

# Beyond Power: Reimagining the Energy Ecosystem With **Green Hydrogen**

The Essential Role of Green Hydrogen in Achieving  
California's Clean Energy Goals

January 23, 2020



**“Climate change is the  
defining issue of our  
time – and we are at a  
defining moment.”**

**Antonio Guterres  
United Nations  
Secretary General**



**“Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it’s the only thing that ever has.”**

**- Margaret Mead**

# Hydrogen is a global commodity widely used today for many applications

Today's Global Hydrogen Value Chains

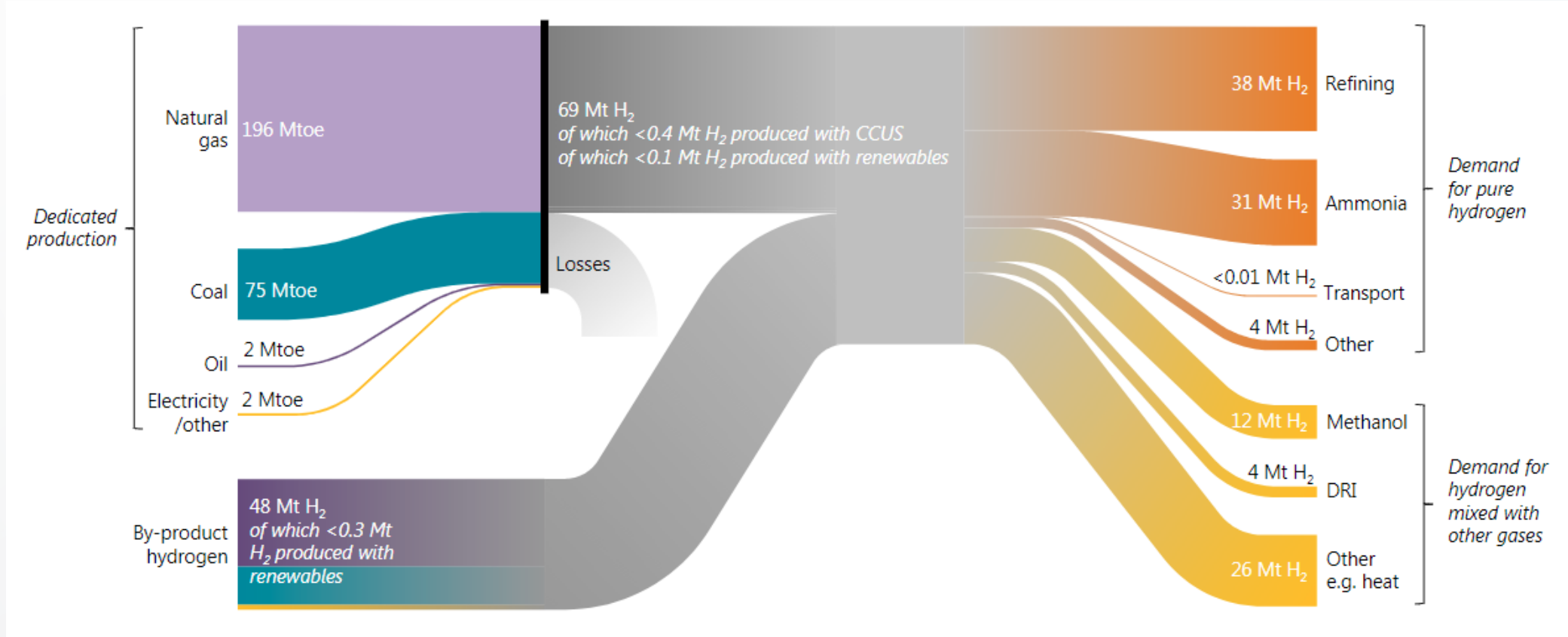


Image from "The Future of Hydrogen: Seizing today's opportunities" report prepared by IEA for the G20, Japan.  
Mtoe=million tons of oil equivalent. Mt=million tons



# Green Hydrogen Can be Made From:

## Renewable Sources\*

- **Biogas** (via reformation)
- **Renewable Electricity**  
(via electrolysis)

