NARUC Summer Policy Summit

Committee on Gas: Transforming the Gas System with Hydrogen

This session will begin at 10:45 am

Transforming the Gas System with Hydrogen: Pilot Technologies and Regulatory Approaches

Yuri Freedman, Senior Director

NARUC Summer Policy Summit / Committee on Gas
July 19, 2022

SoCalGas™

Journey To Be the Cleanest, Safest, Most Innovative Energy Company in America

SoCalGas

Climate Commitment

- Announced Climate Commitment
- Became the largest gas distribution utility in the nation to include scopes 1,2, and 3
- Aligned with California's statewide decarbonization goals and the global Paris Agreement climate emissions

ESG Financing Framework

- Aligns our investments/activities across Sempra with our sustainability goals to help drive our environmental, social and governance (ESG) commitments to support long-term, sustainable value for all shareholders and our other stakeholders

Angeles Link Announcement

- Proposal to develop the nation's largest green hydrogen energy infrastructure system to deliver clean, reliable energy to the Los Angeles region
- Goal to drive deep decarbonization in hard- to-electrify sectors of the Southern California economy

MARCH 2021 | OCT 2021 | NOV 2021 | JAN 2022 | FEB 2022

SoCalGas Clean Fuels White Paper

- A California economy-wide assessment of an integrated energy system
- Key study findings note the importance and requirement of a clean fuels network if we require an affordable, resilient, and risk mitigating solution that supports electrification.

ASPIRE 2045 – SoCalGas Sustainability Plan

- Holistic approach to integrating sustainability across entire business to create positive impact and strengthen business outcomes
- Five focus areas to support our business in being the cleanest, safest, most innovative energy company in America as we advance our climate objectives

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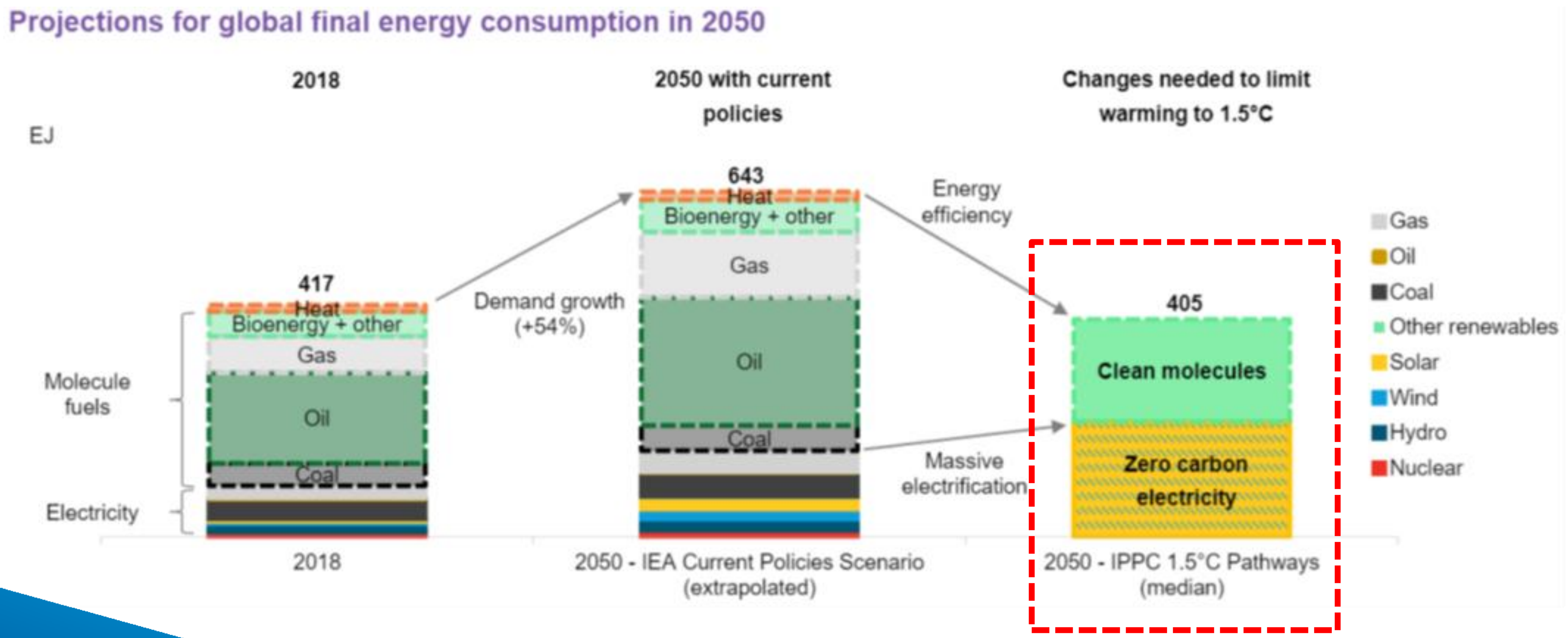
Glad to be of service.®

