Office of Clean Energy Demonstrations

THE OFFICE OF

CLEAN ENERGY DEMONSTRATIONS

Regional Clean Hydrogen Hubs
Mid-Atlantic Regional H2Hub Public Event

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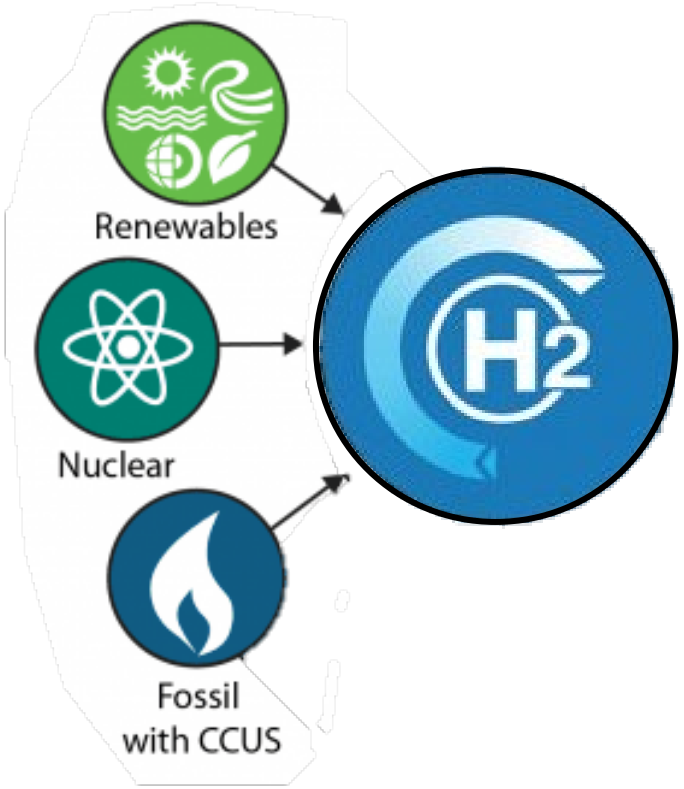
H2Hubs Overview

What is Hydrogen?

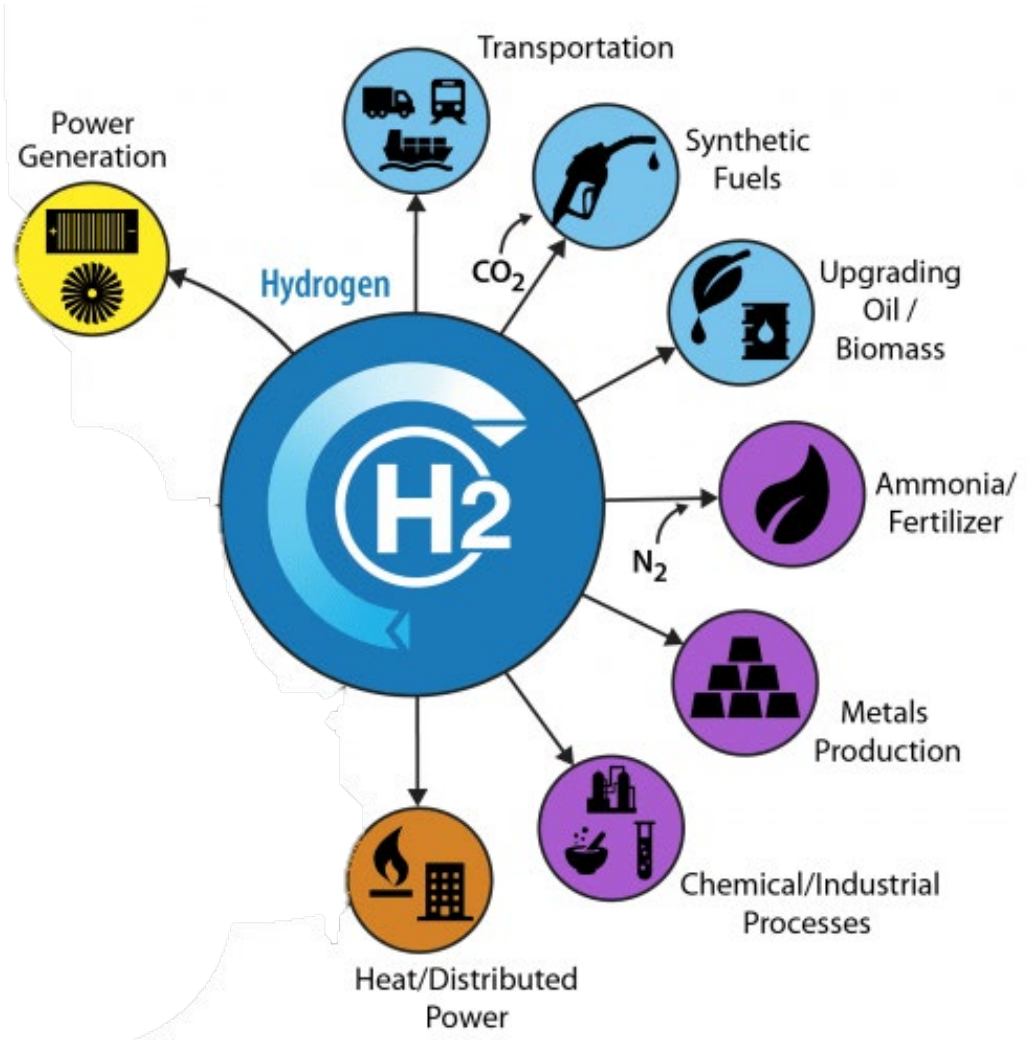
- **Hydrogen (H_2)** is the simplest and most abundant element known.
  - You might recognize it from the chemical formula for water – **H_2O**!



- **Hydrogen can be made using a variety of domestic energy resources.**
- Hydrogen can be produced through several processes, including:
  - Electrolysis; Direct Solar Water Splitting
  - Steam Methane Reforming
  - Biological (e.g., algae)
- **Currently, the U.S. produces 10 million metric tons of hydrogen each year.**

What Can Hydrogen Do?

- Hydrogen is **part of a suite** of solutions that can help our nation achieve its net-zero goals.
- Helps hard-to-decarbonize sectors such as **heavy-duty transportation**, **steel and chemicals** manufacturing, and production of **liquid fuels**.
- Supports **increased integration of renewable energy** into the grid and offers multiple revenue streams for clean power generation.



Whole of Government Approach to Clean Hydrogen

U.S. National Clean Hydrogen Strategy and Roadmap

Clean Hydrogen Standard

IRA tax incentives

Hydrogen Interagency Task Force (HIT)
a collaboration among 11+ U.S. federal agencies to further advance a whole-of-government approach to executing the national clean hydrogen strategy

Hydrogen Shot
($1/kg by 2031)

H2Hubs Demand-Side Support Initiative

Clean Hydrogen Pathways to Commercial Lift-Off Report

Additional DOE funding:
Clean H2 Electrolysis
Clean H2 Manufacturing and Recycling
(additional $1.5B)

Regional Clean Hydrogen Hubs

Build regional clean H2Hubs across the country to create networks of clean hydrogen producers, consumers, and local connective infrastructure to accelerate use of clean hydrogen.

