

## 2024 Energy Law Conference

April 19, 2024

MCLE: 1.25 Hours

### Panel 3: The Architecture of ARCHES: Clean Hydrogen's Emergence in California

Moderator: Ethan Elkind

Speakers: Angela Galiteva, Commissioner Darcie Houck, Buck  
Endemann

#### **Conference Reference Materials**

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## The Architecture of ARCHES: Clean Hydrogen's Emergence in California

Buck Endemann, Partner, Perkins Coie

Angelina Galiteva, CEO, ARCHES

Darcie Houck, Commissioner, California Public Utilities Commission

Moderator: Ethan Elkind, Director, Climate Program, Center for Law, Energy & the Environment, UC Berkeley Law



# 2024 ENERGY LAW CONFERENCE

## NEW ERA OF HYDROGEN: OPPORTUNITIES & CHALLENGES

APRIL 19, 2024 | PRESENTED BY: BUCK ENDEMANN

# 2024 Energy Law Conference



## **BUCK ENDEMANN**

- Partner, Perkins Coie
- San Francisco
- 15 years practicing law
- Focused entirely on environmental regulatory and renewable energy work

## WHY ARE WE TALKING ABOUT HYDROGEN?



- Smallest atom by terms of mass (one proton; one electron)
- “Fuel of the Future” (see *also* “Fuel of the Past”)
- Puts the “hydro” in “hydrocarbons”
- **Key Drivers *now*:**
  - Infrastructure Investment and Jobs Act (Public Law 117-58) (2021)
  - Inflation Reduction Act (Public Law 117-169) (2022)
  - General public interest in reducing fossil fuel emissions
  - Cheap wind/solar

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## “Traditional” Hydrogen Incentives

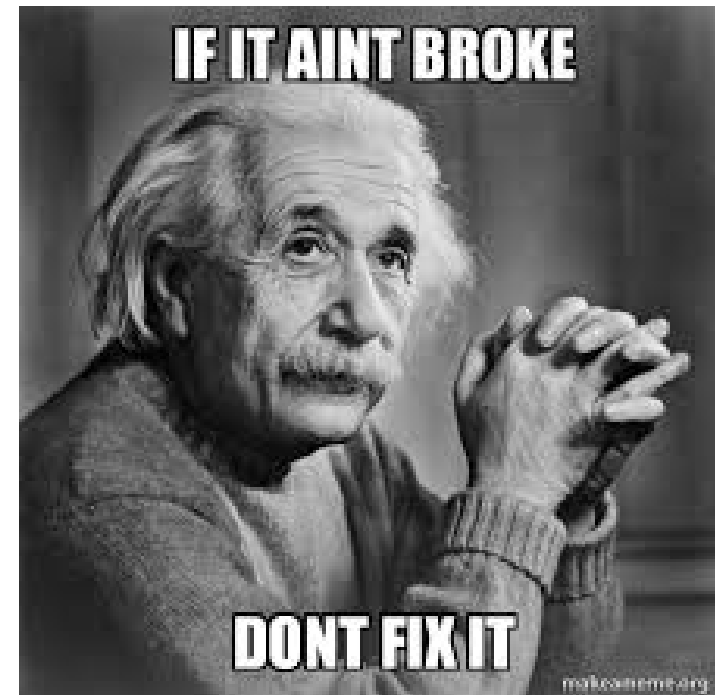


# Challenges

- **Transportation**



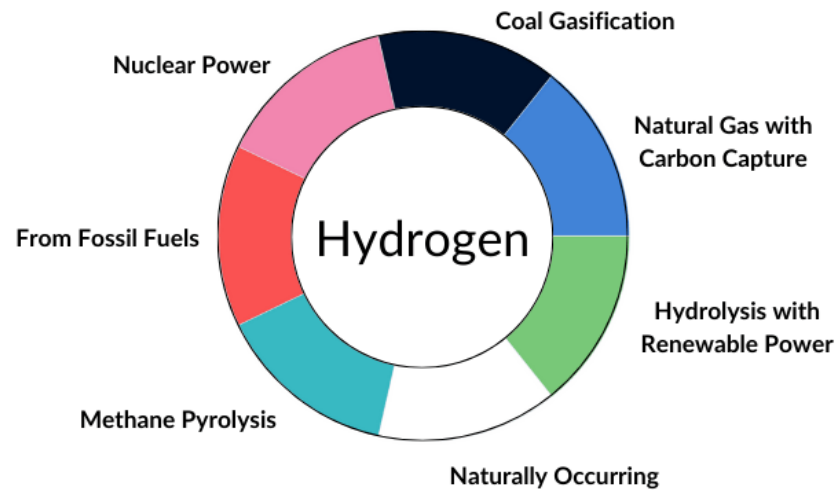
- **Demand**



# New Opportunities – Driven by Federal Dollars

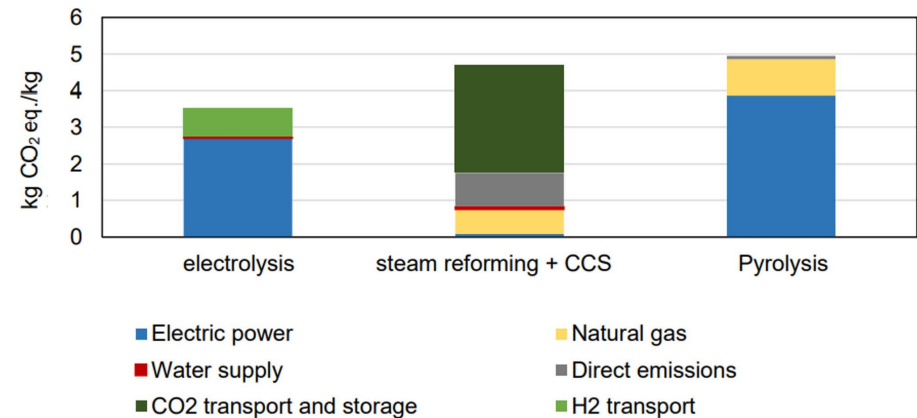
- **Jobs Act**

- \$8B for hydrogen hubs
- \$1B for Clean Hydrogen Electrolysis
- \$500M to support H<sub>2</sub> supply chains



- **Inflation Reduction Act**

- Sec. 45V Clean Hydrogen PTC (up to \$3/kg of H<sub>2</sub>)
- Direct Pay, Transfer



Comparison of the carbon footprint of the hydrogen production processes considered in 2020.



# Challenges Remain!

- Federal money moves slow
- Treasury Guidance: too late and too strict
- Water and other feedstocks
- “Chicken and Egg” problems!



# 2024 Energy Law Conference

## TAKEAWAYS

- Hydrogen provides promise as a low-carbon fuel and feedstock
- **Current drivers**
  - Corporate demand
  - Federal grants
  - Production Tax Credits
  - Cheap renewable electricity
- **Remaining Challenges**
  - “Purity Test”
  - Transportation/Storage
  - Demand/offtake – is it financeable?