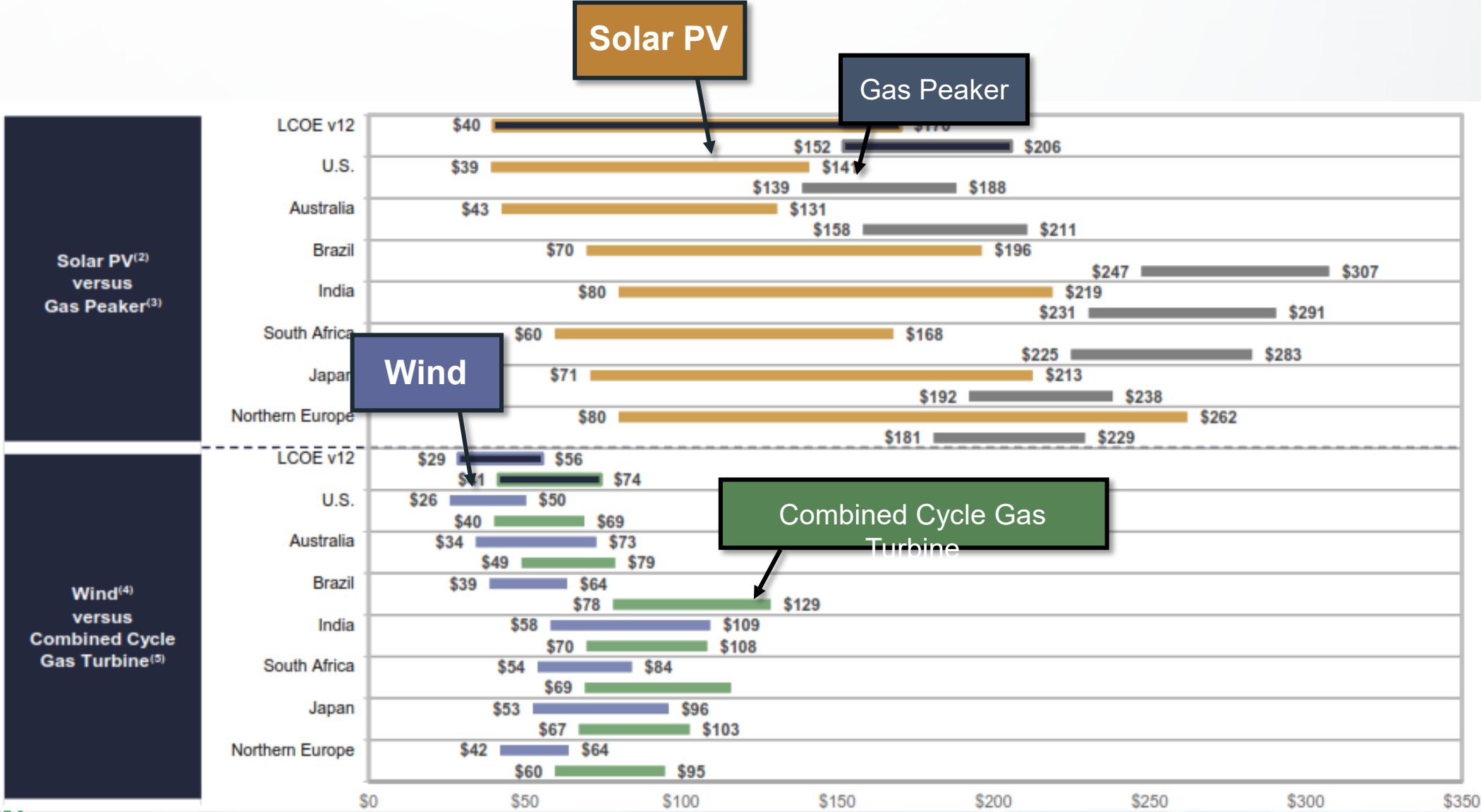
and

## Zero Carbon Sources

- **Carbon-Free Electricity**  
(via electrolysis powered by curtailed solar, large hydro, etc)