H2Hubs Demand-Side Support Initiative

- Sept 2023: Announced RFP. Responses were due on November 2, 2023.
- Jan 2024: H2DI was selected as the independent entity.
- Learn more about the initiative here: https://www.youtube.com/watch?v=QgOL_Xg7K1Q

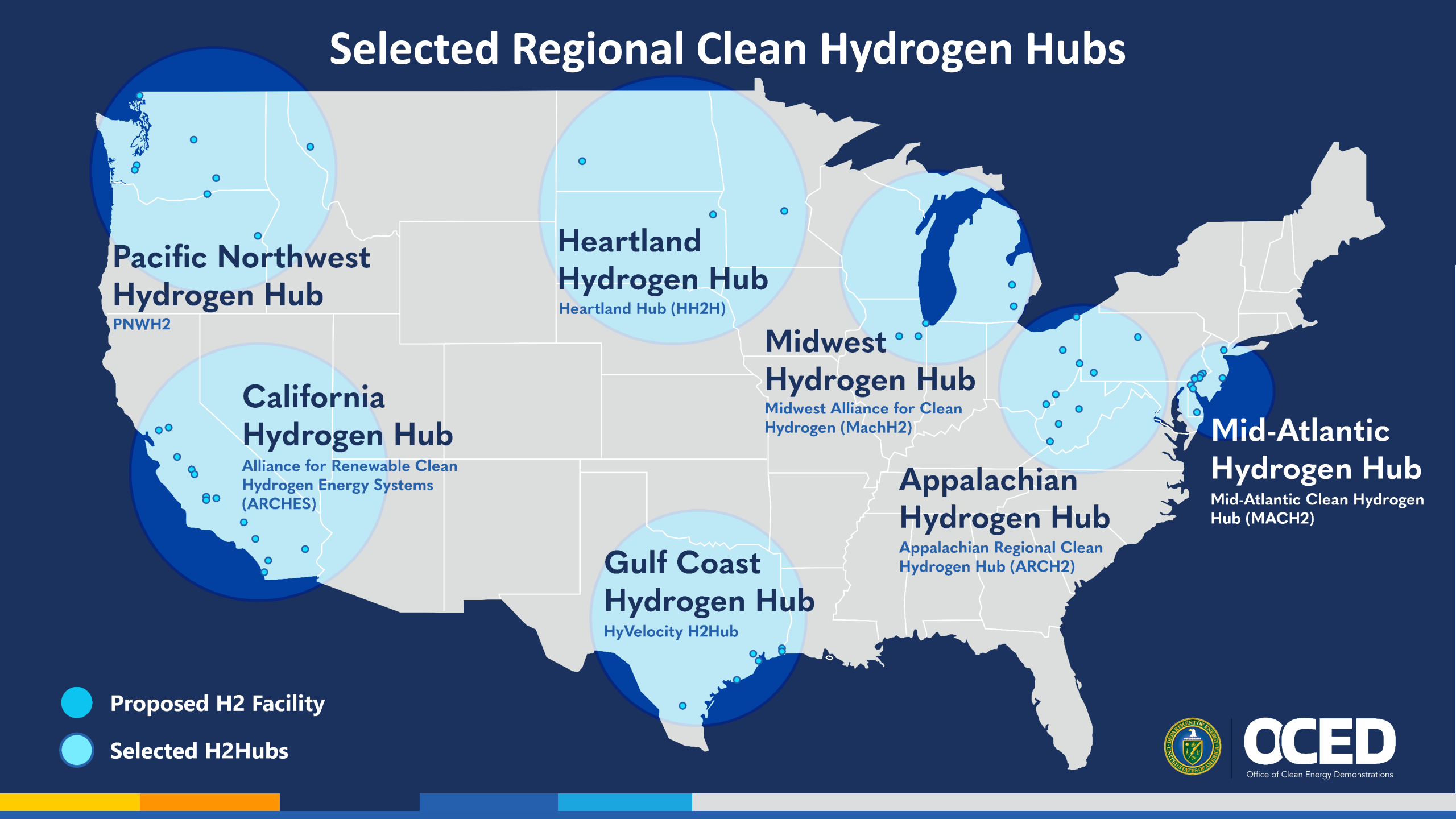
H2Hubs Current Status

- **October 2023: DOE announced 7 projects selected for award negotiations.**

What is a Regional Clean Hydrogen Hub?

OCED
Office of Clean Energy Demonstrations

Selected Regional Clean Hydrogen Hubs



OCED
Office of Clean Energy Demonstrations

Selected H2Hubs Overview

Unprecedented Investment in America's Hydrogen Infrastructure

Federal investment of $7 billion

To accelerate adoption of hydrogen technologies

Approximately 3 Million Metric Tons of Hydrogen Production per Year

Providing tangible benefits for Americans

Dedicated Dollars for Community Benefits

Tens of Thousands of Jobs

Greenhouse Gas Reduction of 25 million Metric Tons Per Year

Community Benefits

Prioritizing Community Benefits in OCED Projects

OCED **requires** applicants to include a Community Benefits Plan to help ensure broadly shared prosperity in the clean energy transition.

By **prioritizing community benefits**, we can ensure the next chapter in America's energy story is marked by greater justice, equity, security, and resilience.