# QUESTIONS?

- [BEndemann@Perkinscoie.com](mailto:BEndemann@Perkinscoie.com)
- (619) 894-5551
- Call, text, or email at anytime

# Alliance for Renewable Clean Hydrogen Energy Systems (ARCHES) – California H2Hub

March 2024

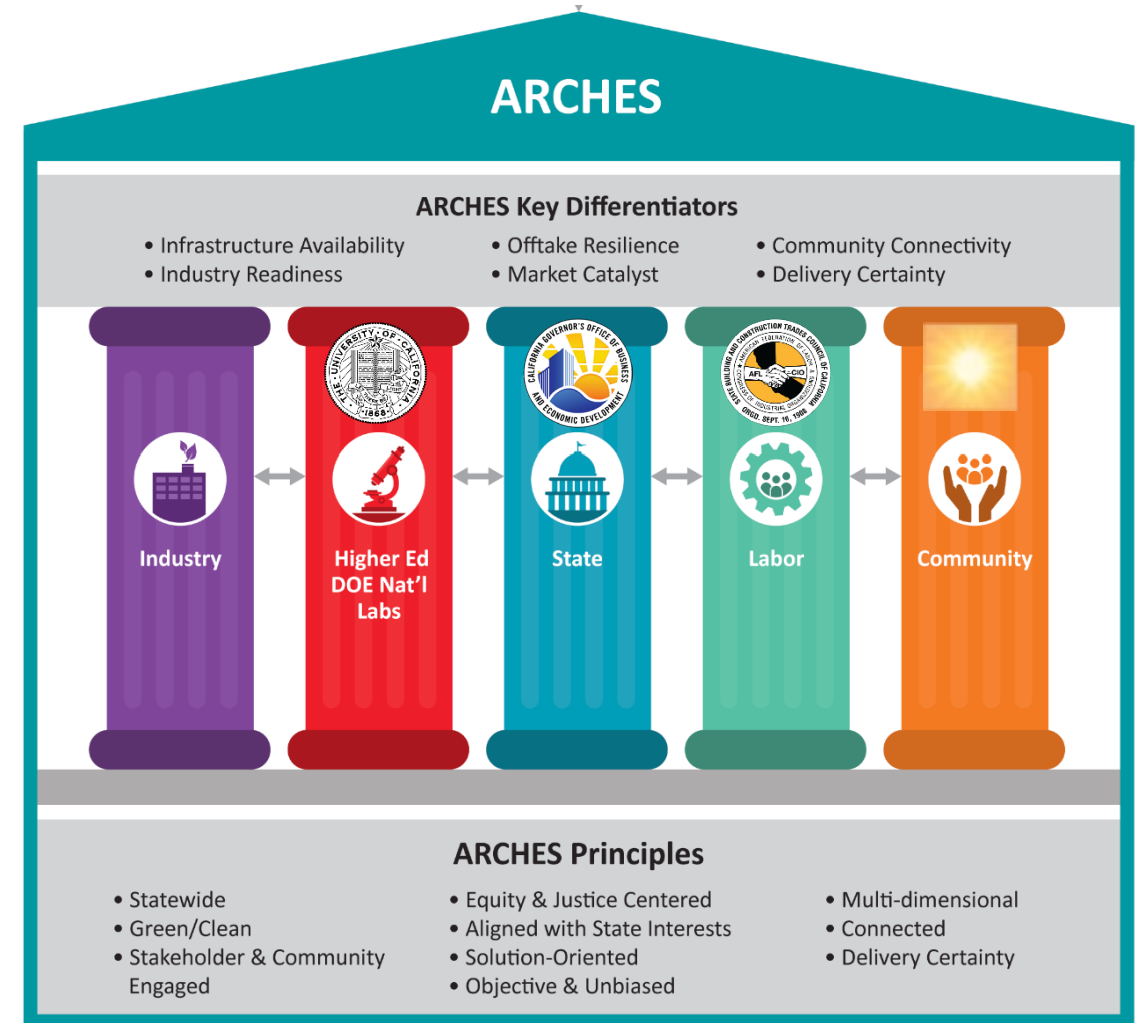




# ARCHES Mission

- ARCHES is a public-private partnership to create a sustainable statewide renewable, clean hydrogen (H2) market and ecosystem in California and beyond
- ARCHES utilizes renewable resources to produce hydrogen with the objective to fully decarbonize the regional economy
- ARCHES prioritizes
  - Environmental Justice
  - Equity
  - Economic Leadership
  - Workforce Development
  - Hydrogen Market Viability