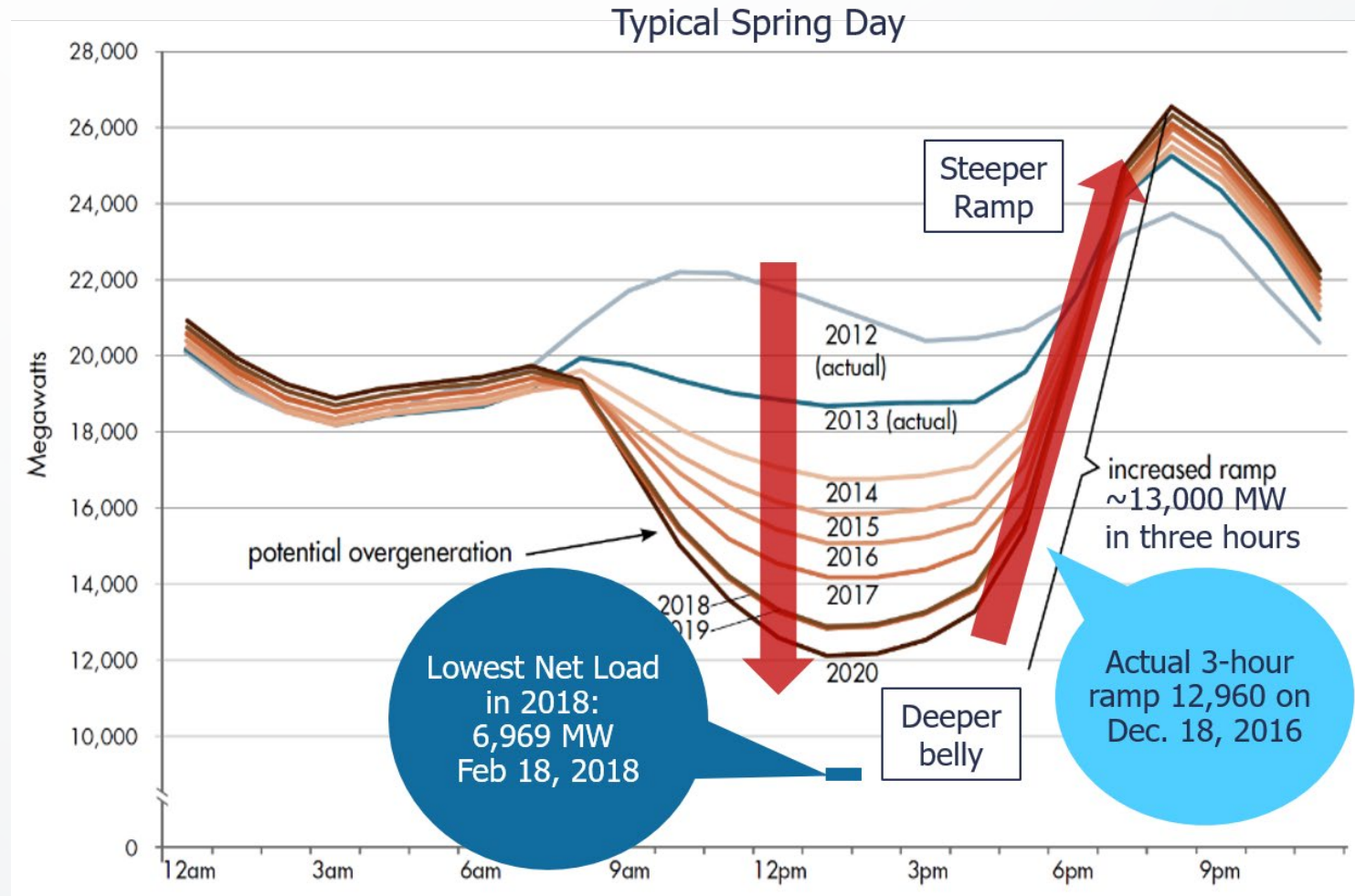


# Renewables are now cheaper than fossil generation



# Integrating renewables into existing grids is challenging

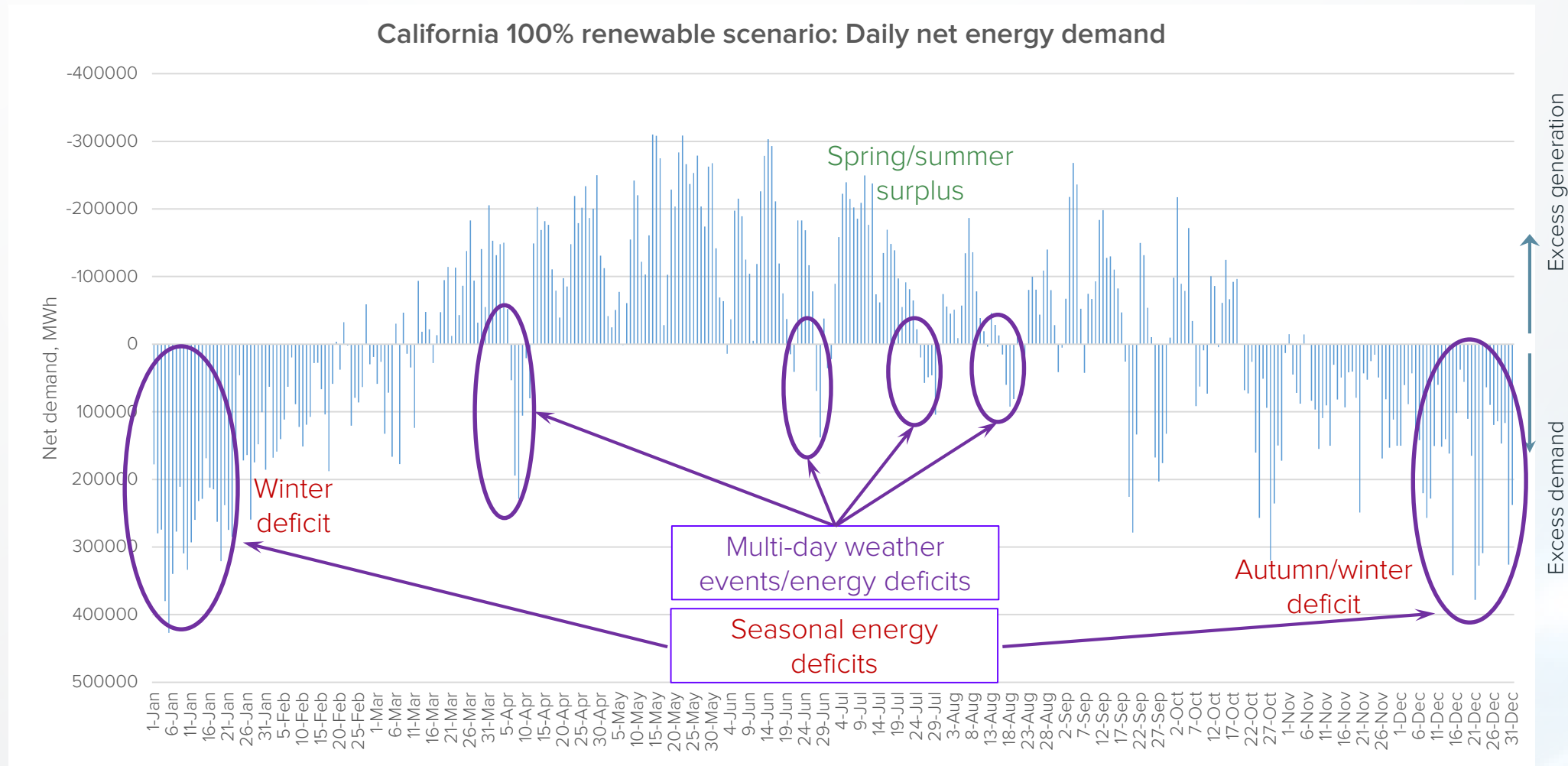
**Storage-enabled grids are the catalyst for higher renewables investment and penetration**



Example: California's net load, forecasted and actual 2016 & 2018

# Why Green Hydrogen Now?

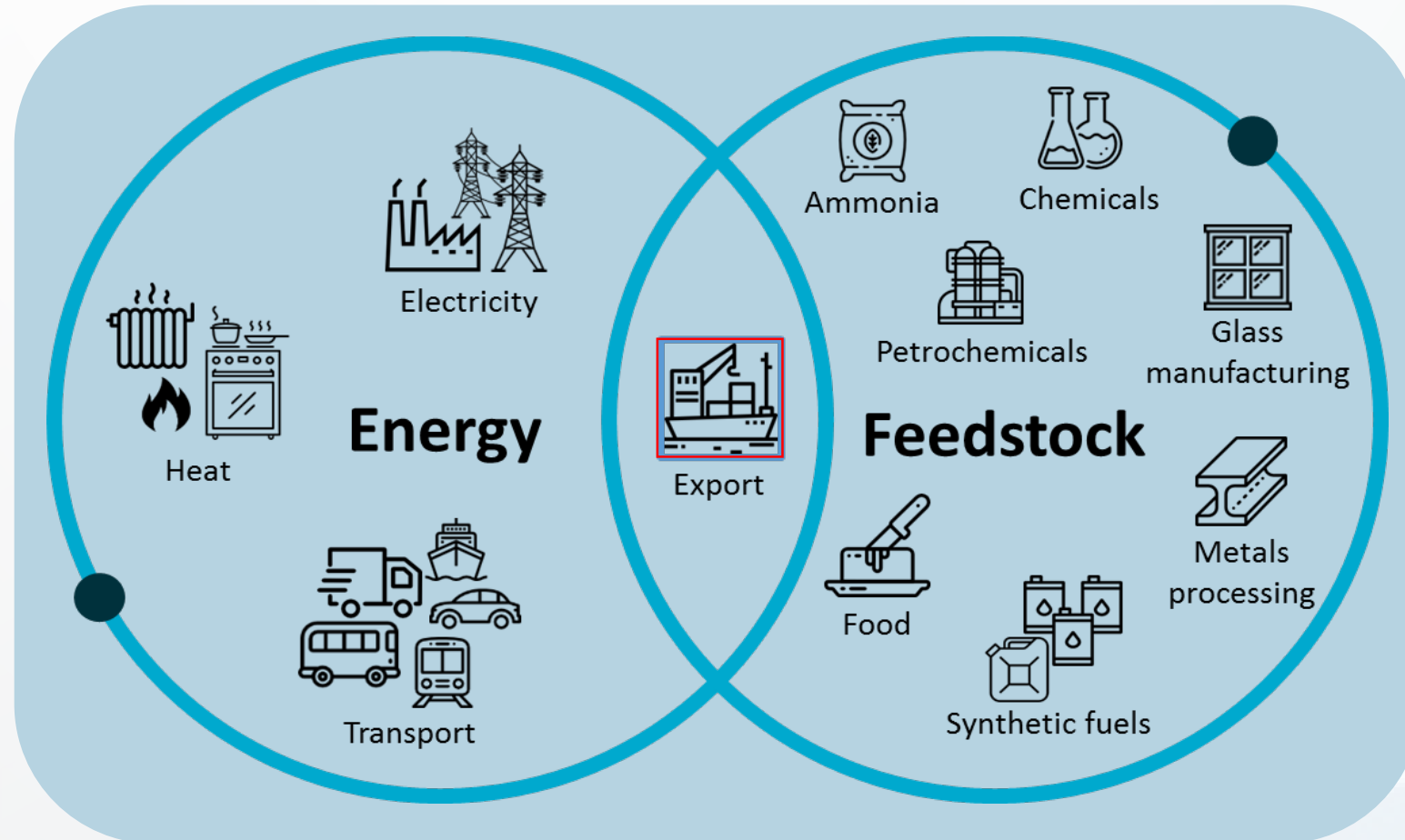
## Need for Multi Day and Seasonal Energy Storage





