ANNOUNCEMENTS

- **Mute Microphone** – in order to prevent background noise that disturbs the meeting, if you aren't talking, please mute your microphone or phone.

- **Chat Box** – if you aren't being heard, please use the chat box or raise your hand to ask a question.

- **Recording Meeting** – we will record and post the board meetings (www.ctgreenbank.com/hydrogentaskforce), can also access meeting dates and dial-in information through Secretary of State.

- **State Your Name** – for those talking, please state your name for the record.

Special Act 22-8

Task Force to Study Hydrogen Power

August 9, 2022

Online and In-Person Meeting

UCONN Innovation Partnership Building

Agenda

- **Approval of Meeting Minutes of July 12, 2022** – 5 min
- **Task Force – New Member Introductions** – 20 min
- **Process – Working Group Charters** – 20 min
- **Environmental Considerations – An Introduction by the Clean Air Task Force** – 30 min
- **Areas of Discussion – Definition for Clean vs. Green Hydrogen** – 30 min
- **Public Comments** – 15 min
- **Tour of Building** – following meeting

Approval of Meeting Minutes of July 12, 2022

Task Force – New Member Introductions

Task Force

New Political Appointee Members (as of 8/9/22)

Appointer	Organization	Name	Area of Expertise
President Pro Tempore			▪ EDC (Electric – 17-) ▪ CT H2 Manufacturer ▪ ENGO (RE Advocate)
Majority Leader Senate	▪ AFL-CIO	▪ Keith Brothers	▪ Building Trades
Minority Leader Senate	▪ Avangrid ▪ Avangrid	▪ Adolfo Rivera ▪ Frank Reynolds	▪ EDC (Electric – 17-) ▪ EDC (Gas – 17-) ▪ ENGO (RE Advocate) ▪ CHFCC
Speaker of House	▪ Eversource ▪ Nel Hydrogen	▪ Digaunto Chatterjee ▪ Katherine Ayers	▪ EDC (Electric – 18+) ▪ CT H2 Manufacturer
Majority Leader House	▪ Eversource ▪ Sierra Club CT ▪ Fuel Cell Energy	▪ Nikki Bruno ▪ Samantha Dynowski ▪ Anthony Leo	▪ EDC (Gas – 18+) ▪ ENGO (RE Advocate) ▪ CHFCC
Minority Leader House	▪ Eversource ▪ Dominion Energy ▪ Infinity	▪ Jennifer Schilling ▪ Mary Nuara ▪ William Smith	▪ EDC (Electric – 18+) ▪ Nuclear Power ▪ CT H2 Manufacturer