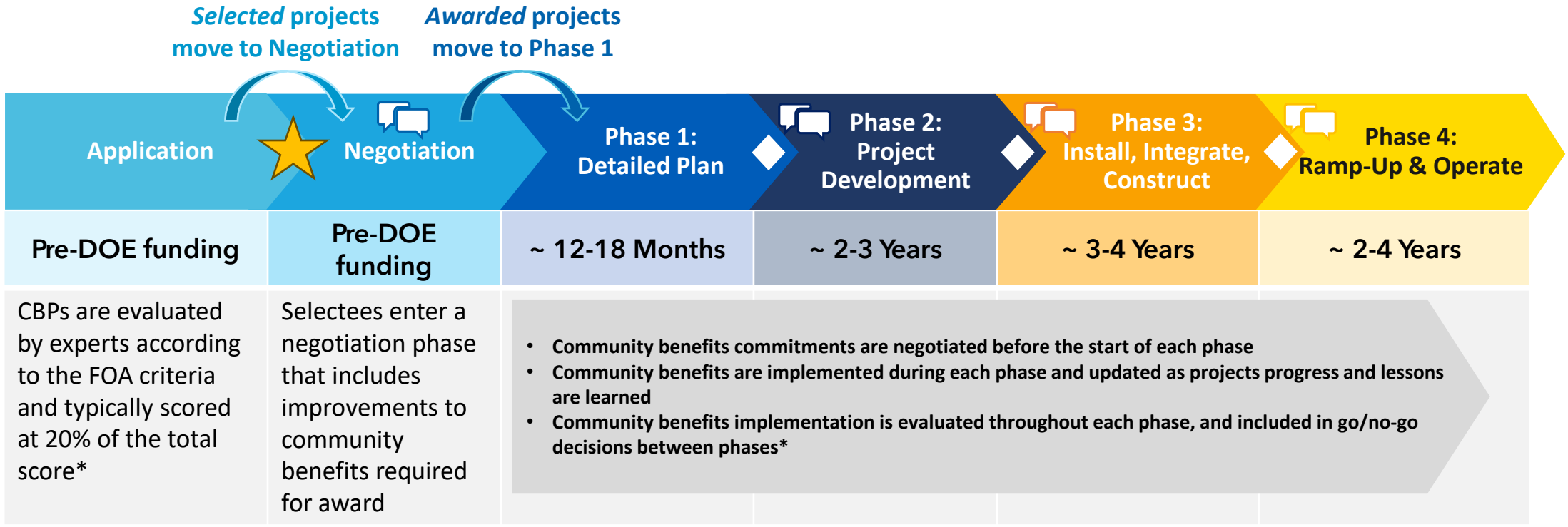
Community & Labor Engagement

Diversity, Equity, Inclusion, & Accessibility

Investing in the American Workforce

Justice40 Initiative

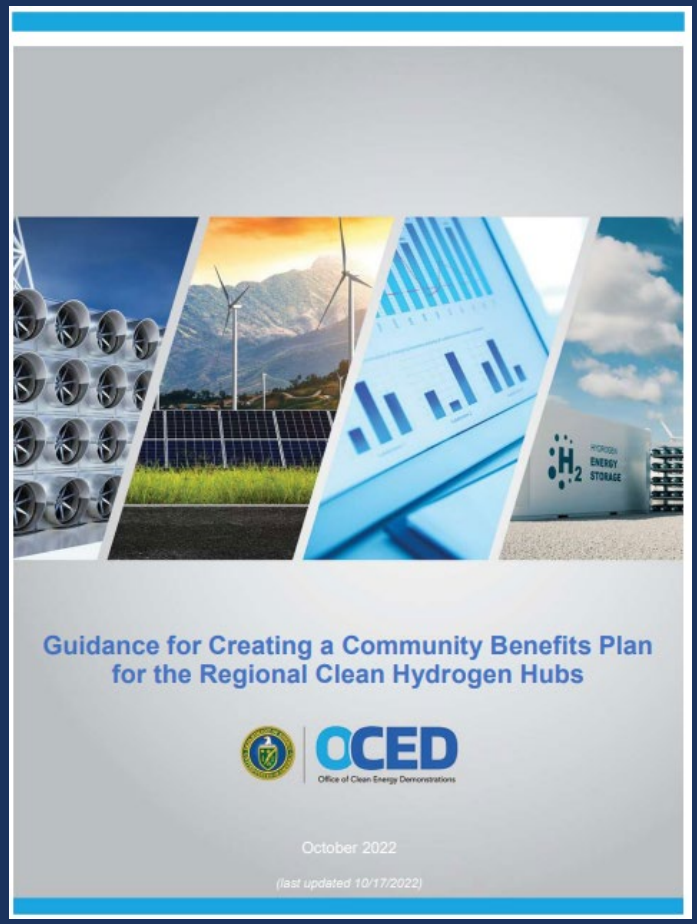
Community Benefit Commitments - Implementation Requirements per Phase



**CBPs are considered alongside assessments of engineering, procurement, and construction; business development and management; permitting and safety; and technical data and analysis.*

Strong Community Benefits Commitments

- Demonstrate moving beyond a vision or assessment into **actionable goals, outcomes, and implementation steps** supported by adequate money, people, and time resources
- Include mechanisms for **accountability to and transparency with** impacted communities
- Propose clear **metrics** to measure success
- Match proposed actions to the **needs and priorities** of impacted communities
- **Robustly address** all four topic areas
- **Minimize and mitigate negative impacts** and harm, especially to already overburdened communities
- **Create quality jobs**, equitable access, and invest in workforce development
- **Evolve** to incorporate community and worker feedback
- **Build** toward lasting and enforceable Community and Labor Agreements



OCED FOA CBP Guidance docs available with each FOA at: https://oced-exchange.energy.gov/

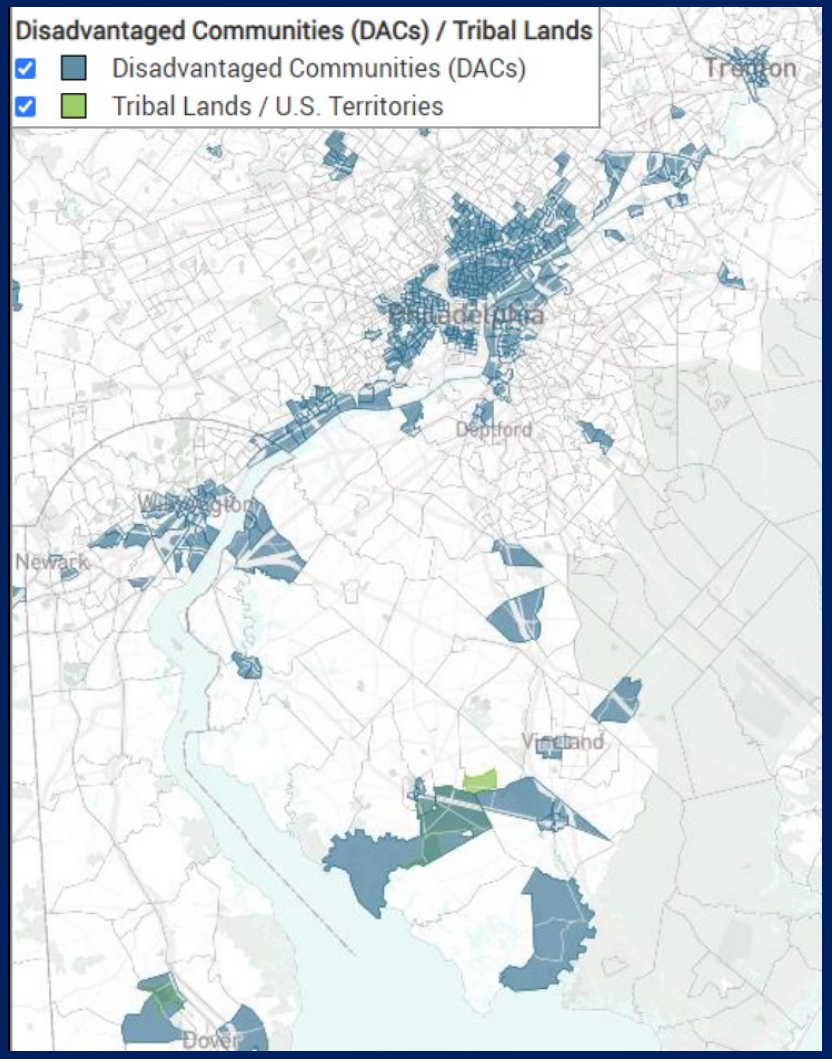
Mid-Atlantic Regional Clean Hydrogen Hub