# Why Green Hydrogen Now?

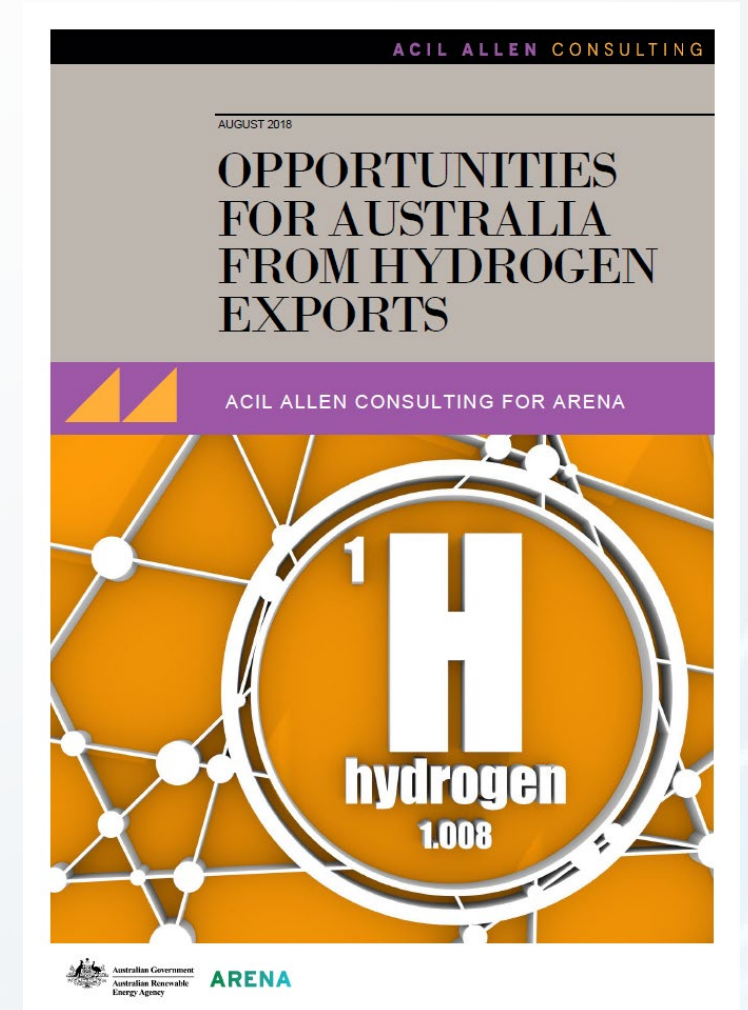
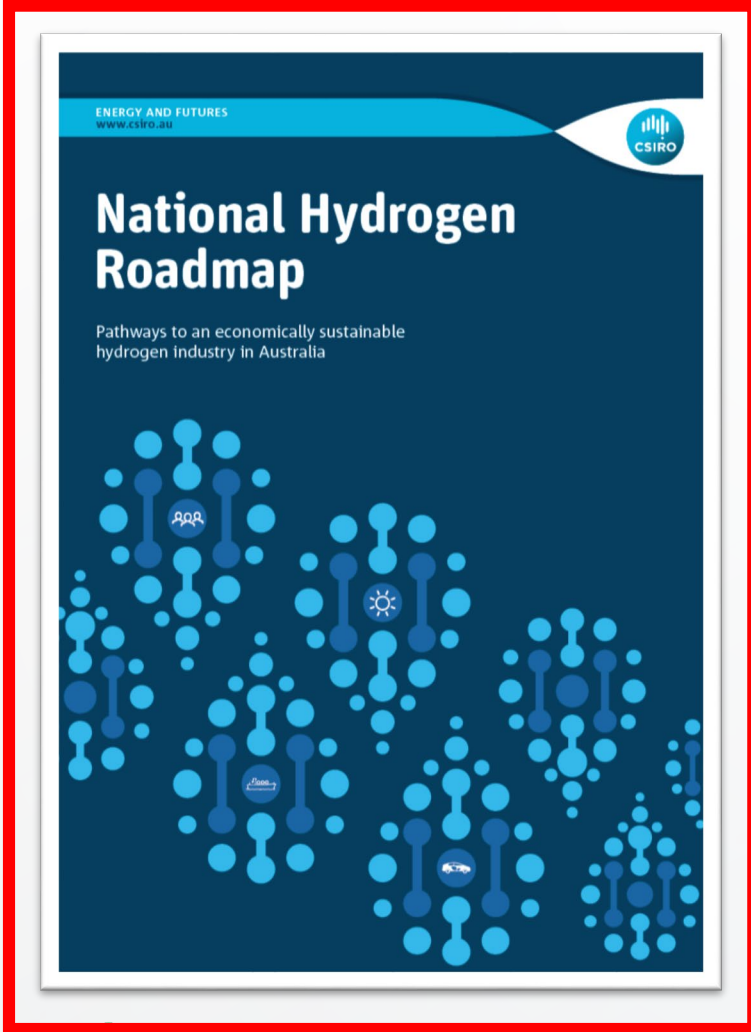
## Can Decarbonize Multiple Sectors- Even Aviation!



Source: CSIRO

# Why Green Hydrogen Now? and Economic Development

## Jobs

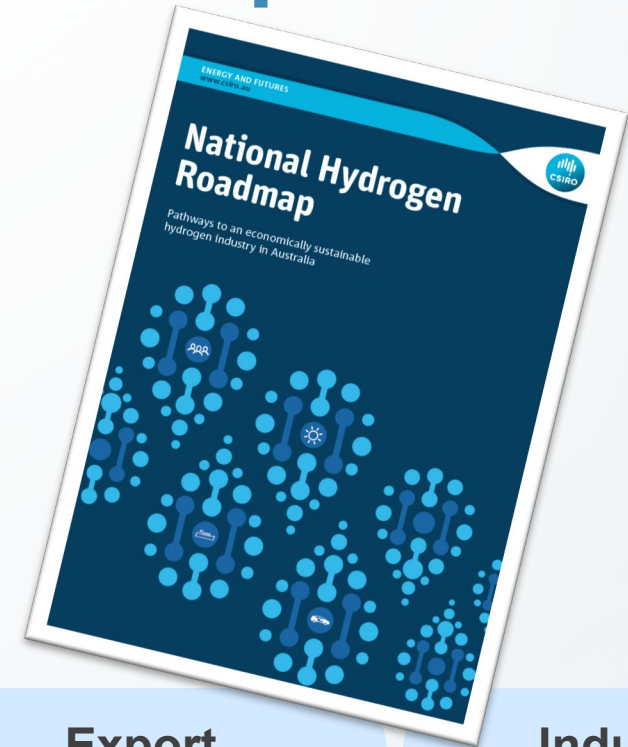


Source: CSIRO Energy

# Australia's National Hydrogen Roadmap: Export Opportunity!

**Primary objective:**

**Assessment of Australian hydrogen opportunities to help inform and coordinate industry investment and government policy (released August 2018)**