Clean Molecules Are Critical for Decarbonization

In a scenario limiting global warming to 1.5° C by 2050, ~50% of global energy needs will be met with clean molecules

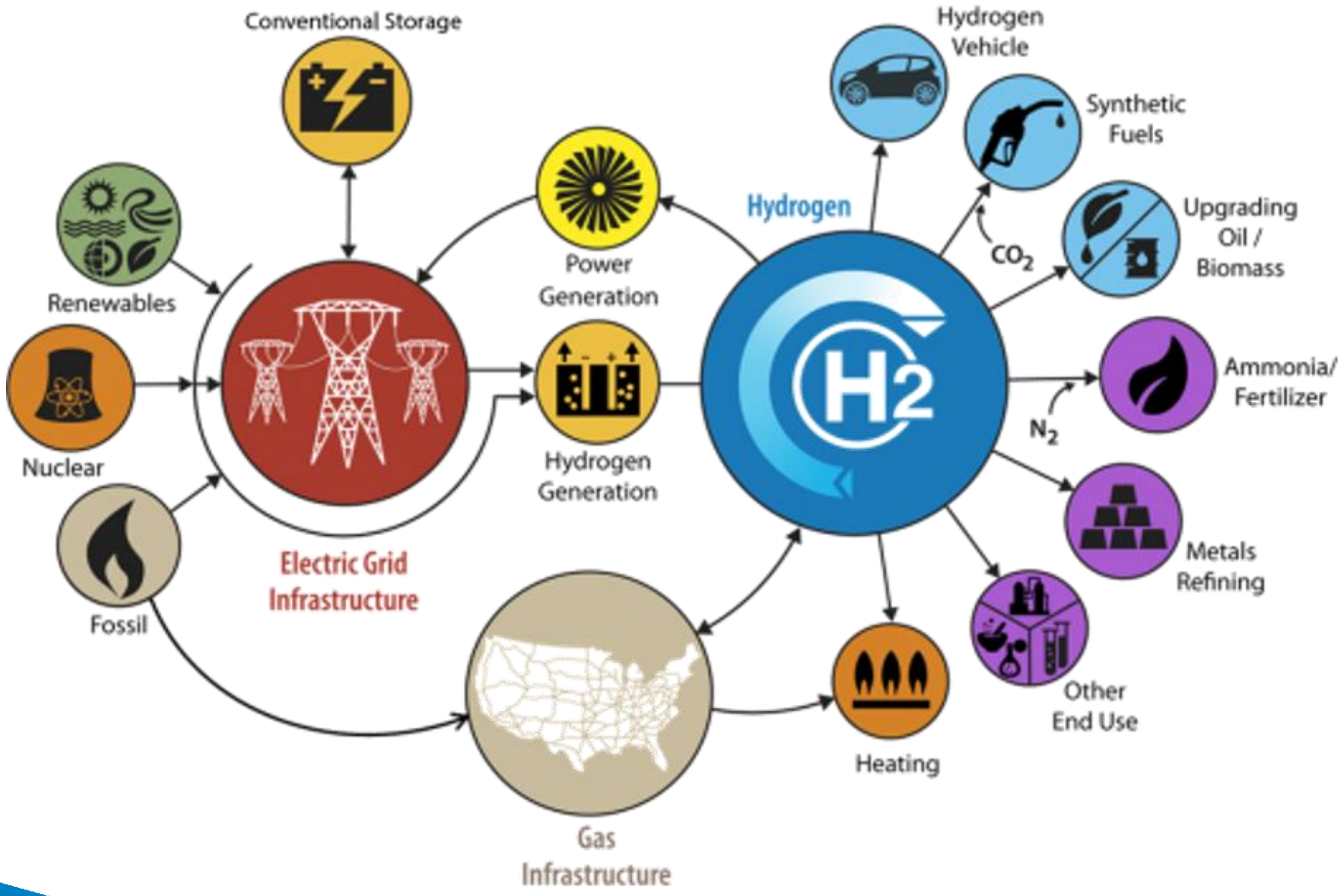


Source: Bloomberg New Energy Finance

Clean Fuels Study Key Findings:
Resiliency, Cost, Diversification

- The most affordable, resilient, and technologically proven decarbonization pathways require a clean fuels network.
- A clean fuels network that supports clean, thermal electric generation with carbon management is the most cost-effective solution.
- A clean fuels network supports electrification and reduces risk.

Clean Fuels:
Hydrogen Is Well Positioned to Play a Central Role



Source: U.S. Department of Energy

Shaping the Future:
Angeles Link

The Challenge

California's ambitious climate and clean air-quality goals will not be achievable unless hard-to-electrify sectors of the economy are fully decarbonized, and we're running out of time.

Project Overview

This project to be developed and studied has the potential to replace natural gas-fired electric generation facilities with clean-burning hydrogen, service hard-to electrify industrial sectors, provide the fuel needed to convert the heavy-duty trucking industry from diesel to fuel cells, and could assist in facilitating permanent retirement of Aliso Canyon.