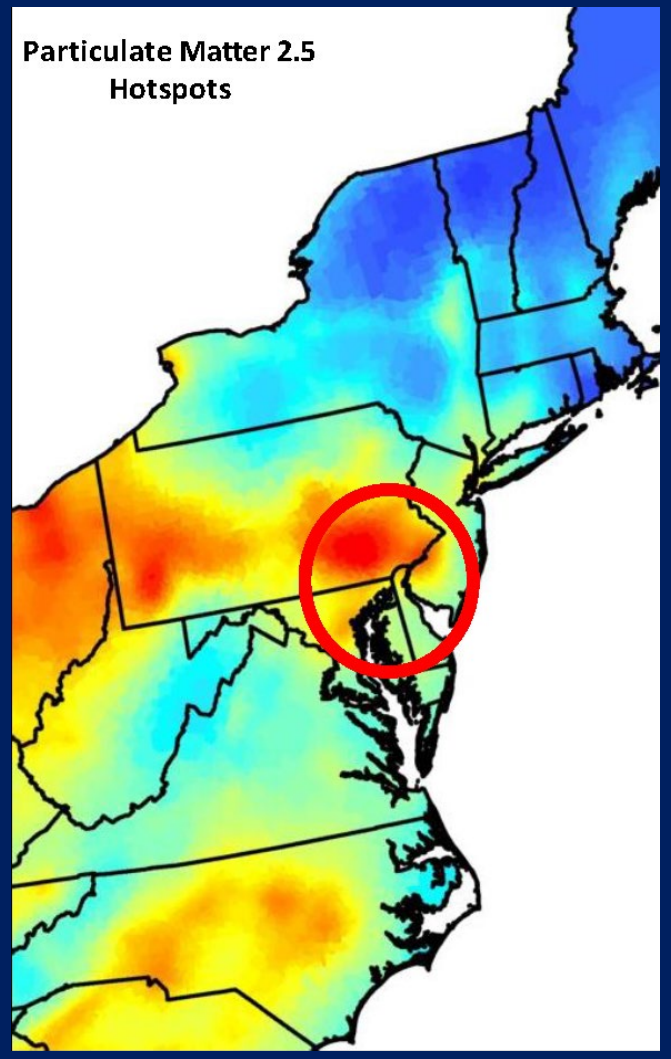
WHY GREEN AND PINK HYDROGEN FOR THE MID-ATLANTIC

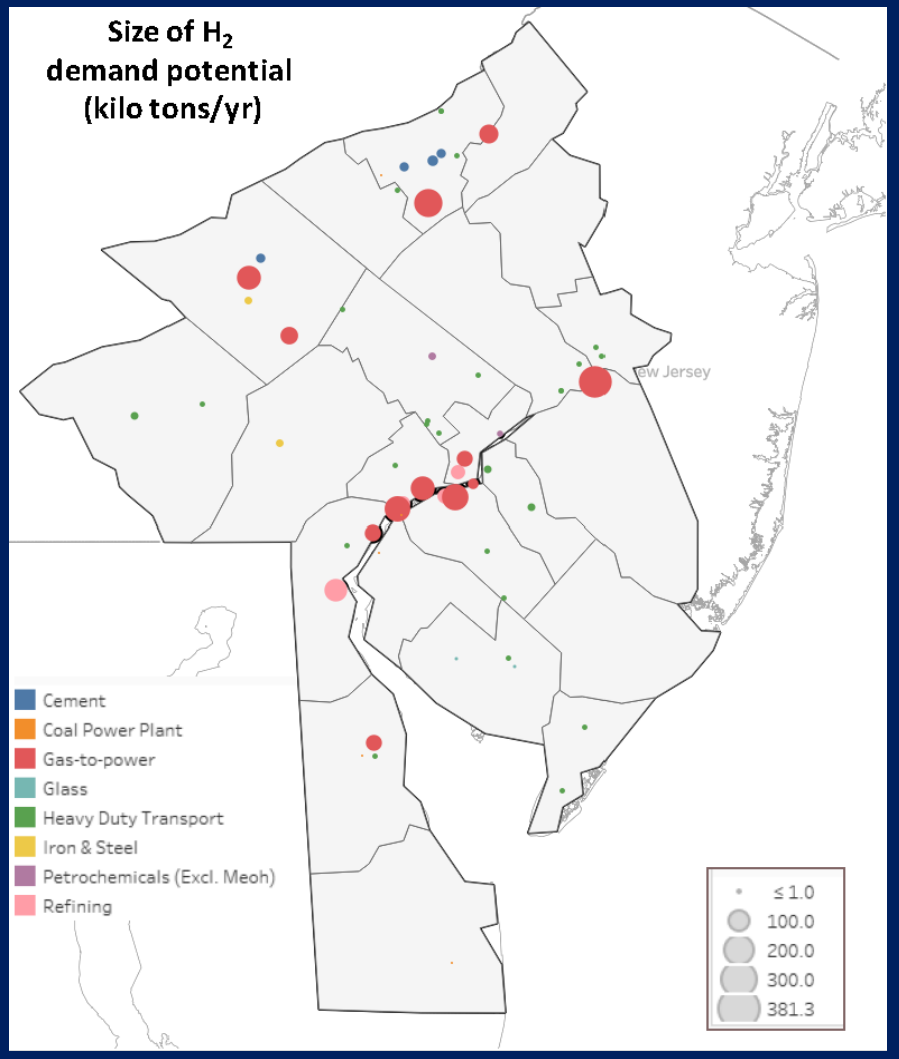
- Only use energy solutions that reduce both GHG & criteria pollutants
- Seize opportunities to create good, union jobs in clean energy economy
- Reduce emissions in sectors that have high levels of pollution and are difficult to decarbonize/electrify :
  - Industrial Facilities (23% of GHG): chemical manufacturing, steel, cement, logistics facilities
  - Transportation (28% of GHG) : Heavy-duty trucking, transit buses, ports, marine vessels, aviation
- Focus renewable energy electrification in sectors that make most sense: residential, light-duty vehicles, commercial buildings, etc.

JUSTICE 40 | SIGNIFICANTLY REDUCING AIR POLLUTION

Large emitters in hub are sources of H2 demand







Source: EIA AEO, EPA 2019 Emission Inventory, DOE AFDC

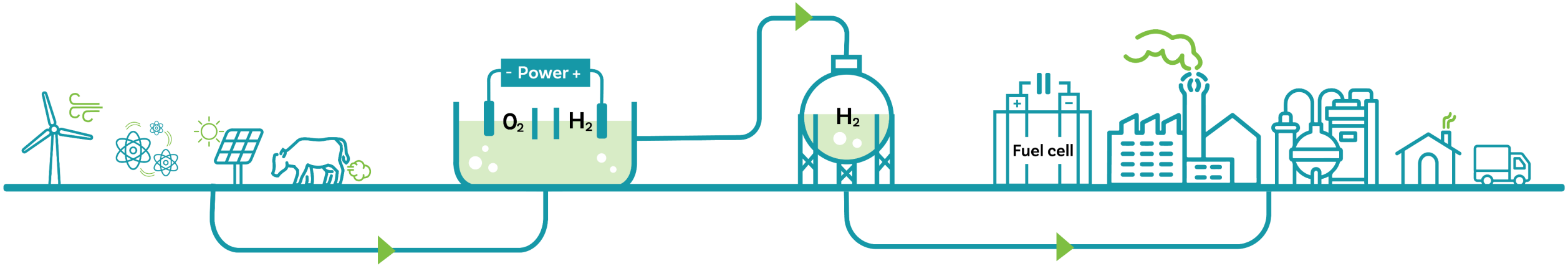
HOW WILL MACH2 PRODUCE HYDROGEN?