## **Electricity Generation & Storage**

- Energy storage
- Grid support
- Remote Energy

## **Direct Combustion**

- Residential / Commercial
- Gas distribution network

## **Transport**

- Passenger vehicles
- Heavy vehicles
- Shipping
- Rail

## **Export Commodities**

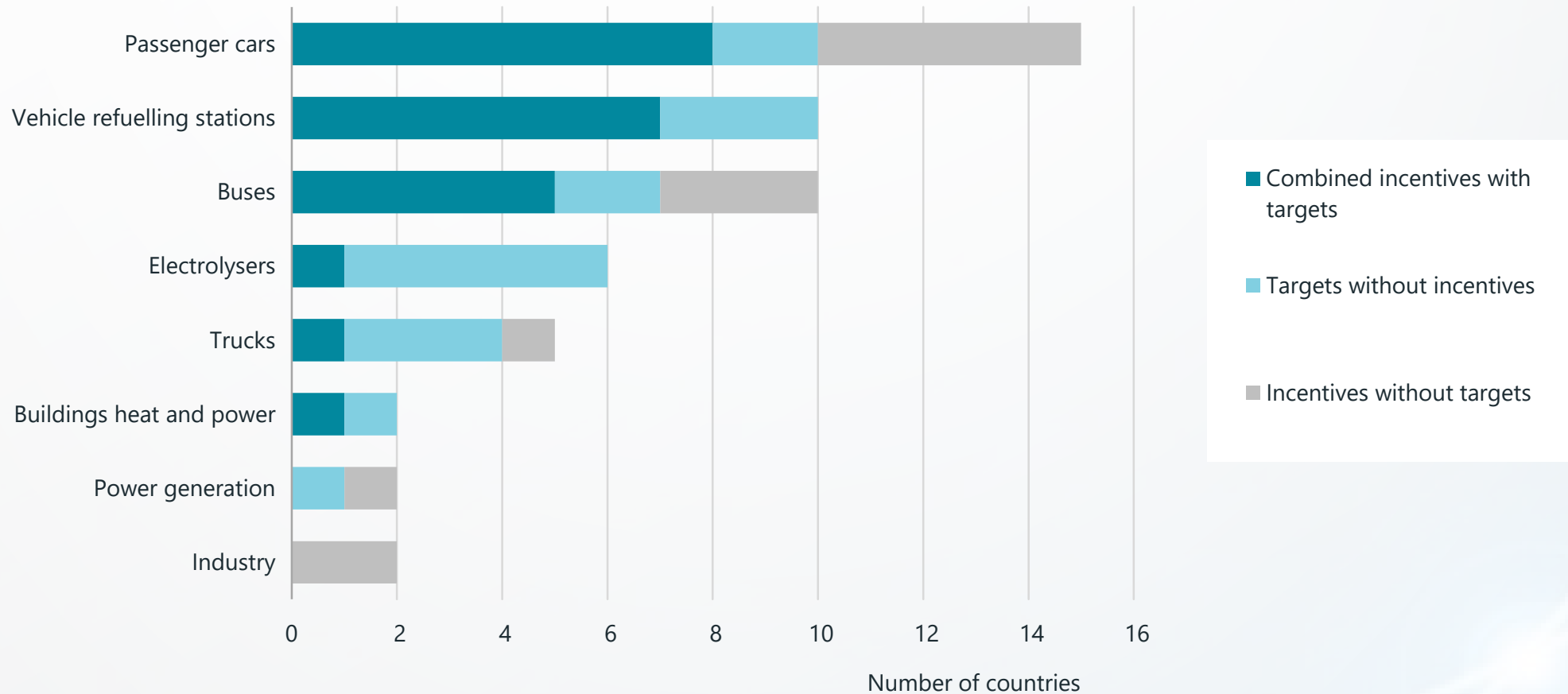
- Hydrogen
- Ammonia
- Methanol
- Synth. Natural Gas

## **Industrial Feedstock**

- Petrochemical
- Metallurgy
- Chemicals
- Synthetic fuels



# Global Policy Support for Hydrogen Deployment



Source: International Energy Agency October 2019

# Green Hydrogen: Key to Carbon Free Energy Supply Across Sectors

- **Green Hydrogen can help overcome difficult challenges**
  - Integrate more renewables
  - Decarbonize hard-to-abate sectors: steel, chemicals, trucks, ships, planes
  - Enhance energy security
- **Challenges for Green Hydrogen are fundamentally market design-related**
  - Achieving scale to reduce cost
  - Compensation for all benefits provided
  - Consideration of Green Hydrogen as part of planning tool kit
- **Multi-sectoral project opportunities to address challenges that exist today**