Project Attributes

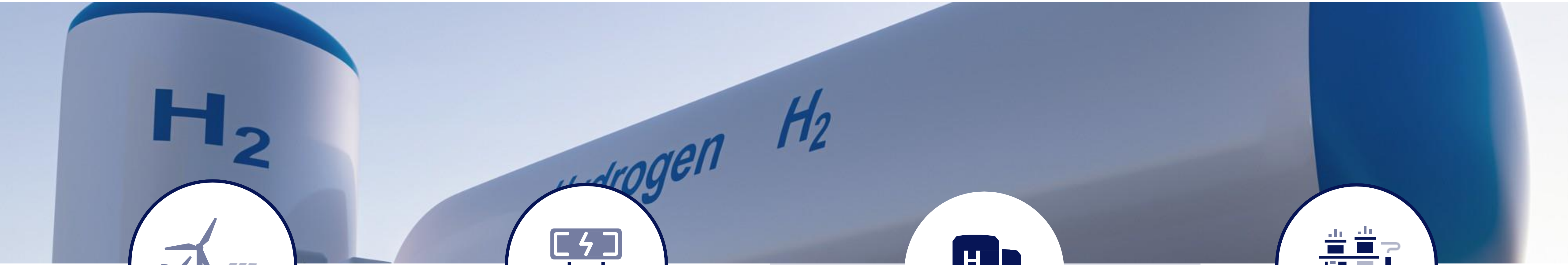
Produced entirely from renewable electricity – the project could expand our renewable energy storage capabilities, allow us to utilize more renewable electricity and avoid curtailment, reduce emissions in hard-to-electrify sectors, protect stakeholders and communities of concerns, and create and maintain thousands of union jobs in the process.

Why SoCalGas?

With **22 million customers**, SoCalGas serves as a public utility under a regulated utility framework suitable for a project dedicated to public use, has decades-long relationship with the region's largest industrial end-users, more than 100,000 miles of transmission and distribution pipelines already in place, local expertise, and an established track record of project development at scale.

Shaping the Future:
How Could Angeles Link Work?

SoCalGas



25-35 GW Curtailed/New/Solar/Wind
2 GW Batteries

Start with 100% renewable electricity

Utilize renewable electricity that is new, on the grid or being curtailed to provide power to electrolyzer

10-20 GW Electrolyzers

Convert it into green hydrogen with advanced electrolyzers

Electrolysis splits water into hydrogen and oxygen -- with virtually zero greenhouse gas and criteria pollutant emissions

Hydrogen infrastructure

Deliver it into LA Basin by pipeline

SoCalGas will use its expertise in pipeline infrastructure and potential rights-of-way to safely deliver hydrogen from outside of LA Basin to industries that need it most

14.3 million tons of CO_2 emissions eliminated

Use it to decarbonize sectors that can't be plugged in

Dispatchable electric generation and hard-to-electrify sectors like manufacturing and heavy-duty transportation are the missing links to solving the most challenging aspect of decarbonization; green hydrogen offers the solution

Shaping the Future:
Proposed Project Phases

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Angeles Link project planning is divided into three phases

Phase 1
Pre-Engineering, Design, Environmental Review

Phase 2
Identify Preferred Option, Refine Design & Environmental Review

Phase 3
Develop Certification of Public Convenience and Necessity Application, CEQA Analysis

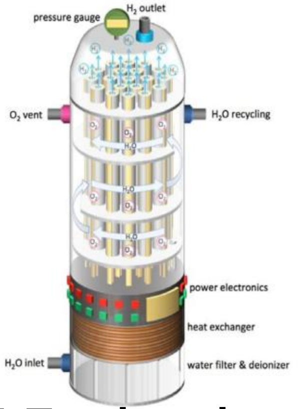
Continuous Stakeholder Engagement

Shaping The Future:
Selected SoCalGas RD&D Projects

H2 Hydrogen Home

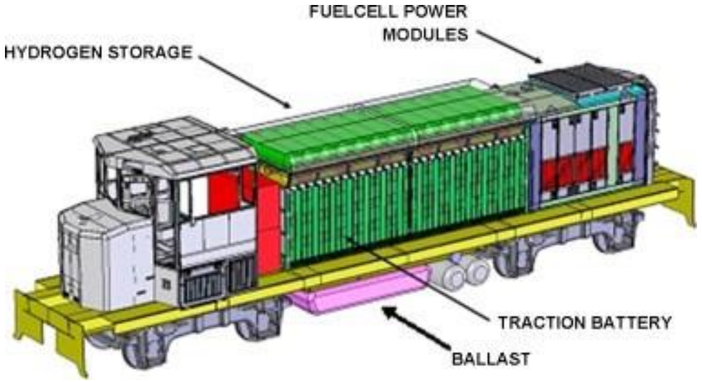
H2 PureComp

H2 SilverSTARS



H2U Technologies

Hydrogen Fuel Cells for Marine Vessels



Hydrogen for Commercial Transportation

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Thank You!