U.S. Department of Energy





# Where ARCHES is in the Process

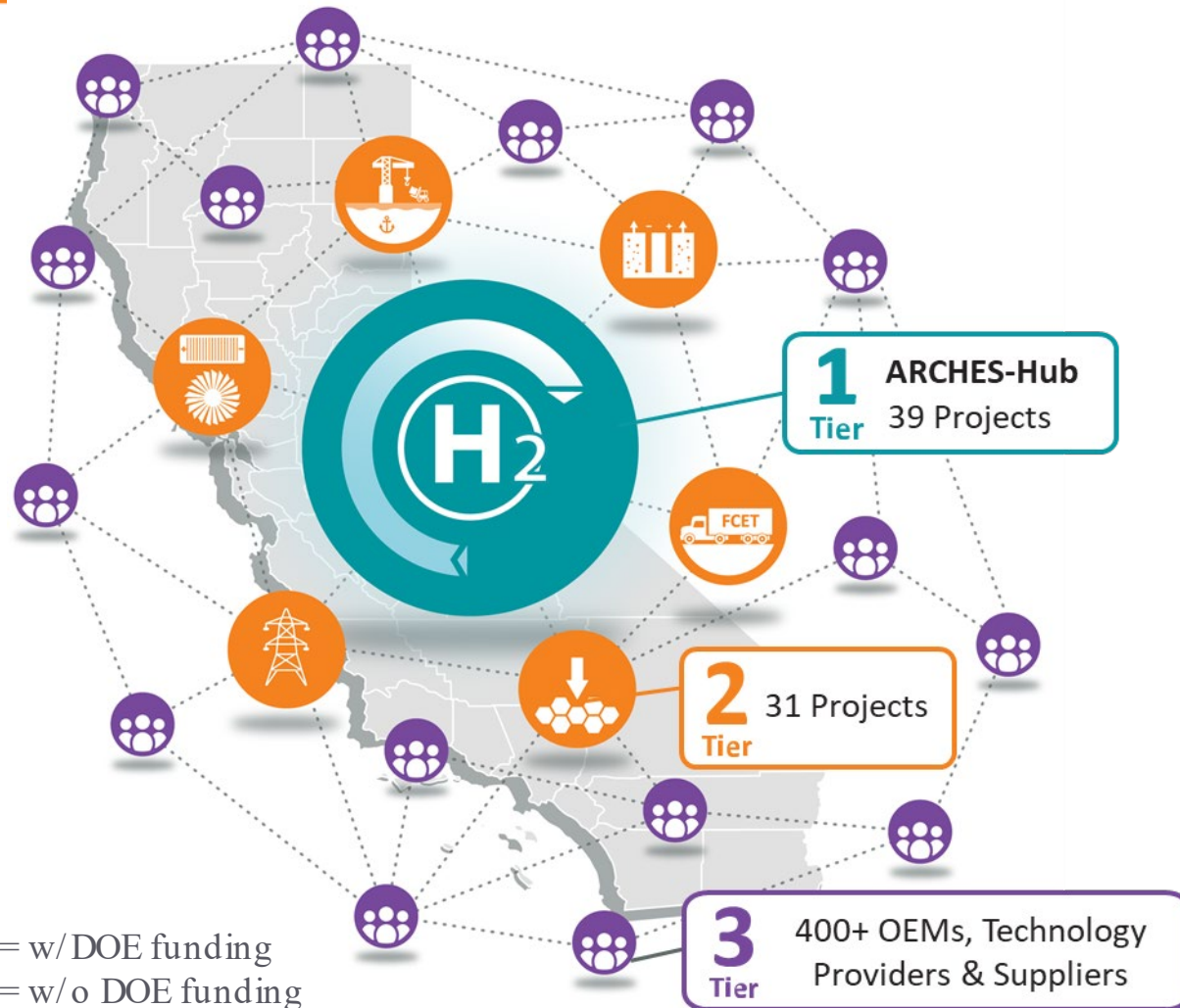


↑  
ARCHES  
is here

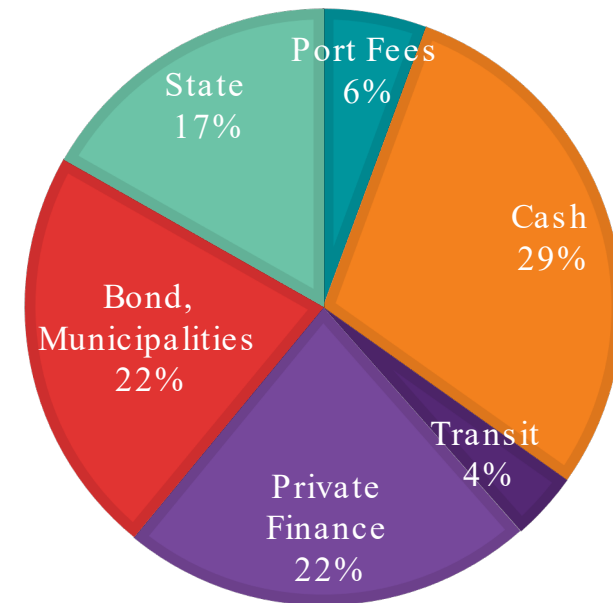
-  Negotiations Conducted
-  Go/No-Go Decisions