**Progress requires multi-jurisdictional focus**

**New Paradigm  
Is Needed:**

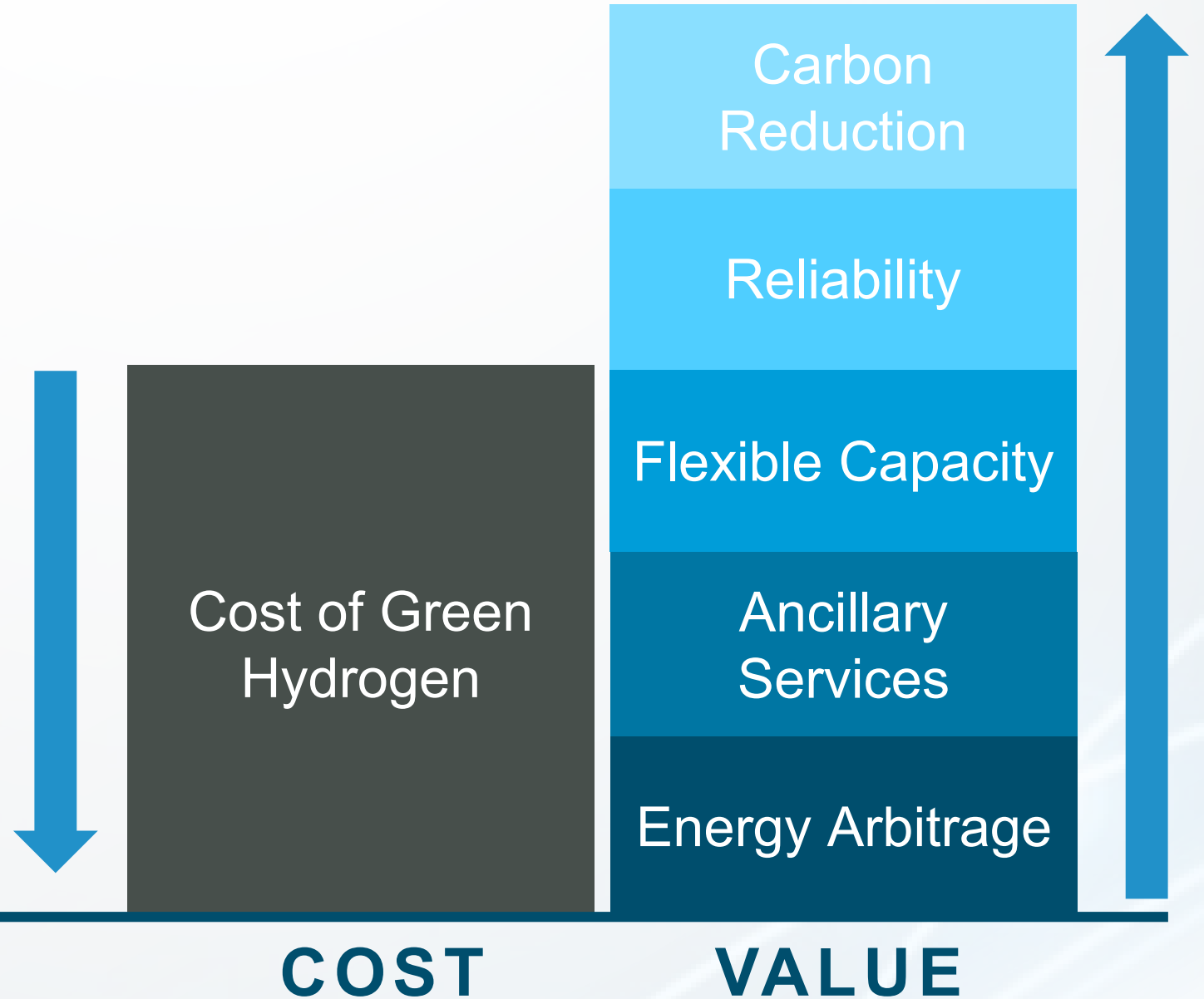
**Valuing and  
procuring for  
net benefits**

**NOT just cost**

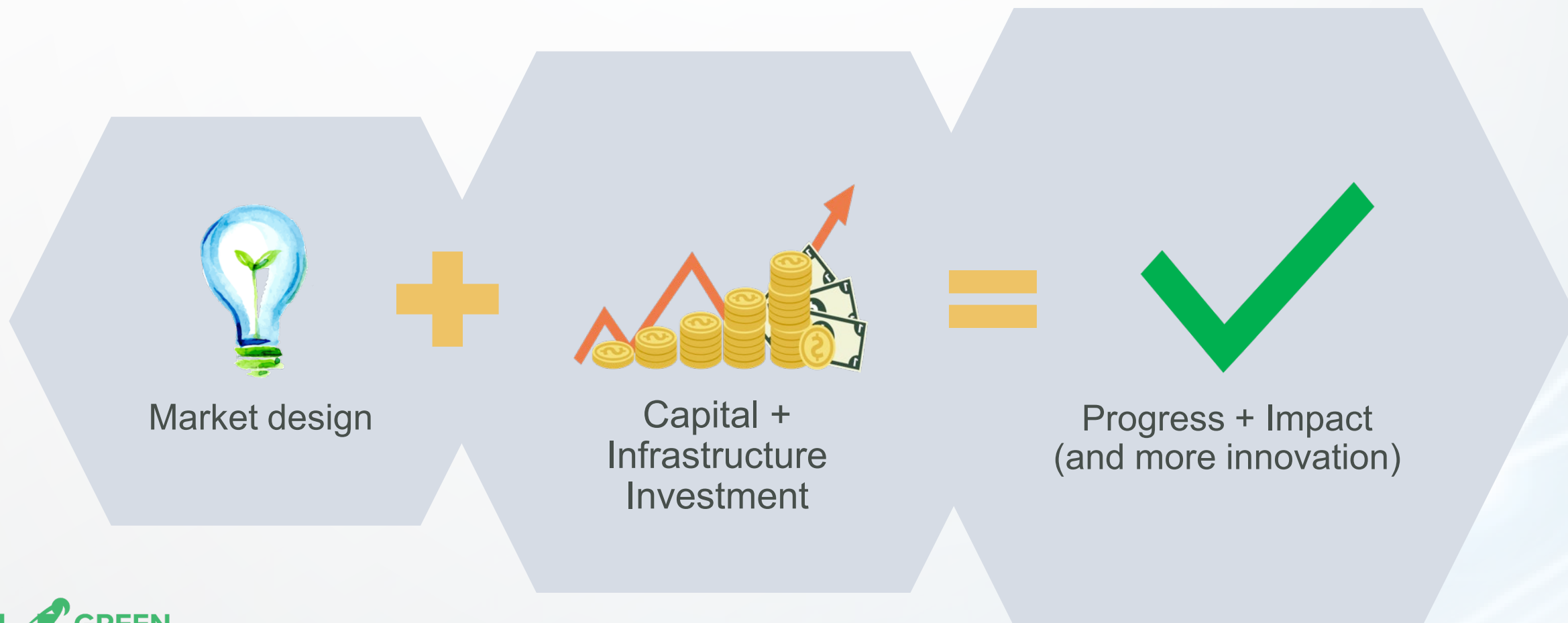




Regulatory  
Innovation is  
Needed to  
Recognize **ALL**  
the Values  
Green Hydrogen  
Can Provide