Using energy produced by clean energy sources like wind, solar, nuclear

...Low to zero carbon electricity could produce hydrogen from water through electrolysis.

Hydrogen is stored safely for when needed.

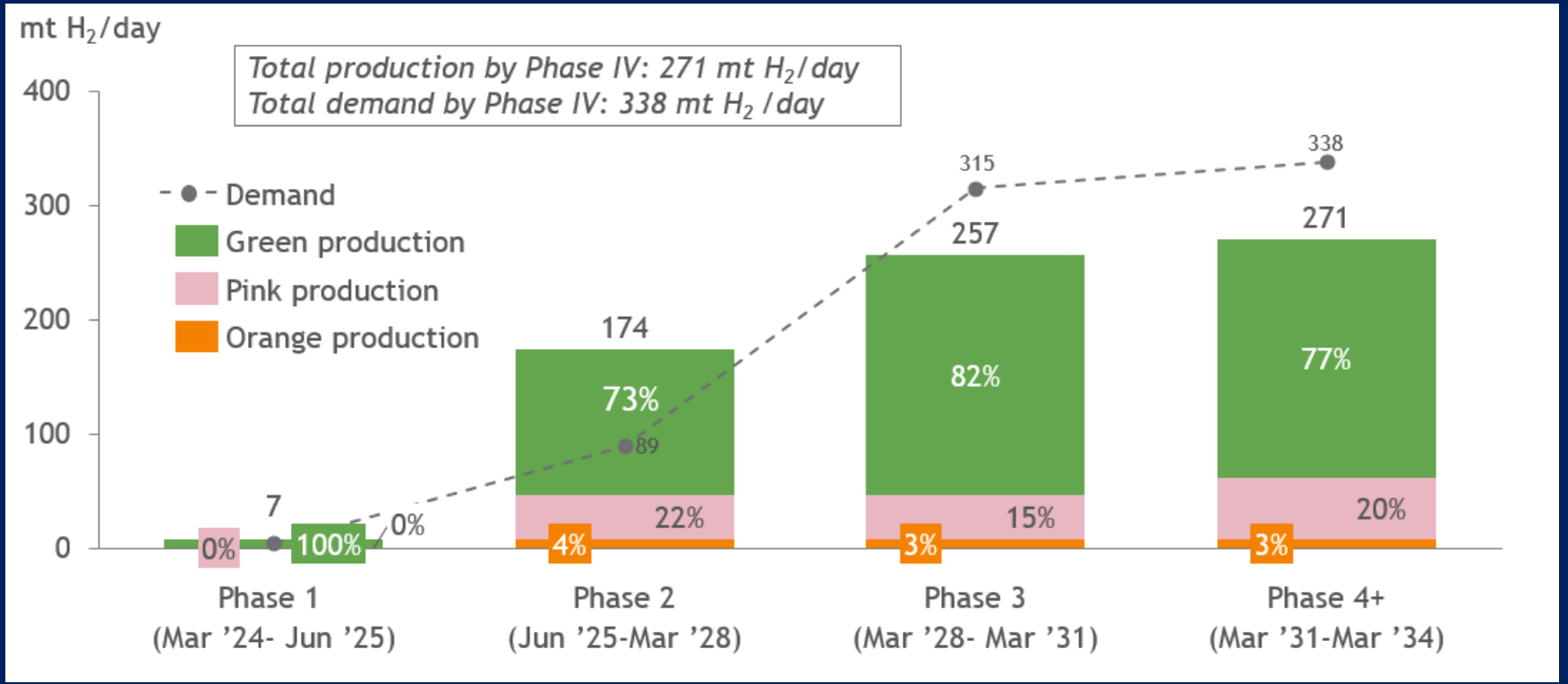
Clean hydrogen could be used for power generation, transportation fuel, refining and other industrial processes.