# ARCHES Projects: A Resilient Hydrogen Ecosystem for California

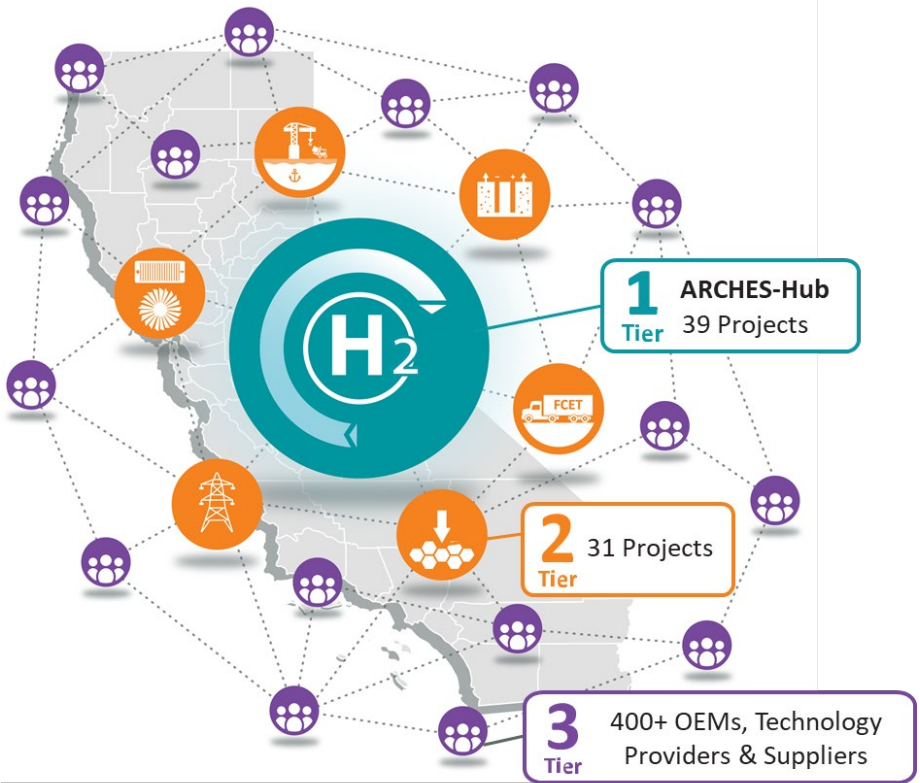


\$1.2B DOE funds unlocks \$11.7B in matching funds

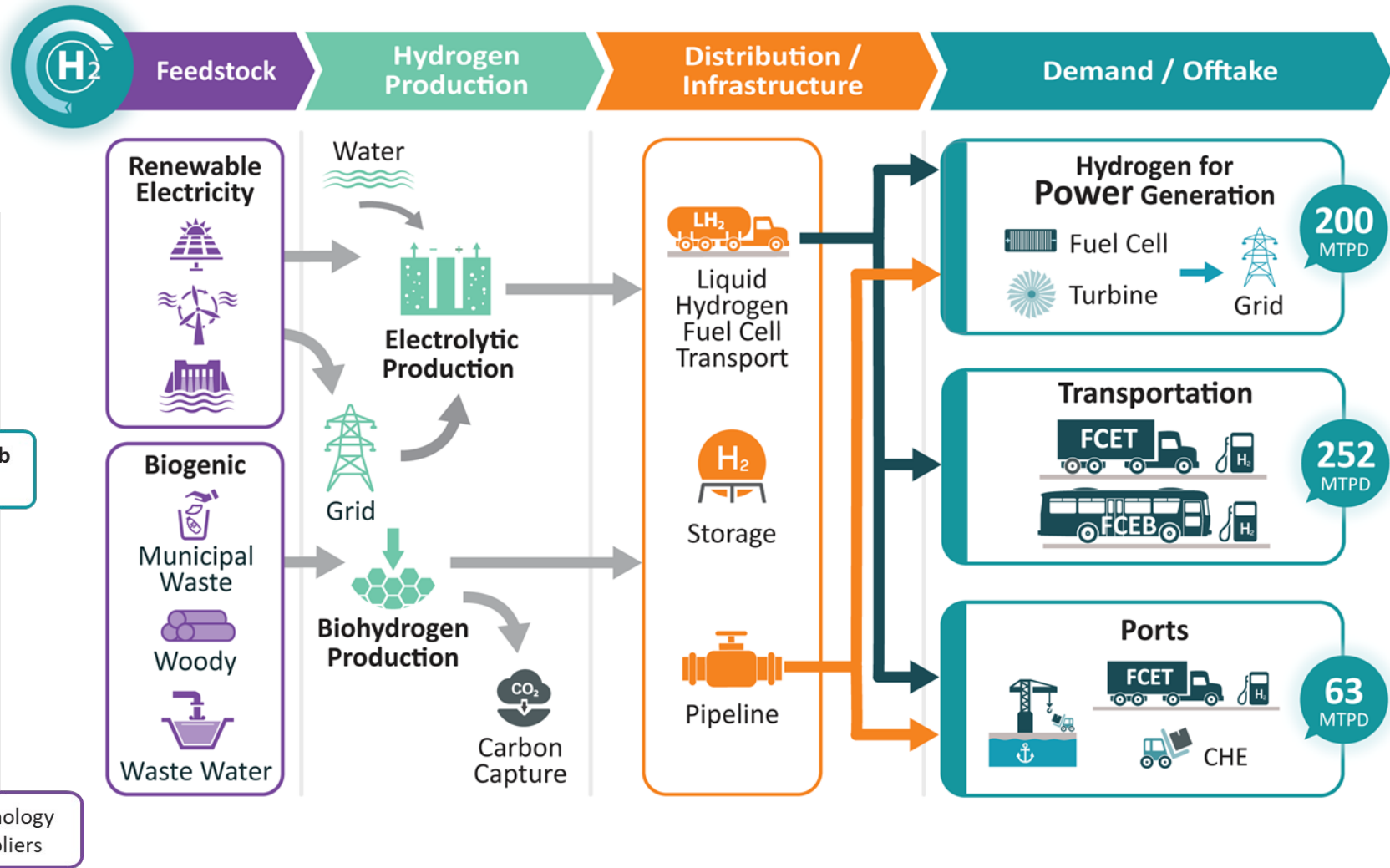




# ARCHES Projects



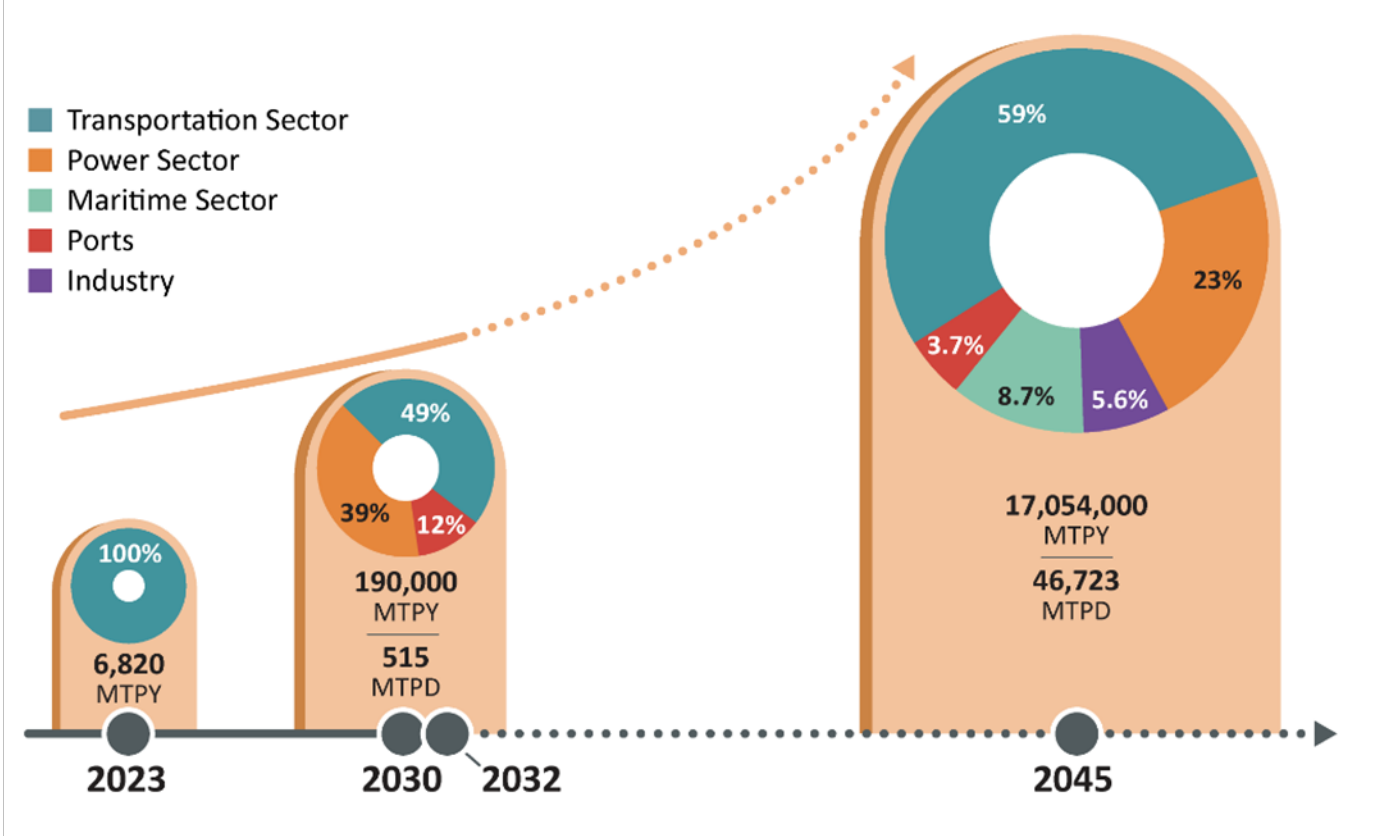
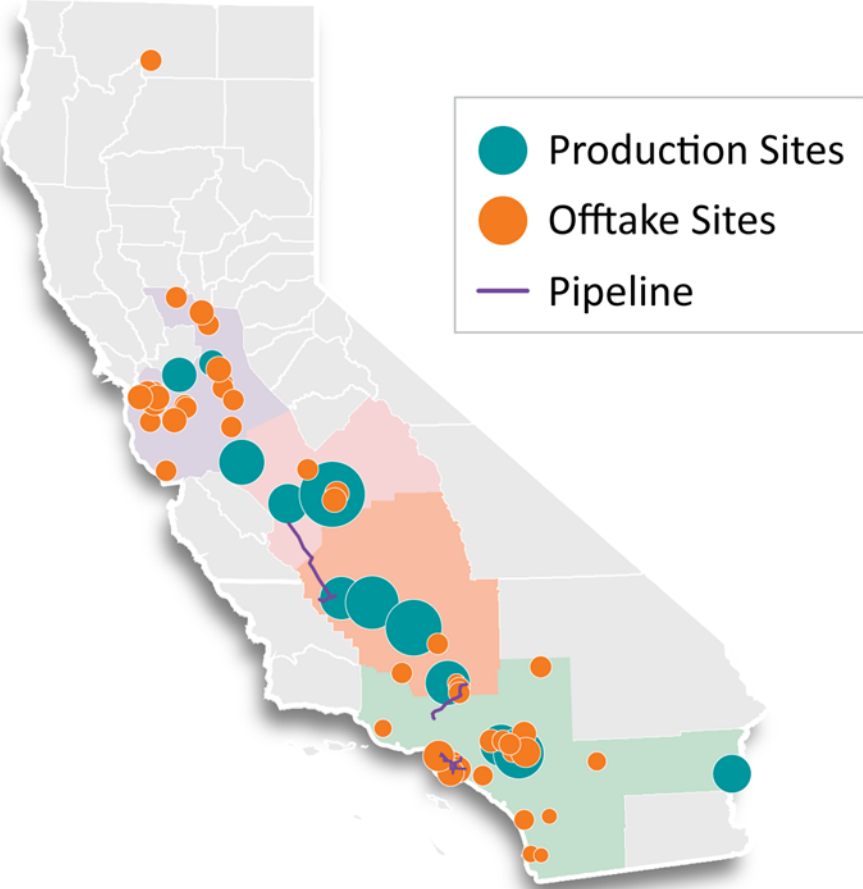
Tier 1 = w/DOE funding  
 Tier 2 = w/o DOE funding