# Appropriate market design is necessary to scale up & accelerate progress



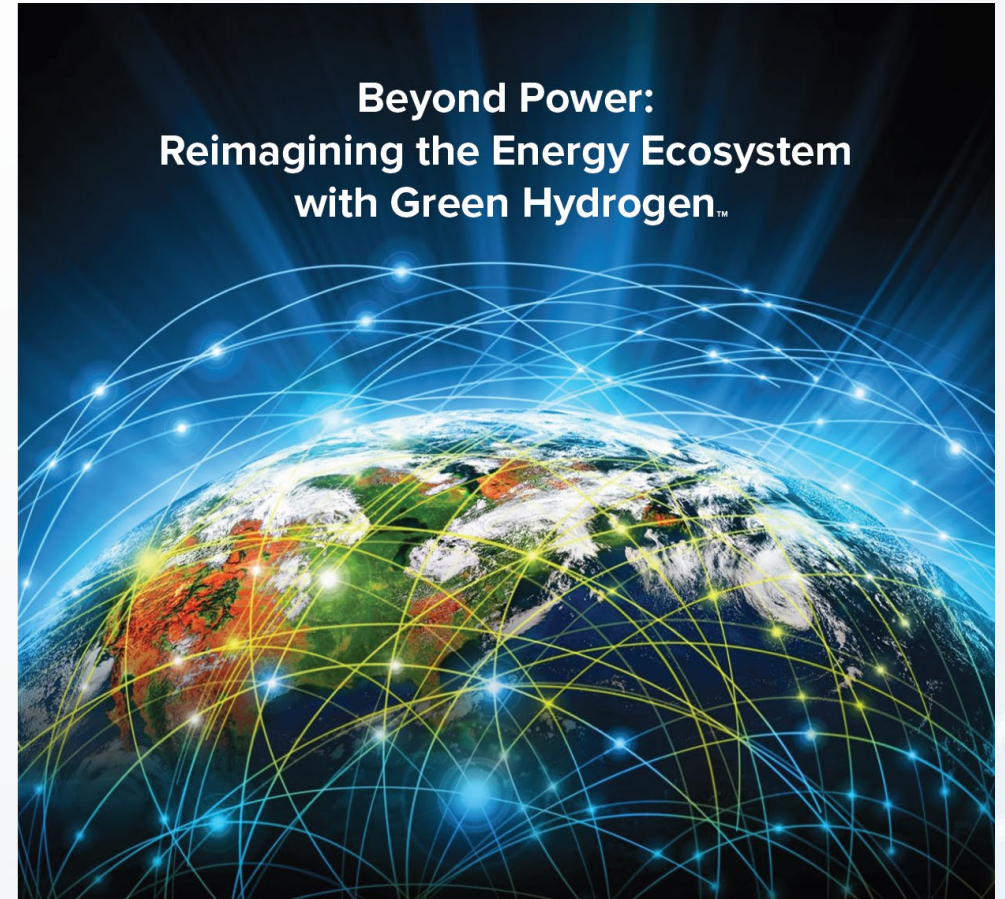
# Green Hydrogen Coalition Overview\*

## Mission:

Facilitate policies and practices to advance Green Hydrogen production and use in all sectors where it will accelerate a carbon-free energy future

## Approach:

Focus on Green Hydrogen project deployment at scale; leveraging multi-sector opportunities to simultaneously scale supply and demand





# GHC Purpose, Values and Approach



**Purpose: Accelerate decarbonization to combat climate change**

## **Core Values:**

- **Technology and business model neutral**
- **Respectful and constructive collaboration with all stakeholders**
- **Integrity**
- **Safety**
- **Environmental justice**
- **Impact**

**Approach: Leverage multi-sector opportunities to simultaneously scale Green Hydrogen production and use, one project at a time**

# GHC will address key barriers...



- **Build broad stakeholder support for Green Hydrogen use cases**
- **Establish evaluation & procurement framework for the costs/benefits of Green Hydrogen, including use cases that span jurisdictions**
- **Reduce the cost of physically moving green hydrogen from supply sources to demand centers – find ways to repurpose existing infrastructure**
- **Establish pricing, renewable energy credit accounting and development of new market products for Green Hydrogen production and uses**

**...that span jurisdictions ...**



**...By Focusing on Accelerating Specific  
Cross-Sector Project Deployment at Scale:  
First Initiative: Intermountain Power Project (IPP)**





# **IPP Overview: Convert Large-Scale Thermal Plant to 100% Green Hydrogen & Establish Regional Renewable Reliability Reserve**

## **PROJECT OVERVIEW**

**Leverage curtailed and low-cost purpose-built wind and solar to produce Green Hydrogen at scale, displacing natural gas at IPP and providing renewable regional reliability (Green Hydrogen stored in purpose-built salt caverns on site)**

## **PROJECT GOALS**

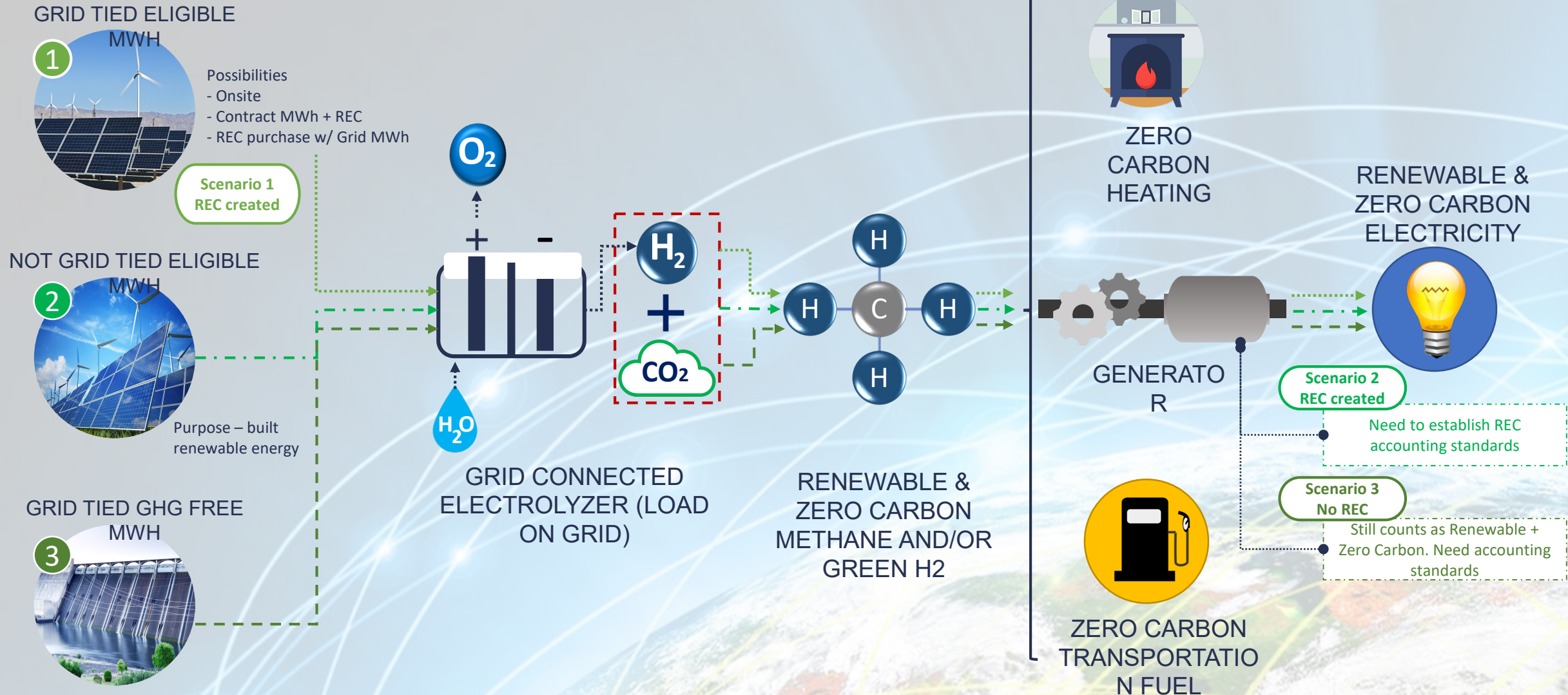
- 1. Demonstrate large-scale thermal plant conversion to 100% Green Hydrogen**
- 2. Leverage IPP project to develop market products & contracting mechanisms for regional renewable reliability reserve for Western US.**