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UCI

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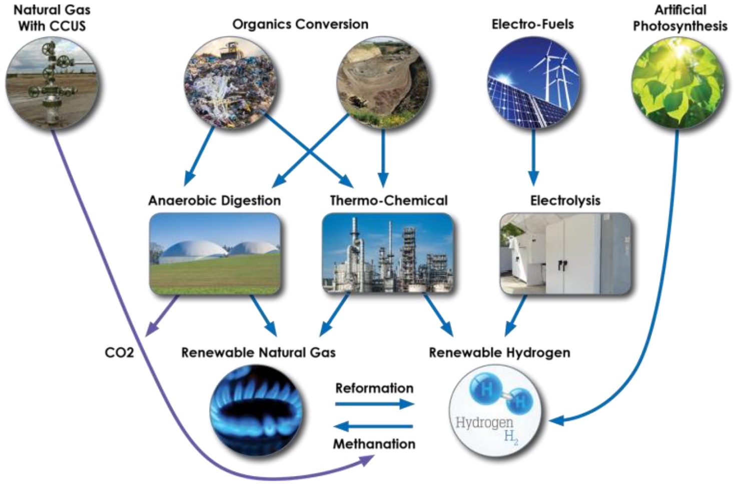
Jeffrey Reed, Ph.D.
UC Irvine Advanced Power and Energy Program

Active in All Aspects of Hydrogen: Production-Transport-Use-Impacts

Production



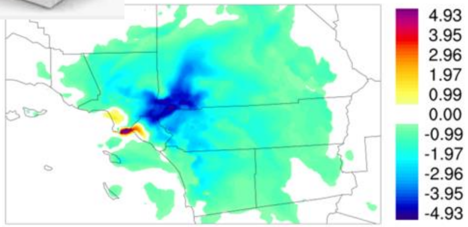
- Power-to-Gas on Campus Microgrid
- Power-to-Gas Design -- Five Points
- GridH2 – Optimal Use of Excess Renewables

Transport and Storage

- Hydrogen injection and blending
- System impacts (leakage and embrittlement)
- RH2 and RNG for renewables firming
- Gas grid H2 carrying capacity
- Optimal pathways for deep decarbonization of the gas system