# ARCHES Systems Approach Initiates Large Future Growth and Opportunities





# Our Community Partnership Commitment

**ARCHES is committed to partnering with communities in the development of our hydrogen energy ecosystem**

Our Community Benefits Pathway is something we will chart and travel together, toward a chosen destination:

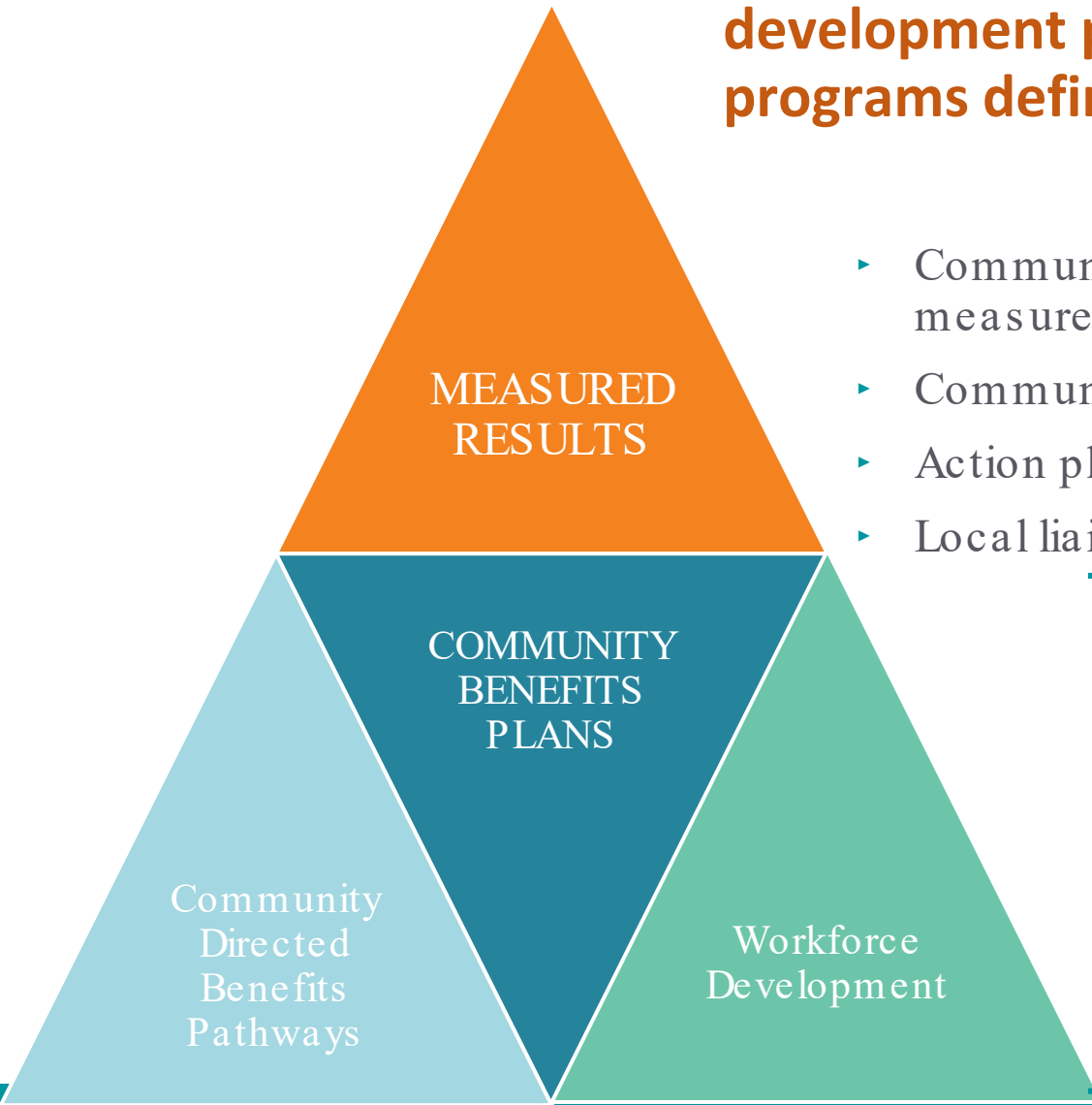
- Improved environmental health and quality of life
- Increased availability of high-quality, family-sustaining green careers
- A hydrogen market aligned with California community needs





# Realizing Benefits through Every Project

**In total, ARCHES will invest \$229 million in workforce development projects and an additional \$150 million in programs defined in partnership with individual communities**