# **Green H2 is Essential to Achieving SB 100 Goals**

## **Proposed Next Steps**

- 1. Education! Build stakeholder understanding & support for green hydrogen use cases to enable clean energy transition**
- 2. Form multi-jurisdictional task force to focus on multi-sectoral role of Green Hydrogen in achieving SB 100 goals**
- 3. Establish an evaluation & procurement framework for the costs and benefits of Green Hydrogen applications, including renewables integration and long term energy storage for incorporation into IRP planning efforts**
- 4. Establish REC and zero-carbon resource tracking and accounting rules for green hydrogen toward achieving SB 100 goals.**
- 5. Reduce the cost of physically moving Green Hydrogen supply sources to demand centers**

# REC accounting challenges for Green H2 (Electrolysis Example)





# GHC has a different approach than other hydrogen-focused organizations

1. The GHC is an educational and advocacy non-profit with a focus on building **top-down momentum** for Green Hydrogen
2. The GHC will leverage **multi-sectoral opportunities to concurrently scale production and demand** for Green Hydrogen.
3. The GHC will **facilitate policies and practices to create compensation pathways and other market mechanisms** to enable Green Hydrogen project development that spans multiple sectors
4. The GHC will have a **global focus**, demonstrating the technical and business feasibility of Green Hydrogen for domestic use and as a valuable export commodity

# GHC Founding Board

## Janice Lin



Janice is the founder of the Green Hydrogen Coalition and CEO of Strategen, a mission driven professional services firm focused on nurturing and empowering champions from the public and private sectors to accelerate energy system decarbonization. Since entering the clean energy sector in 1999, Janice has helped to transform the power sector with energy storage and is now working on decarbonizing other sectors with renewable hydrogen. She co-founded the California Energy Storage Alliance and Energy Storage North America, the largest conference for energy storage in North America. Prior to founding Strategen in 2005, Janice held several senior management positions with PowerLight Corporation (now SunPower Corporation), including Vice President of Product Strategy and Vice President of Business Development. During her tenure at PowerLight, Janice led initiatives in product and new market strategies, business development, regulatory affairs, strategic partnerships, investor relations, and customer finance. Janice has won numerous industry awards, including the 2019 Entrepreneur of the Year Cleanie® Award; the 2014 NAATBATT Market Development Award; and the ESA 2013 Phil Symons Energy Storage Award. Janice has served on the Electricity Advisory Coalition of the US Department of Energy, the Board of Advisors for the Energy Policy Initiatives Center (EPIC) and the Energy Storage Committee of Joint Venture Silicon Valley.

## Jon Wellingshoff



Jon is Founder and CEO of GridPolicy, Inc. Jon Wellingshoff is an internationally recognized expert and thought leader in energy policy, electric grid operations and markets, and the interface of disruptive energy systems with traditional utility structures. He currently consults with business, government and regulatory policy leaders in the U.S., Asia, Canada, Australia and Europe. His firm GridPolicy, Inc. is dedicated to furthering the deployment of and investment in clean sustainable distributed energy resources (DERs) and efficient alternative transmission technologies (ATTs). Jon works to remove regulatory, policy, and institutional barriers to the widespread adoption of cost effective DER and ATT resources and systems, assisting companies, governments, and consumers who market and/or operate such resources. In 2006, Jon received his first of two Presidential appointments to serve as a Commissioner on the Federal Energy Regulatory Commission (FERC), and was designated by the President in 2009 to be Chairman of FERC. He was FERC's longest serving Chairman (2009-2013). During his FERC tenure, he led efforts to make the U.S. power system cleaner and more efficient by promoting and integrating renewable energy, demand response, energy efficiency and storage into the nation's transmission system. In 2016, the *Public Utilities Fortnightly* named Jon one of the 10 individuals since 1990 who have had the greatest impact on the electric utility industry.

## Thierry Lepercq



Thierry Lepercq is a serial entrepreneur in technology and energy. He recently founded Soladvent, a global pioneer of green hydrogen, the large-scale production of hydrogen from solar and wind aiming at fossil fuel parity for industry, energy and mobility. He is the author of *Hydrogen is the New Oil*, a successful new book which describes how 7 energy wars are converging into a global convulsion and ushering a fossil fuel-free world. Thierry was Executive Vice-President in charge of Research, Technology and Innovation at energy giant Engie from 2016 to 2018. His efforts focused on disruptive business models in such areas as dispatchable renewables, electric mobility, digital energy platforms and hydrogen. From 2006 to 2016, he was the president and co-founder of Solairedirect, a global pioneer of competitive solar power, which has developed and built 3 GW of capacity on four continents at prices as low as 20 \$/MWh. Solairedirect was acquired by Engie in 2015.

**“Whatever you can do or dream  
you can, begin it.  
Boldness has genius, power  
and magic in it.  
Begin it now!”**

**- Goethe**



To learn more,

Contact:

Janice Lin

[info@ghcoalition.org](mailto:info@ghcoalition.org)

+1 415 595 8301

[www.strategen.com](http://www.strategen.com)







Strategen is a mission-driven professional services firm dedicated to decarbonizing energy systems

## ASSOCIATIONS

Strategen co-founded and manages the California Energy Storage Alliance (CESA), the Global Energy Storage Alliance (GESA) and the Vehicle Grid Integration Council (VGIC). Through these organizations, Strategen policy work has been pivotal in building the energy storage industry in California, the US, and around the world.

## CONSULTING

Since 2005, Strategen provides analysis and insight to public sector leaders, utilities, developers, and global corporations helping them to achieve transformational and sustainable clean energy strategies.

## CONVENINGS

Strategen excels in stakeholder engagement, via customized small and large events. Strategen founded Energy Storage North America (ESNA), the largest grid-connected storage conference in North America. Now in its 8<sup>th</sup> year, the annual event connects over 2000 participants from 30+ countries.