MACH$_2$ IS A FOSSIL FUEL-FREE HUB

POWERED BY RENEWABLE & NUCLEAR ENERGY

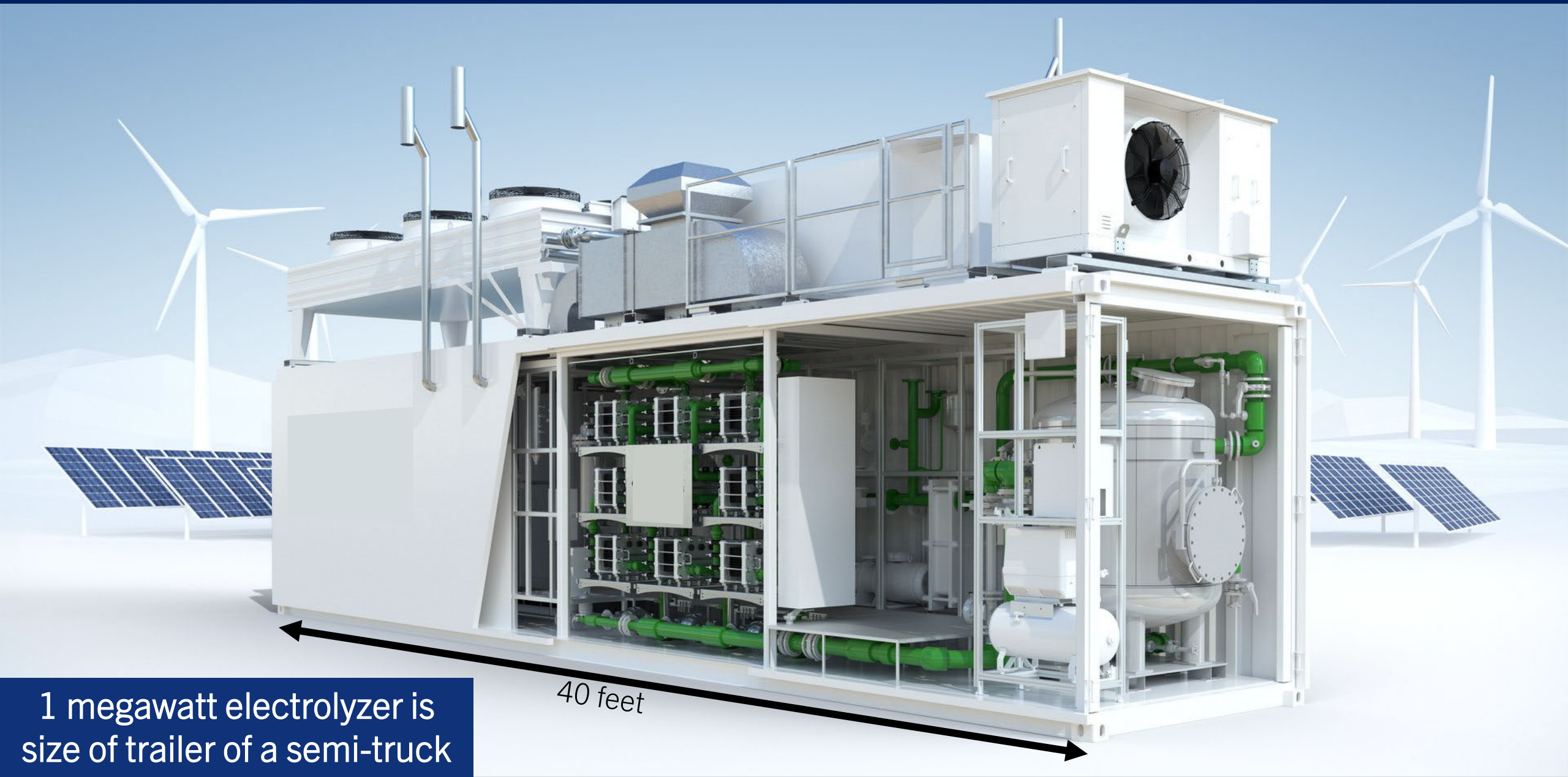
LEVELIZED H_2 COST: $3.86/KG



	Green	Pink	Orange
Definition:	Solar or Wind powered electrolyzer	Nuclear powered electrolyzer	Biogas or biomethane in SMR (e.g., RNG)
Carbon intensity:	0 kg CO_{2e}/kg H_2	0.2 kg CO_{2e}/kg H_2	0.2 kg CO_{2e}/kg H_2

Source: DOE GREET Model; IEA; Acar et al 2022; Yao et al 2017; Müller 2013; Kraussler 2013

WHAT DO ELECTROLYZERS LOOK LIKE?



1 megawatt electrolyzer is size of trailer of a semi-truck

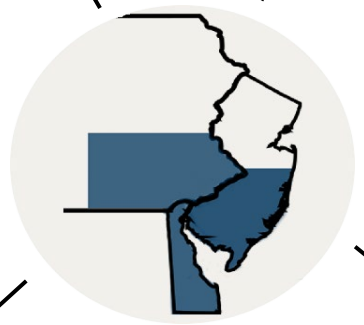
MACH$_2$

Labor, Workforce & Community Outreach

- PA AFL-CIO
- DE AFL-CIO
- Building Construction Trades
- Pipefitters & Steamfitters
- Delaware Prosperity Partnership
- DESCA
- DE Workforce Development Board
- Philadelphia Works
- University of Delaware
- Cheyney University
- Rowan
- UPenn
- Drexel
- Delaware State University

Industrial & Commercial Applications

- Monroe Energy
- Braskem
- DuPont Experimental Station
- Vicinity Energy
- PSE&G
- Enbridge
- Hilco
- HyAxiom
- Amazon
- Ameresco



Transportation Applications

- SEPTA
- DART
- NJ Transit
- Philadelphia Municipal Fleets

H_2 Producers & Innovators

- Air Liquide
- PBF Energy
- Bloom Energy
- PGW
- Monroe Energy
- Enbridge
- Versogen
- Holtec
- PSE&G
- Chesapeake Utilities
- sHYp
- Hydropore
- First State Hydrogen

Education, Research & Development

- University of Delaware
- Cheyney University
- Rowan
- UPenn
- Drexel
- Delaware State University
- DESCA

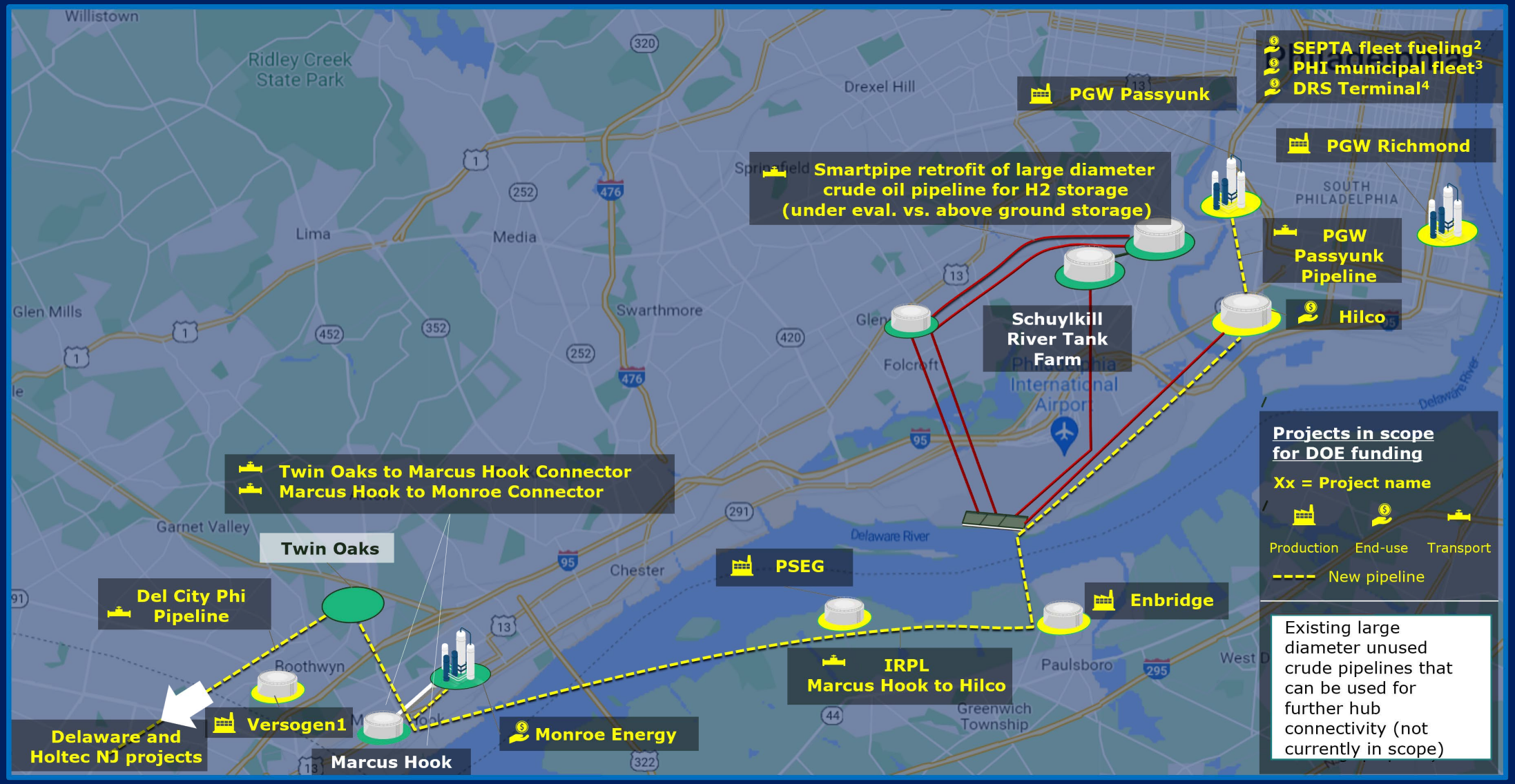
Feedstock Diversity & Infrastructure

- PECO
- PSE&G
- US Wind
- Buckeye
- IRPL
- Orsted

H_2 Supply Chain

- Chemours
- DuPont
- WL Gore
- Compact Membrane Systems

PRELIMINARY CONCEPT



Preliminary Projects under consideration for potential U.S.. DOE funding as of 2/28/2024