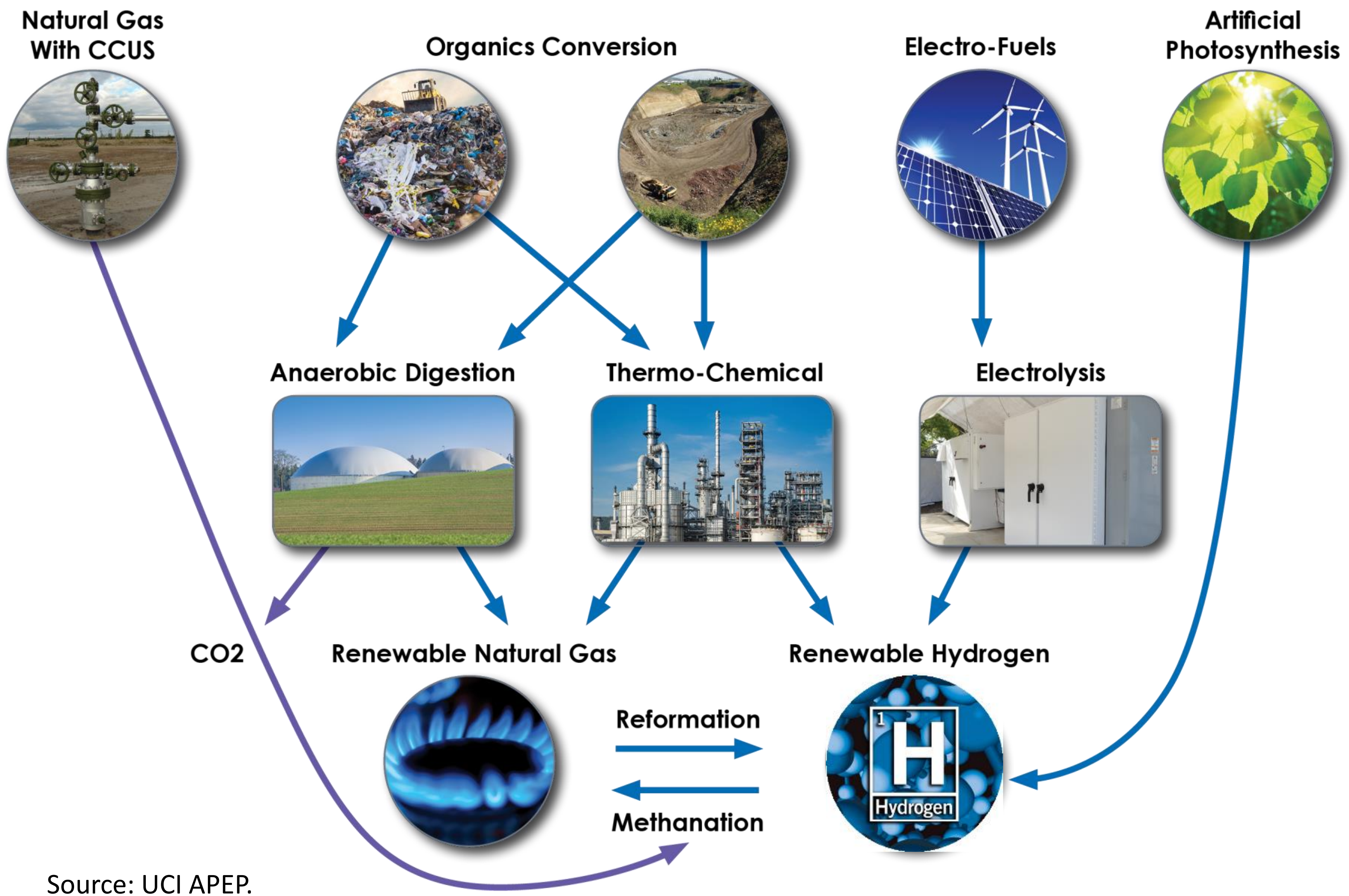
End Use

Impacts



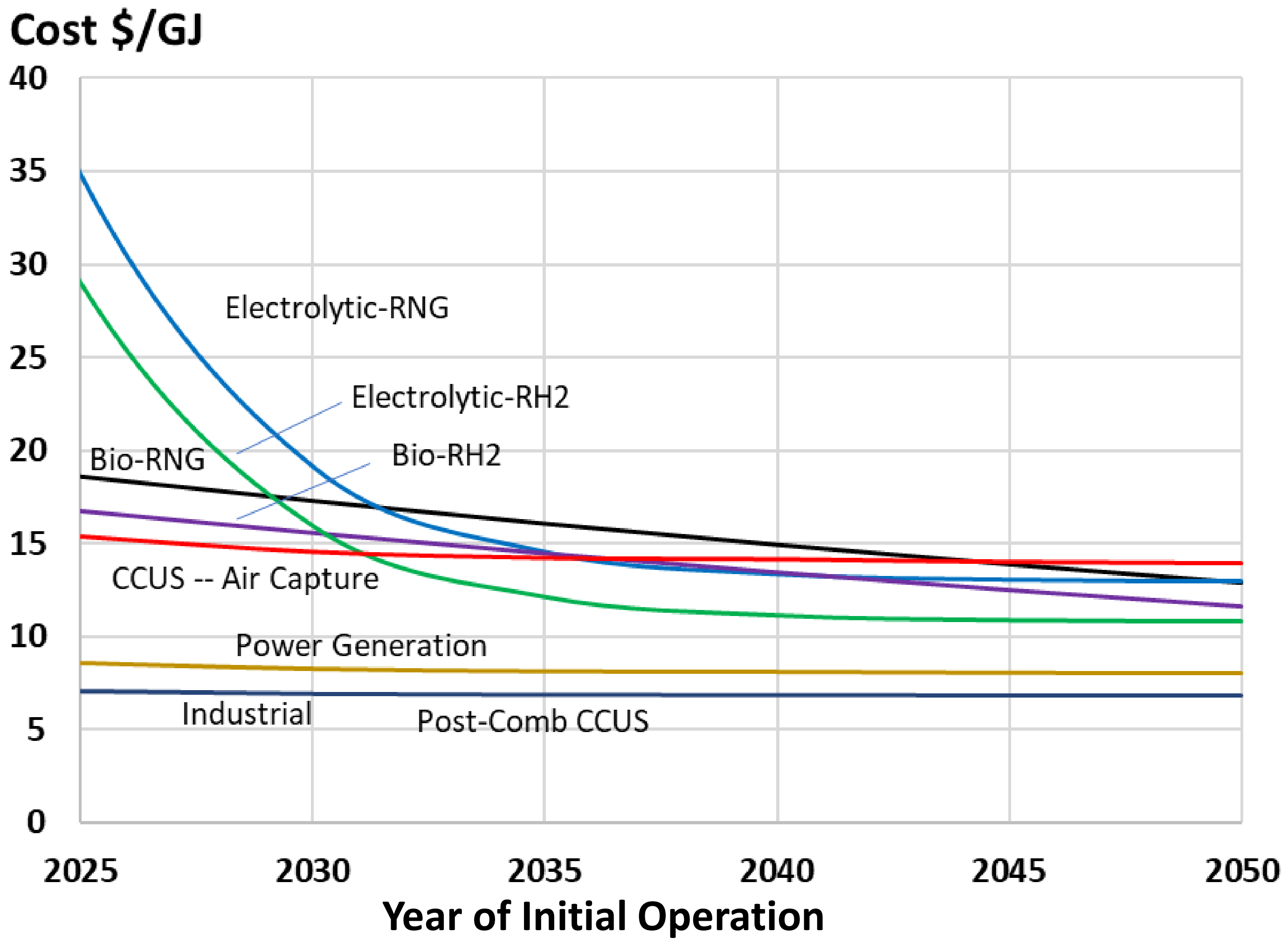
- Electrochemistry
- Hydrogen tolerance of burners
- Emissions/AQ impacts
- Performance validation