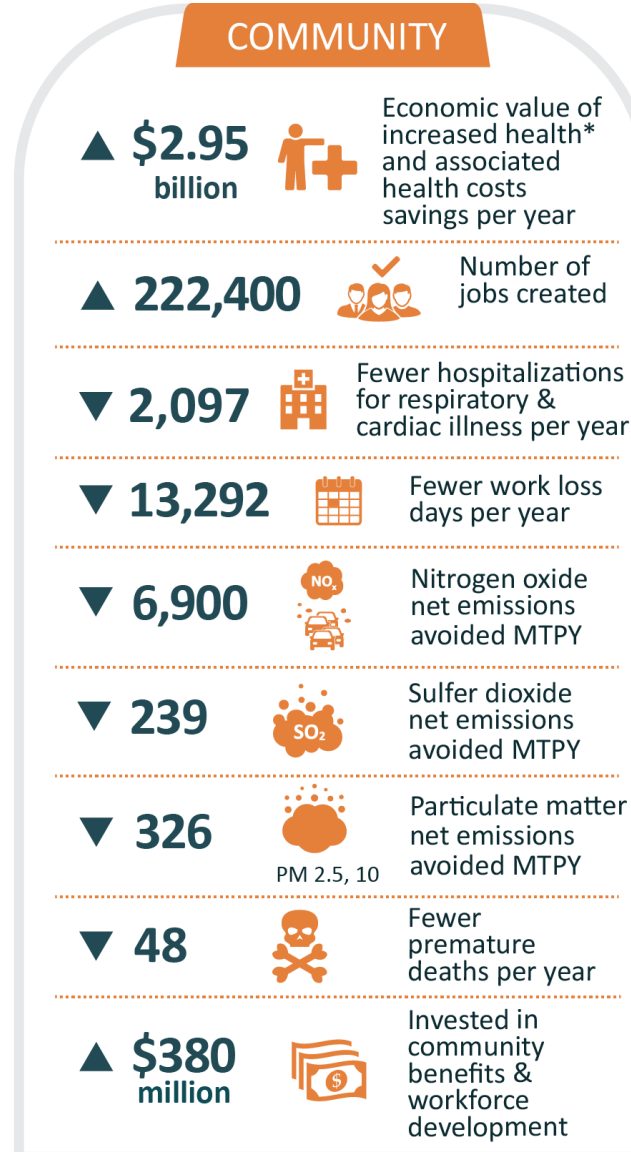
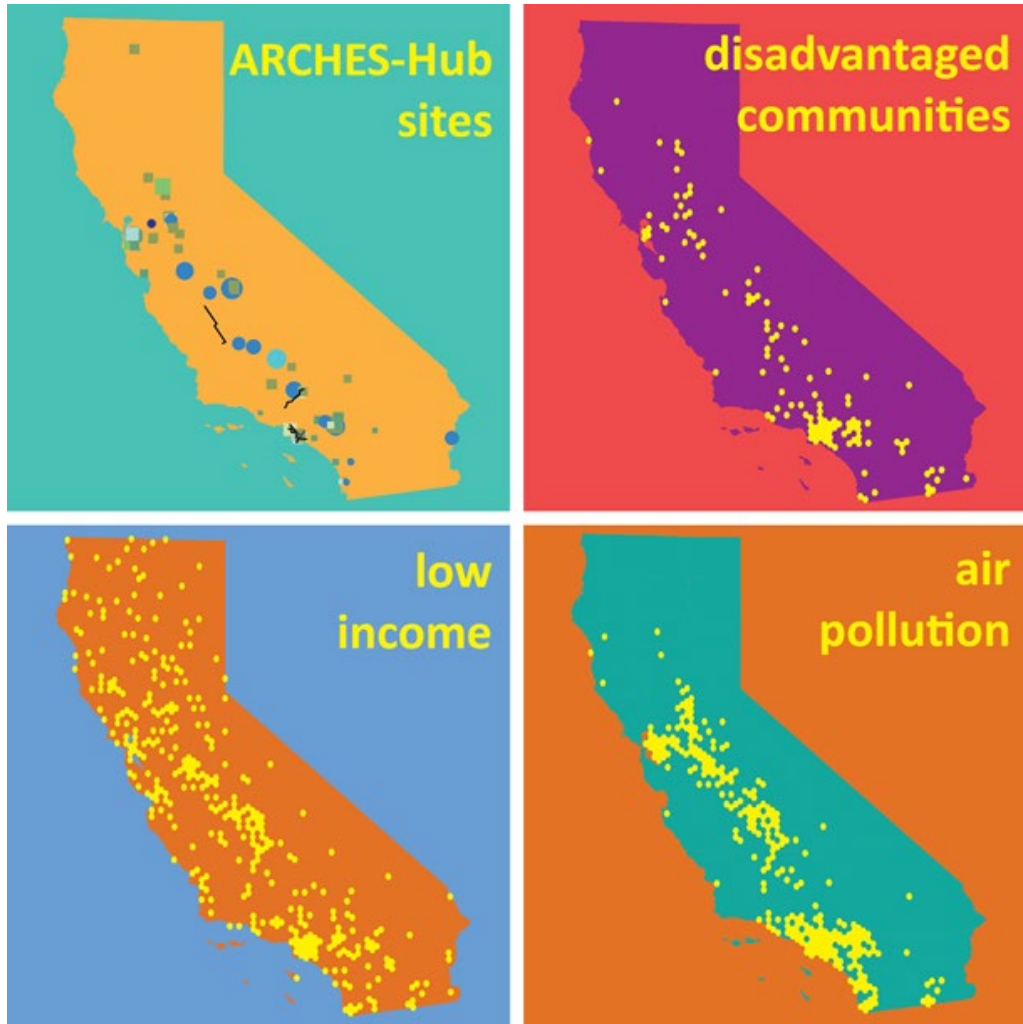
- ▶ Communities will help determine desired results and performance measures
- ▶ Community benefits scorecards will clearly report project results
- ▶ Action plans will be used for troubleshooting and keeping plans on track
- ▶ Local liaisons will hold regular community engagement meetings

**1%**  
of Project Budget

▶ Every ARCHES project is required to allocate 1% of its budget toward community benefits