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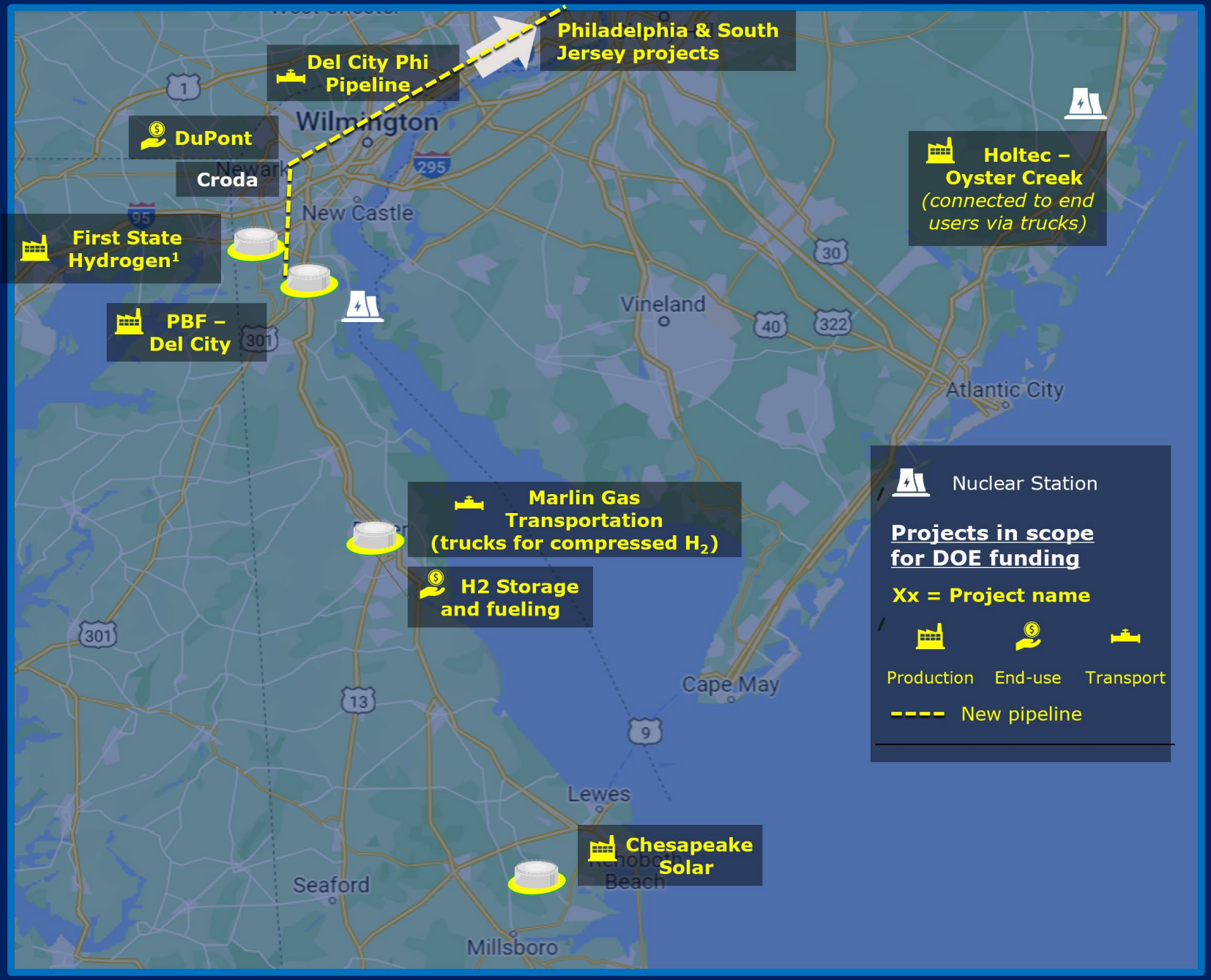
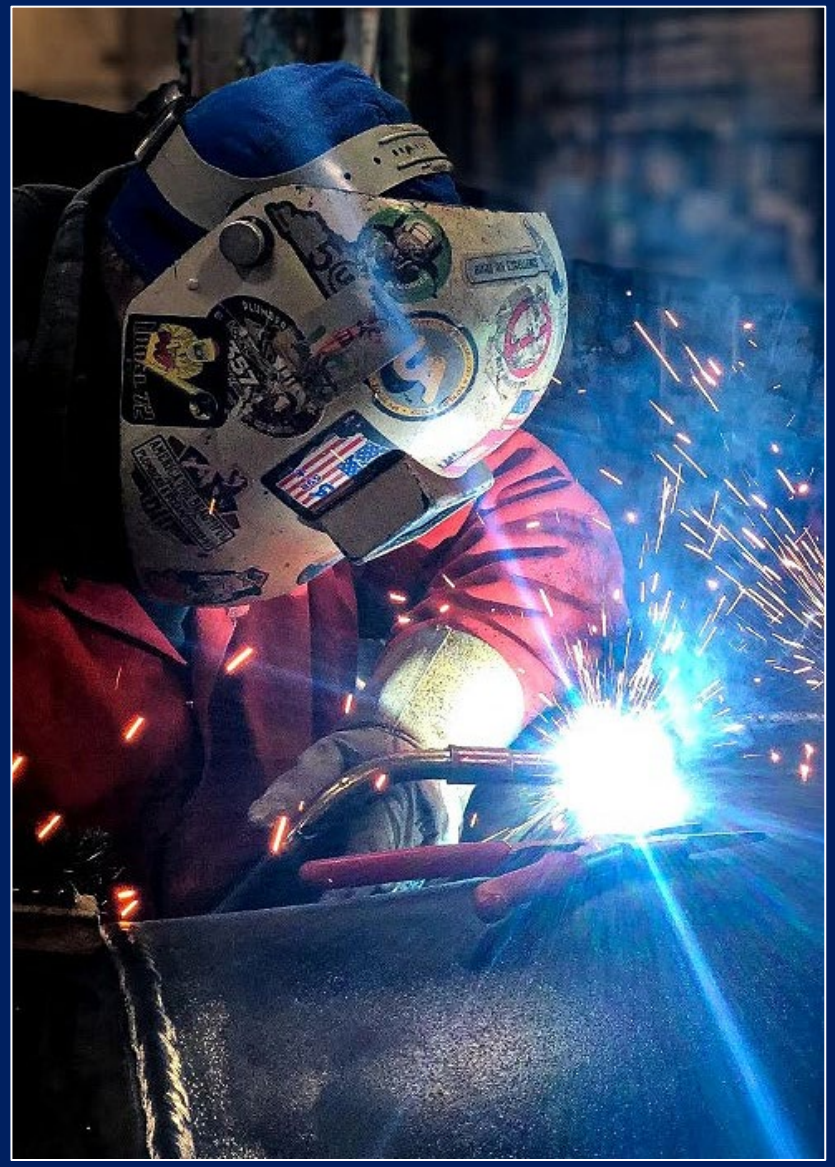