Renewable and Zero-carbon Hydrogen Pathways



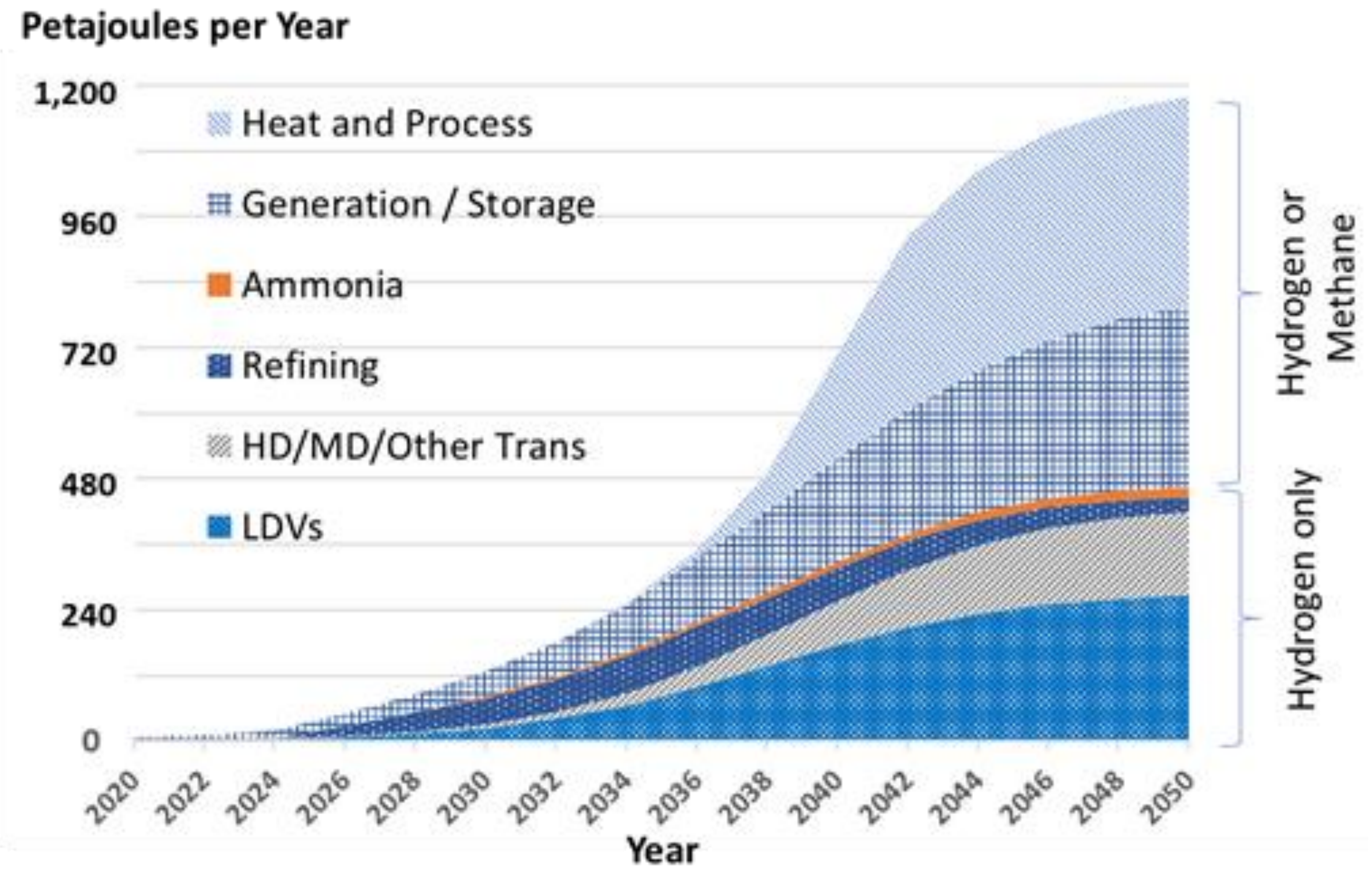
Source: UCI APEP.

