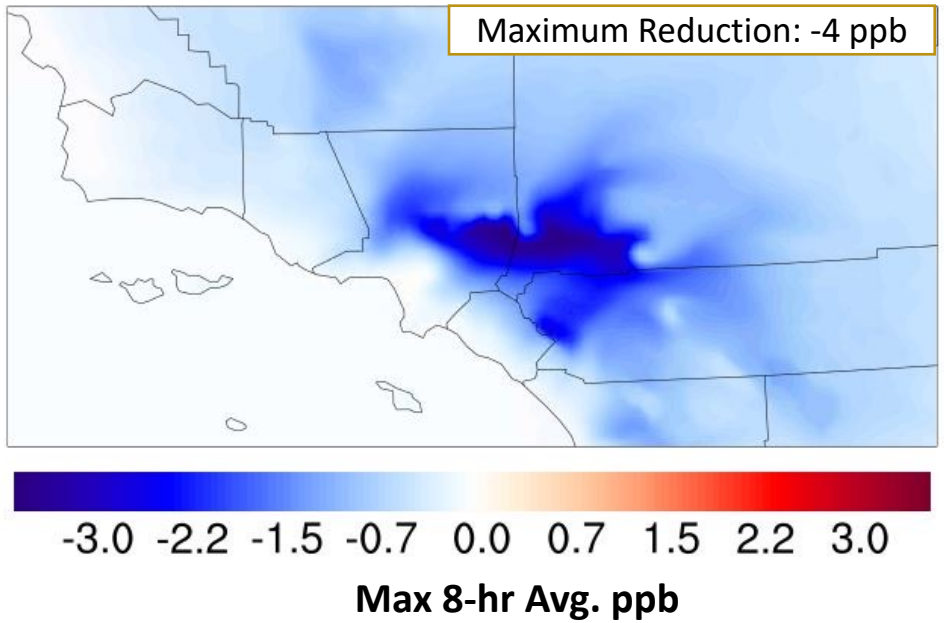
Key Learning 3

Green hydrogen displaces fossil fuels from the worst polluting sectors and improves air quality, particularly in communities that have suffered most

2045 Reduction in Ozone (Smog) Under the Modeled GH2 Adoption Scenario

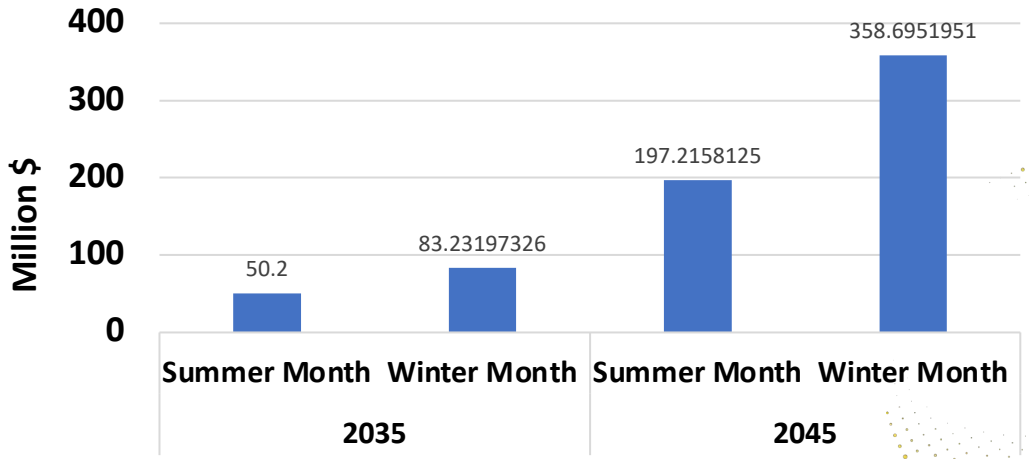


What does this mean for the South Coast Air Basin?

In total, the improvements in air quality modeled (ozone & PM2.5) for 4 modeled months* would result in:

- 27 fewer premature deaths
- 1,183 fewer hospitalizations for respiratory and cardiovascular illness
- 7,500 fewer work loss days

These quality-of-life improvements attain important monetary savings:



Source: University of California, Irvine Advanced Power and Energy Program, Analysis for HyBuild LA, 2022
**Measured a summer and a winter month in 2035 and 2045*

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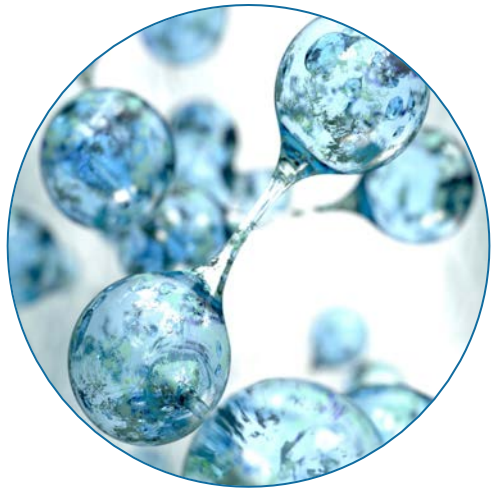
We look forward to a great discussion! Please reach out anytime. As an educational nonprofit, we would be happy to be a resource for you.



Download the Free GH2 Guidebook

This free guidebook covers GH2 production and distribution, safety, use cases, policy and regulatory drivers, & more:

www.ghcoalition.org/guidebook

Read the HyBuild LA Report

The GHC will soon release a report of its vision for a green hydrogen economy in LA:

www.ghcoalition.org/hybuild-la

Sign Up for Our Newsletter

Get a monthly recap of global green hydrogen news, events, and other industry updates:

www.ghcoalition.org/newsletters

Support the Green Hydrogen Coalition

To learn more about how to get engaged in the GHC's activities, reach out to Jackie:

jmeyer@ghcoalition.org

Mark Your Calendar for Catalyst H2

The premier, global GH2 conference is coming to Long Beach December 6 – 6:

www.catalysth2-hydrogen.com

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Contact Info: Janice Lin, jlin@ghcoalition.org

CATALYST H_2

December 4-6 | Long Beach, CA

Accelerating North America's Green Hydrogen Economy

The GHC is teaming up with Strategen to host their annual in-person event, Catalyst H2™.

Don't miss the opportunity to network with leading green hydrogen market makers, including multi-sectoral buyers, investors, innovative technology and solutions providers, developers, policymakers, frontline and community leaders, and global movers and shakers.

Register at catalysth2-hydrogen.com