# Community Benefits: Engagement

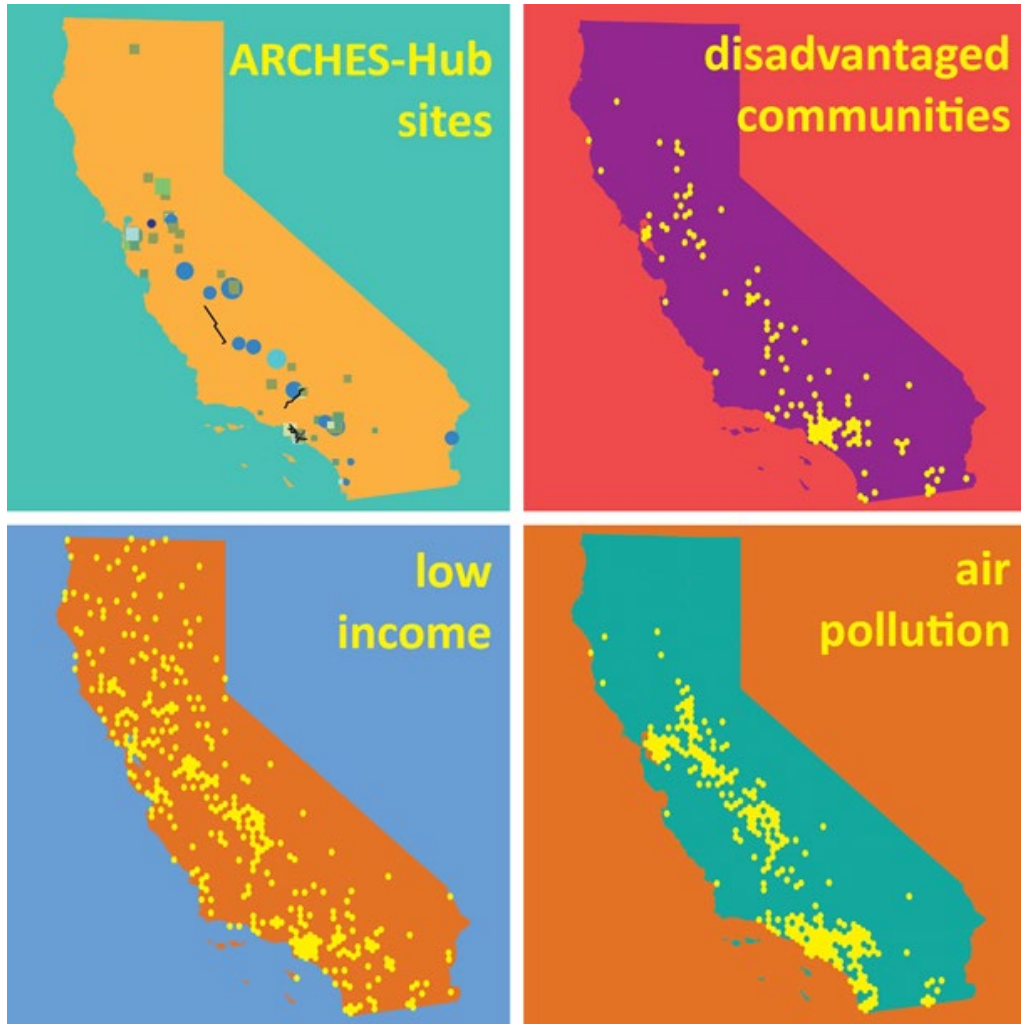


\*Reduced premature death, asthma, cancer risk, missed work days

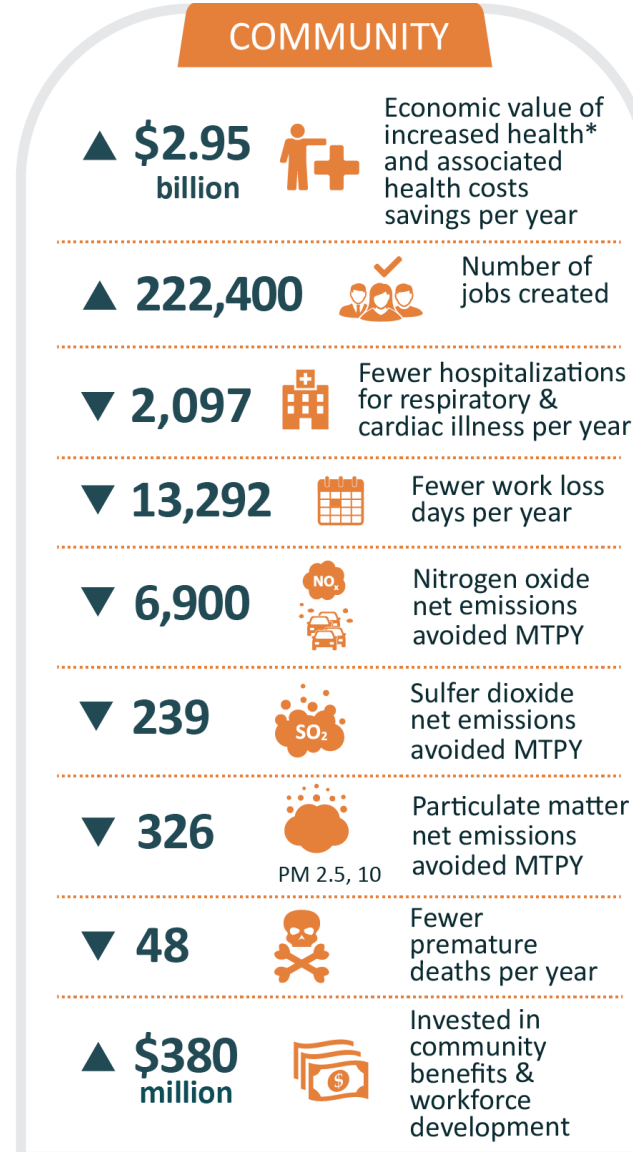
- Community benefits plan for every project: 1% of project budget
- Independent Community Benefits Monitoring Team reporting to the Board w/ accountability and enforcement mechanisms
- \$150M in direct community benefits
- Community benefits scorecard for assessing project success
- Tribal, Community, and Environmental/NGO representation on the board
- Weekly community engagement meetings



# Community Benefits: Workforce



\*EJ 40 database and CalEnviroScreen



\*Reduced premature death, asthma, cancer risk, missed work days

- Community benefits plan for every project: 1% of project budget
- Labor is a full partner in ARCHES and represented on the board
- \$229M for workforce development
- Project Labor Agreements required for every project
- Comprehensive workforce development plan with training at all levels: Higher Ed, Trades, High Schools
- Over 200,000 new clean, green family-supporting jobs created



# Alliance for Renewable Clean Hydrogen Energy Systems (ARCHES)

Thank you!  
Questions?

# Hydrogen Policy at the CPUC

Commissioner Darcie L. Houck  
California Public Utilities Commission  
April 19, 2024



California Public  
Utilities Commission

# CPUC Hydrogen Policy Overview

- Dedicated Pipeline – Angeles Link (A.22-02-007)
- Hydrogen Blending into Natural Gas Pipelines (R.13-02-008 and A.22-09-006)
- ARCHES



# Equity and Community Benefits

- Environmental and Social Justice Action Plan 2.0
  - Embed equity and access in policies
  - Invest in benefits for ESJ communities
  - High road jobs
  - Climate resiliency in ESJ communities
  - These are just a few examples of nine goals for CPUC proceedings
- Hydrogen Blending Decision (D.22-12-057) directs utilities to consider stakeholder feedback regarding impacts on disadvantaged communities, environment, safety, and cost-effectiveness

# Current Focus Areas

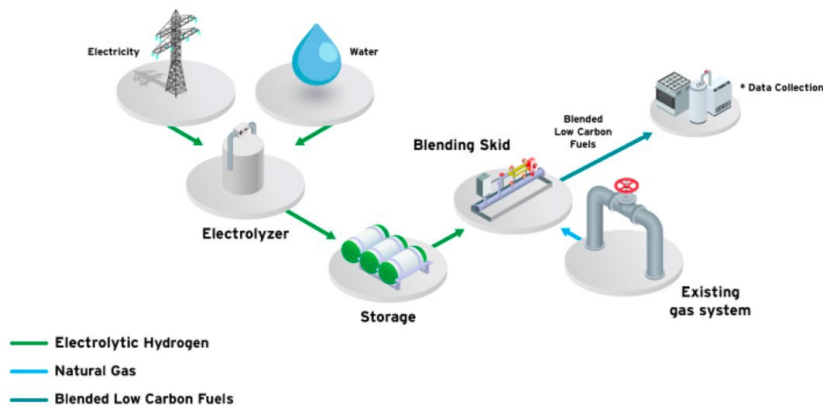
## Angeles Link Application

SoCalGas's proposal to develop a "green" hydrogen energy pipeline transportation system from unspecified production sources to serve hard-to-electrify industries and heavy-duty transportation in the Los Angeles Basin.



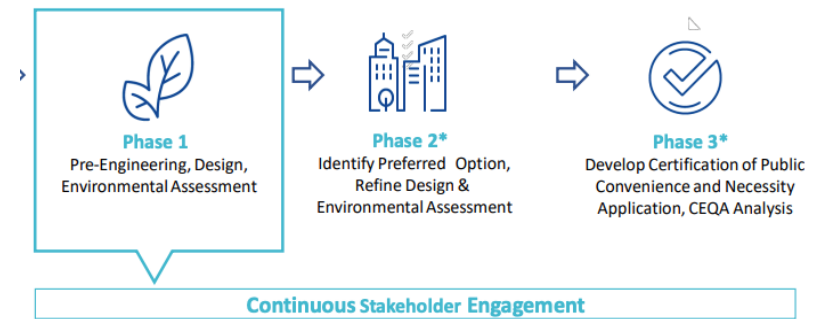
## Hydrogen Blending Application

A proposal from SoCalGas, SDG&E, PG&E, and Southwest Gas to pursue pilot projects to inject clean renewable hydrogen into the existing methane pipeline system in small amounts to better understand real-world safety (e.g., embrittlement, leakage, etc.) and operational impacts in order to inform what a system-wide safe hydrogen injection standard might look like.



# Angeles Link Application Summary

- Filed as [A.22-02-007](#) on February 17, 2022 by SoCalGas.
- SoCalGas sought approval to record costs necessary to perform three phases of work:
  - Phase 1 (\$26 million): 12-18 months to perform initial assessments.
  - Phase 2 (\$92 million): 18-24 months to conduct refined design, engineering, and environmental studies.
  - Phase 3 (“hundreds of millions of dollars”): 18-30 months for final refinements, permitting, and regulatory applications.
- [D.22-12-055](#) granted SoCalGas the authority to establish the Angeles Link Memorandum Account to record the costs of performing Phase 1 feasibility studies for the Angeles Link Project, up to a cap of \$26 million with an option for an increase of up to 15%.
- D.22-12-055 also directs SoCalGas to do the following:
  - Join California in its ARCHES application for federal funding and
  - Study the feasibility of a localized (in addition to system-wide) clean renewable hydrogen hub solution in the Los Angeles Basin.
- Recorded costs may or may not be approved for future cost recovery from ratepayers following the conclusion of Phase 1, and there is no guarantee that Angeles Link will ever be built.