Cost Evolution of Zero-Carbon Gaseous Fuel Pathways



Source: UCI APEP. Note: 1 GJ is approximately equivalent to 1 MMBtu

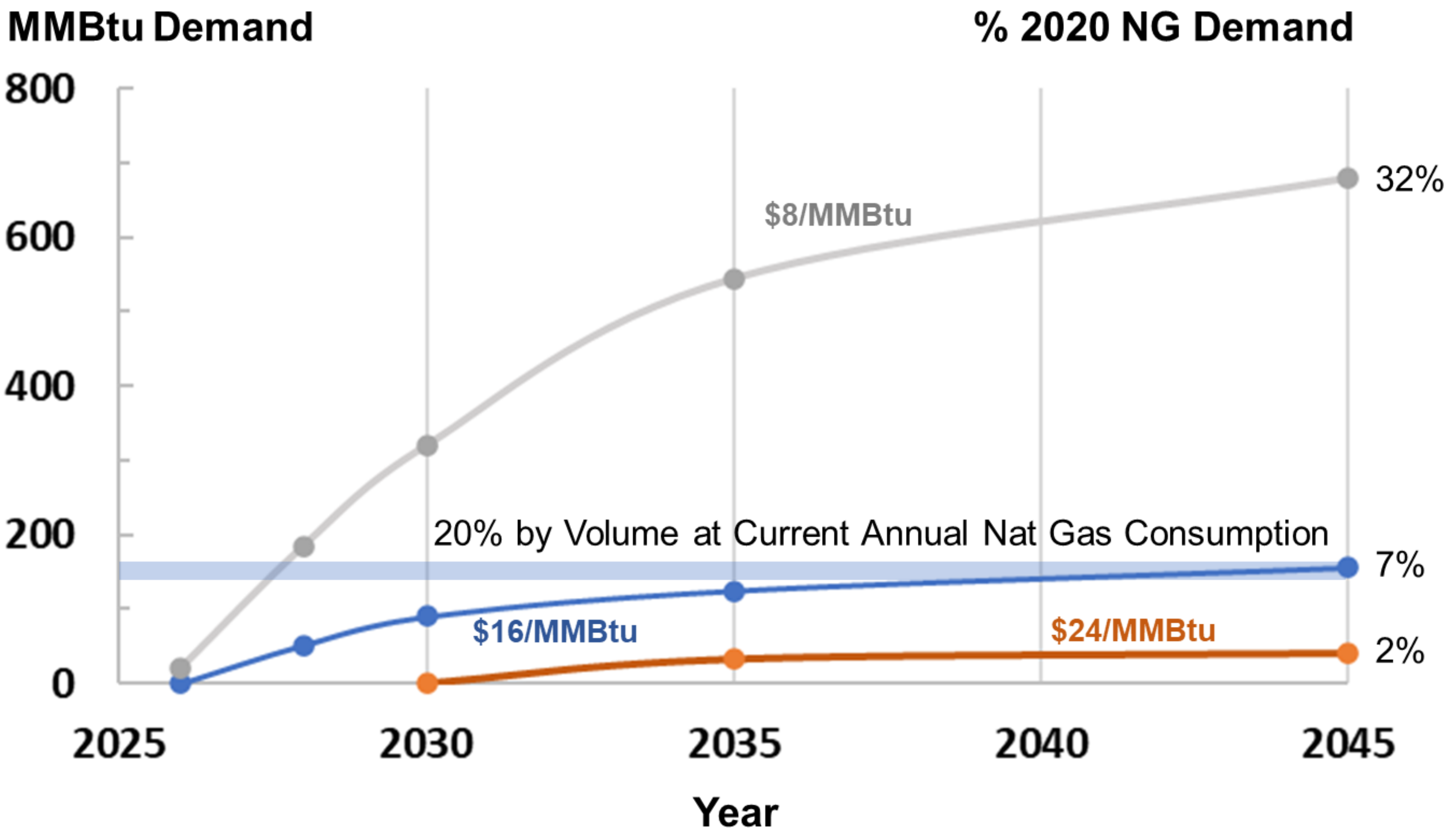
California High-case Demand ~ 25% of Final Energy



Source: UCI APEP.

Electrolytic Hydrogen as a Long-Duration Storage Resource

Demand for Renewable Fuel for Firming



Source: UCI APEP modeled with CA PUC RESOLVE resource planning model.