WORKFORCE DEVELOPMENT AND JOBS



- $MACH_2$ will create 20,800 well-paying jobs in the clean energy economy, including 13,400 union construction jobs
- The regional Building Trades and AFL-CIO helped lead $MACH_2$ from the start. Every project will be constructed with project labor agreement
- $MACH_2$ will coordinate equitable access to next-generation job training opportunities, especially historically underserved communities
- Key workforce partners: Labor, Cheyney University, Delaware Tech, the Collegiate Consortium, Philadelphia Works, DE Workforce Development Board, NJ State Employment and Training Commission, FAME, Inc., LEEP

MACH2

Mid Atlantic Clean Hydrogen Hub

POST AWARD ORGANIZATIONAL STRUCTURE EMBEDS COMMUNITY BENEFITS, WORKFORCE DEVELOPMENT & EJ40 ACTIVITIES AT ALL LEVELS INCLUDING BOARD, ADVISORY COMMITTEES, EXECUTIVE TEAM & COMMUNITY BENEFITS STAFF

BOARD OF DIRECTORS (BOD)

Up to 15 individuals that represent all 3 states, the Board of Directors holds all fiduciary responsibility for the organization, and authorizes/manages the movement of money, establishes and approves by-laws, codes of conduct and governance structures. Permanent committees oversee audit, compensation, governance

ADVISORY COMMITTEES (AC)

Subject matter experts to advise both the BOD and the CEO/Executive Team on hub planning and execution. Members of the AC can also be members of the BOD as well as members of any ad hoc sub-committees formed for the execution of the hydrogen hub. Initially two ACs as a minimum: Industry/Technical and Community/Workforce Development, more to be developed if required.

Industry AC

Representatives from industry such as Air Liquide, Bayotech, Bloom Energy, Buckeye, Chesapeake Utilties, CMS, Enbridge, Holtec, Monroe Energy, PBF Energy, PGW, PSEG, Versogen, Schuyler Energy, South River Maritime, MDavis, Engineering, Compliance & Regulatory Expertise

Community AC

Environmental Justice Expertise, DESCA, Chambers of Commerce, Economic Development Partners, UD, UPenn, Rowan, DSU, DTCC, DE Workforce Development Board, Union reps, Philadelphia Works, DEI&A reps, FAME, Inc

CHIEF EXECUTIVE OFFICER (CEO)

The CEO will report to the BOD and be accountable for executing the H2Hub plan as specified in the proposal submitted to the DOE. The CEO will be responsible for forming and hiring the executive team, staff, and consultants needed to execute on the plan. This team will also be responsible for forming any and all ad hoc sub-committees required for the execution of the hydrogen hub plan.

- HR & DEIA Director
- Communications
- COO, Technology Director & Staff
- CFO & Staff
- Community Benefits Lead & Staff
- General Counsel
- Consultant(s) and ad hoc sub-committees as required

Next Steps & Resources

Current Status – Negotiations

Award Negotiations: OCED is in negotiations with project selectees.

After Award: ***IF the projects receive an award (successful negotiations)***

- Selectees enter into cooperative agreement with OCED
- Detailed Project Plan begins
- OCED will work with selectees to ensure compliance with the National Environmental Policy Act (NEPA)
- Significant engagement with OCED and awardee

Get Involved

How to engage during negotiation:

- Visit **Hub webpages**
- Attend **Hub-specific virtual briefing**
- **Email the H2Hub**
- **Email DOE** at engage_H2Hubs@hq.doe.gov
- **Attend local engagements** (details TBD)
- Read **Initial CBP summary**

DOE will use feedback from engagements to inform the negotiation process

How to engage during Phases 1-4:

- **Attend facilitated sessions** with DOE and project performers to raise priorities and concerns
- **Reach out to H2Hub teams** any time
- **Participate in H2Hub engagements**; workforce or community agreements; or advisory boards H2Hubs may have as part of their CBP activities
- **Reach out to DOE** if any questions or concerns are not being adequately addressed **engage_H2Hubs@hq.doe.gov**
- Each phase has a go/no-go where DOE will assess project performance including CBP – **your feedback matters!**

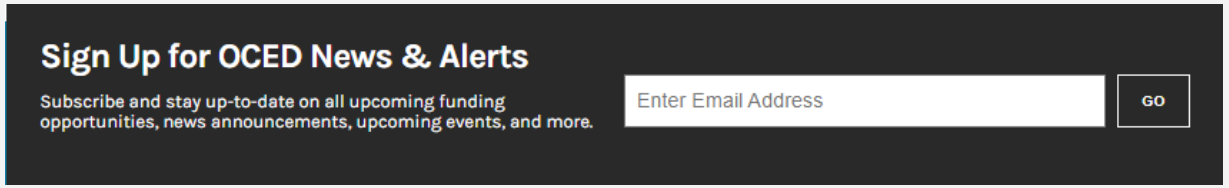
How NEPA will work:

- **DOE will comply** with the National Environmental Policy Act (NEPA) and related requirements for the Hubs.
- Feedback via early engagement will **inform initial scope of NEPA reviews**.
- **Stakeholder engagement** throughout the NEPA process, including at scoping and draft NEPA document review stages.

Communities and labor can still engage with the applicant based on the information they released to date to explore a path forward without this specific source of federal funding.

Stay Connected

- **Reach OCED about the H2Hubs**
  Engage_H2Hubs@hq.doe.gov
- **OCED Website & Newsletter Sign-up**
  energy.gov/oced
  Scroll to bottom to sign up here:



- **OCED Exchange (RFIs, NOIs, and FOAs)**
  oced-exchange.energy.gov
- **Follow us on LinkedIn**
  linkedin.com/company/doe-oced/

H2Hubs Resources

Regional Clean Hydrogen Hubs

- Program Page
- Press Release
- Overview of Selected Projects
- Local Engagement Opportunities
- OCED CBP fact sheet

Demand-Side Support Initiative for Clean Hydrogen

- Request for Proposals (RFP)
- Video: OCED Update on Demand-Side Support Initiative

Additional Clean Hydrogen Resources

- U.S. National Clean Hydrogen Strategy and Roadmap
- Hydrogen Interagency Task Force
- Clean Hydrogen Pathways to Commercial Liftoff Report
- Hydrogen Shot

Additional DOE Resources

- Office of Economic Impact and Diversity assistance to advance equity & CBP in communities
- Office of Energy Jobs technical assistance to advance CBP jobs, labor & skilled workforce

Thank you!

OCED

Office of Clean Energy Demonstrations

energy.gov/OCED

For more information, please contact oced@hq.doe.gov