# Current Status of Angeles Link

SoCalGas is working actively with Planning Advisory Group (PAG) members and Community-Based Organizations (CBOs) to explore possible pipeline routing, end-use customers, production sources, project costs, and other relevant issues.

## Key Considerations Moving Forward

**How should hydrogen transportation be regulated moving forward?** Policymakers have not yet determined whether hydrogen transportation should be regulated in a manner similar to natural gas. The existing hydrogen pipeline system is not currently regulated as a public utility service. How hydrogen is regulated will ultimately determine who will pay for its transportation in addition to how it is permitted and how system safety is ensured.

**What will the hydrogen market look like in the future?** The report ordered by SB 1075 (Skinner, 2022) will inform what role hydrogen will play in California's clean energy future. Other legislation and agency work will be needed to further refine future plans for the use of hydrogen.

**How should hydrogen be delivered and stored?** It is not yet certain to what extent hydrogen should be transported via pipeline (like natural gas) vs. trucked (like gasoline). Future end uses will determine how best to meet the needs of end-use customers who are hard to electrify while remaining cost-competitive in the long-term.

# Hydrogen Blending Application Activity

- Filed as [A.22-09-006](#) on September 8, 2022 by SoCalGas, PG&E, SDG&E, and Southwest Gas.
- A previous iteration of a similar Application was dismissed without prejudice by the CPUC in 2021 ([D.21-07-005](#)) pending further research.
- [D.22-12-057](#) ordered all four gas utilities to refine their approach to hydrogen blending and submit new or amended pilot programs within two years to test hydrogen blends ranging from 0.1% to 20%.
- Ordering Paragraph 7 of D.22-12-057 establishes 12 distinct criteria for future pilot programs relating to safety, cost, methodology, and stakeholder engagement.

# Hydrogen Blending: Impact Study

- The CPUC released a UC Riverside-led Hydrogen Blending Impacts Study on July 18, 2022 and solicited party comments on its findings. The project analyzed the viability of blending hydrogen with natural gas in California's existing natural gas infrastructure. The study assessed safety concerns associated with injecting hydrogen at various percentages.
- Based on the study's findings, D.22-12-057 directed SDG&E, SoCalGas, PG&E, and Southwest Gas to further study hydrogen blending to better understand real-world safety (e.g., leakage) and operational impacts before adopting a system-wide hydrogen injection standard.
- In response to D.22-12-057, California's large gas IOUs will revise their proposals in A.22-09-006 to reflect the new requirements specified by the CPUC. PG&E will be brought into the Application despite not being part of it previously.

# Hydrogen Blending: Study Conclusions

- The main recommendation of the study is to conduct real world demonstrations projects between 0.1 to 5% and 5 to 20% hydrogen blending to address safety and performance issues in California's pipelines.
- The study concludes that determining a single injection standard would have to consider the most susceptible conditions observed throughout all infrastructure. This systemwide blending injection scenario becomes concerning as hydrogen blending approaches 5% by volume.
- The body of literature reports that in relatively low hydrogen concentration (1 to 5% by volume) blending seems to be viable without significantly increasing risk factors in the storage, transmission, and utilization of hydrogen blends.
- The study highlights the potential for pipeline embrittlement and gas leakage at increasing volumes of hydrogen injected.

# Hydrogen Blending: Proposed Projects

The following proposed projects are subject to change, but reflect what California's four large utilities are currently interested in piloting to better understand blending's impacts.

Project Title	Live Blending Description	H2 Blends Considered	Pipeline Detail	End Use Equipment Detail	Location & Climate Detail	Project Costs
<b>SoCalGas – UCI H2 Blending Pilot</b>	Isolated portion of distribution system.	Up to 20% by volume	Medium Pressure Distribution Pipeline (Steel and Plastic)	Commercial and Residential	Irvine, CA; Moderate coastal conditions	\$14.82 MM
<b>SoCalGas – Open System Blending</b>	“Open” portion of distribution system	Up to 5% by volume	TBD	Commercial and Residential	TBD	TBD
<b>SDG&amp;E – UCSD H2 Blending Pilot</b>	Isolated portion of distribution system	Up to 20% by volume	Medium Pressure Distribution Pipeline (Polyethylene Pipe)	Fuel cell	La Jolla, CA; Moderate coastal conditions	\$13.9 MM
<b>Southwest Gas H2 Blending Pilot</b>	Isolated portion of distribution system	Up to 20% by volume	Medium Pressure Distribution Pipeline (Polyethylene Pipe)	Commercial	Truckee, CA; Extremely cold weather conditions, high elevation	\$10.21 MM
<b>PG&amp;E</b>	Isolated, standalone, and new transmission system	Up to 30% by volume	High pressure (steel)	Power Plant and Fueling Station	City of Lodi, CA; Mediterranean climate	\$90-330 M



# Current Status of Hydrogen Blending Applications

The four gas utilities are currently retooling their pilot programs and will present their revised pilots for CPUC consideration as part of A.22-09-006 in Q4 of 2023. PG&E will be brought into A.22-09-006 despite not being part of the initial filing.

## Key Considerations Moving Forward

**Is injection of hydrogen into the methane system a good environmental solution?** The CPUC, research institutions, the gas utilities, and other stakeholders will need to assess the extent to which clean renewable hydrogen can help California decarbonize. Special attention will need to be given to whether – and to what extent – hydrogen should be procured vis-à-vis biomethane, as well as how to ensure that such procurement doesn't undermine building electrification efforts.

**Is the risk worth the reward?** Additional testing is necessary to determine whether embrittlement risks and leakage concerns are small enough to merit procurement and injection of hydrogen without posing any undue risk to the public.

**How do test scenarios translate to broader system impact?** It remains to be seen to what extent testing on small closed-loop segments of the gas distribution system translates into broader system-wide injection and usage implications.

# Eligible Hydrogen

Both the Angeles Link project (if built) and the Hydrogen Blending pilots (if approved) are required to transport only “clean renewable hydrogen.”

The CPUC defines “clean renewable hydrogen” as follows:

- “Hydrogen which is produced through a process that results in a lifecycle (i.e., well-to-gate) greenhouse gas emissions rate of not greater than 4 kilograms of CO<sub>2</sub>e per kilogram of hydrogen produced and does not use fossil fuel as either a feedstock or production energy source.”
- The term “fossil fuel” is consistent with the definition found in Pub. Util. Code Section 2806. The prohibition on the use of fossil fuel does not apply to an eligible renewable energy resource that uses a de minimis quantity of fossil fuel, as allowed under Pub. Util. Code Section 399.12 (h)(3).

Future refinement of this eligibility standard will be considered following the issuance of the SB 1075 report.

# ARCHES-CPUC Cooperation

- Hydrogen economy
- Hydrogen planning with respect to blending, pipelines, and infrastructure research
- Renewable energy curtailments for hydrogen production

Discussion/ Questions





# California Public Utilities Commission