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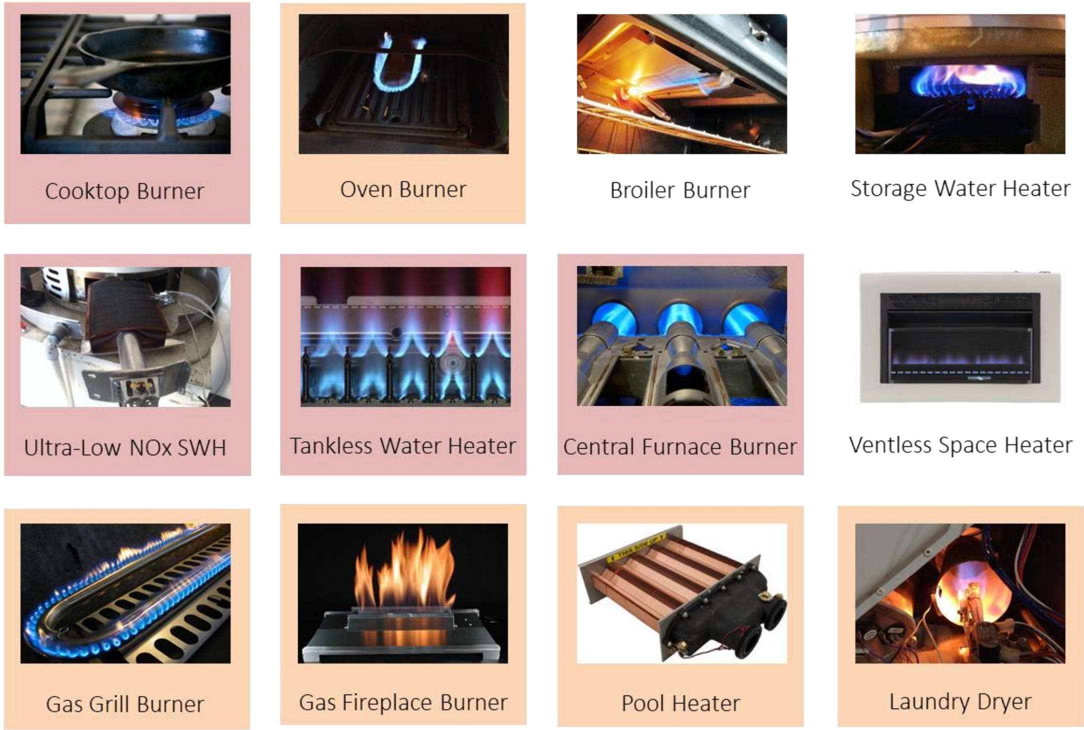
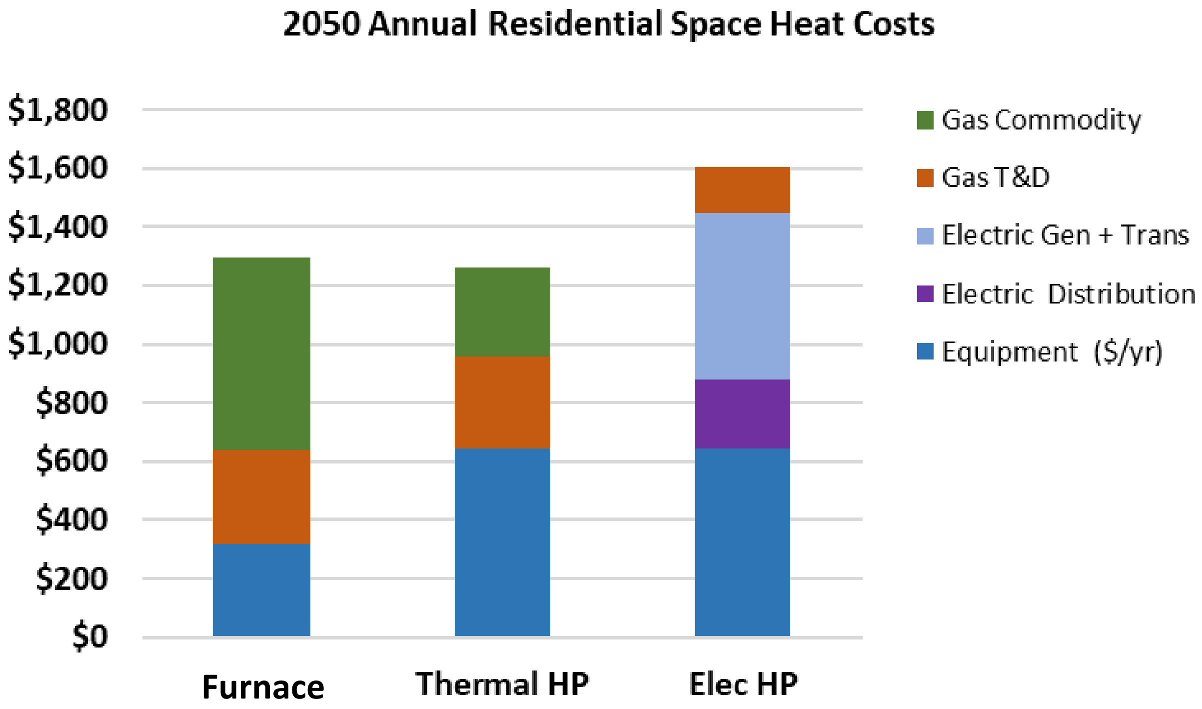
Renewable Fuels for Heat May be Least

In spite of the high efficiency of electric heat pumps, renewable fuels may be least cost depending on evolution of renewable gas costs and impact of T&D upgrades on electric rates





Source: UCI APEP

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Thank You

#RH2@APEP

RENEWABLE HYDROGEN

UCI ADVANCED POWER AND ENERGY PROGRAM

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Thanks for attending.

The next session begins at 1:45 pm.