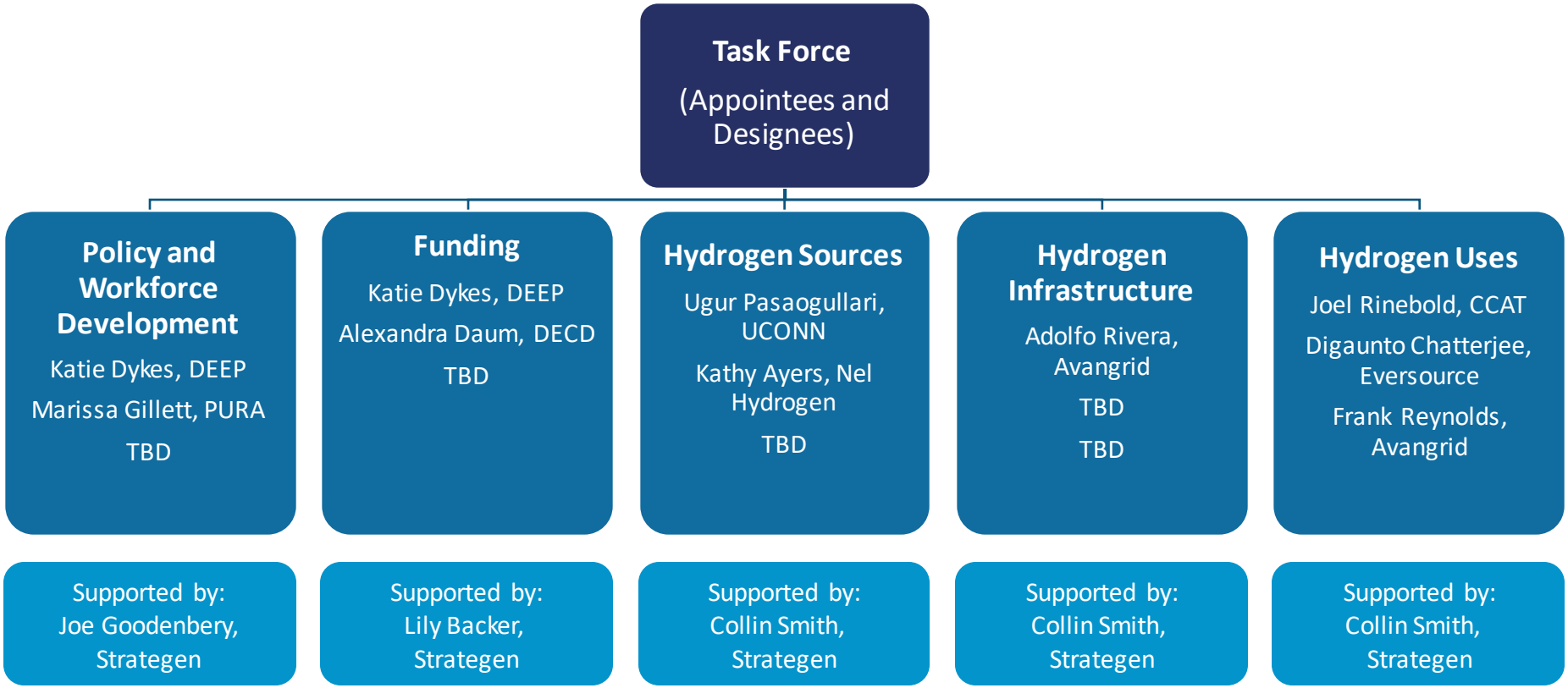
Task Force

Ex Officio Members

Appointer	Organization	Name	Title
Ex Officio	DEEP	Katie Dykes	Commissioner
Ex Officio	PURA	Marissa Gillett	Chair
Ex Officio	UCONN	Ugur Pasaogullari	Professor (Designee)
Ex Officio	CCAT	Joel Rinebold	Director
Ex Officio (Chair)	CT Green Bank	Bryan Garcia	President and CEO
Ex Officio (Co-Chair)	CT Green Bank	Sara Harari	Associate Director

Process – Working Group Charters

Working Groups will be coordinated and supported by Strategen



The Policy & Workforce Development, Funding, Sources, and Infrastructure Working Groups are all accepting additional co-chairs.

Working Group Logistics

- It is expected that working groups will meet once to twice a month and meetings will be open to the public.
  - Meeting recordings and meeting minutes will also be made publicly available.

- Strategen and Green Bank will be working with Working Group chairs to finalize Charters by the September Task Force Meeting

- The Strategen team will handle the following responsibilities:
  - Meeting logistics including scheduling and recording meeting minutes.
  - Coordination with Working Group Co-Chairs to develop meeting agendas which will be provided to participants before Working Group meetings.
  - Technical assistance (including research), where appropriate.

Sources Working Group

- **Co-Chairs** – Ugur Pasaogullari (UCONN), Kathy Ayers (Nel Hydrogen), and TBD
- **Strategen Support** – Collin Smith
- Objective – The objective of the Hydrogen Sources Working Group is to "[examine] the sources of potential clean hydrogen [in Connecticut] including, but not limited to, wind, solar, biogas and nuclear." This will include an assessment of the maximum in-state clean hydrogen production that could be achieved using Connecticut's share of carbon-neutral feedstocks, factoring in potential needs for these types of resources in other segments of a decarbonized economy. This analysis will also be coordinated with forecasts of clean hydrogen demand developed by the Hydrogen Uses Working Group to assess any gaps in the state's clean hydrogen production capacity and its projected hydrogen use.

Uses Working Group

- **Co-Chairs** – Joel Rinebold (CCAT), Digaunto Chatterjee (Eversource), and Frank Reynolds (Avangrid)
- **Strategen Support** – Collin Smith
- Objective – The objective of the Hydrogen Uses Working Group is to provide "recommendations for potential end uses of hydrogen-fueled energy" to promote achievement of Connecticut's decarbonization goals. This will include a cross-sectoral assessment of the areas where clean hydrogen use will be most viable in the future, coupled with analysis on the potential demand from the identified end uses. This includes (but is not limited to) potential hydrogen use in long-term energy storage, industrial feedstocks, long-haul transit, and shipping ports. In addition to a forecast for overall hydrogen demand, this Working Group will also consider the geographic location of end users and their proximity to potential sources of hydrogen production.

Infrastructure Working Group

- **Co-Chairs** –Adolfo Rivera (Avangrid), TBD, and TBD
- **Strategen Support** – Collin Smith
- Objective – The Infrastructure Working Group will develop insights into infrastructure requirements to meet projected clean hydrogen demand and assess existing infrastructure that can be repurposed to meet this demand. This will include providing context around hydrogen transportation and storage needs, as well as identifying opportunities and barriers to developing this infrastructure in Connecticut. The Working Group will also consider the potential for strategic partnerships with neighboring states to enhance infrastructure development for a regional clean hydrogen ecosystem.

Policy and Workforce Development Working Group

- **Co-Chairs** – Katie Dykes (DEEP), Chair Marissa Gillett (PURA), and TBD
- **Strategen Support** – Joe Goodenbery
- Objective – The objective of the Policy & Workforce Development Working Group is to review the Connecticut policy and regulatory landscape to determine gaps that need to be addressed to promote development of a clean hydrogen ecosystem. The Policy & Workforce Development Working Group will also develop recommendations regarding workforce initiatives and policy developments based on best practices that can help support a hydrogen ecosystem.

Funding Working Group

- **Co-Chairs** – Katie Dykes (DEEP), Alexandra Daum (DECD), and TBD
- **Strategen Support** – Lily Backer
- Objective – The objective of the Funding Working Group is to review existing hydrogen funding mechanisms and incentives, such as the Infrastructure Investment and Jobs Act (IIJA), and determine how Connecticut can be best positioned to participate in these programs and potentially develop new opportunities. The Funding Working Group will also recommend additional funding sources for developing a hydrogen ecosystem with particular focus on the Targeted Brownfield Development Loan program.

Environmental Considerations – An Introduction by the Clean Air Task Force

Introduction to Clean Air Task Force

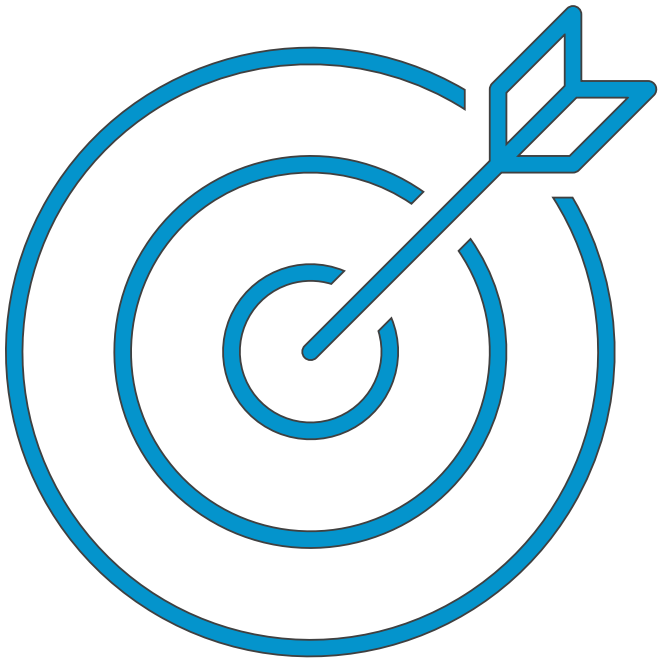
Environmental Considerations Fireside Chat

Erin Childs (Moderator)
Director
Strategen Consulting

Jonathan Lewis
Director, Transportation Decarbonization
Clean Air Task Force

Areas of Discussion
Definition for Clean vs. Green Hydrogen

Objectives

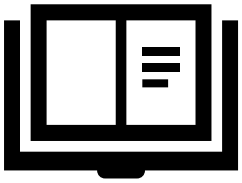


- Understand the key considerations for establishing a definition for clean hydrogen
- Align on a Connecticut-appropriate definition for "clean hydrogen" that will underpin the activities of the Hydrogen Task Force.

Hydrogen has typically been identified in terms of colors, but there is need for a clear definition framework to inform policy and investment decisions

From complexity
(hydrogen colors with unclear meanings)

To consistency
(quantifiable definition framework)

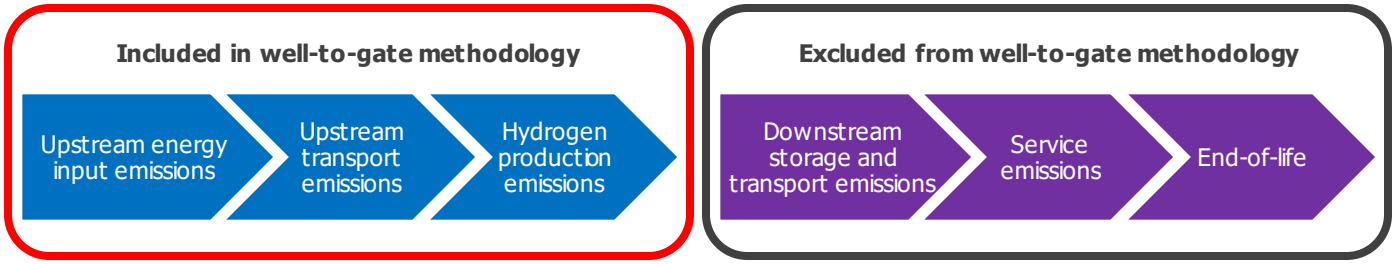


Definition Consideration

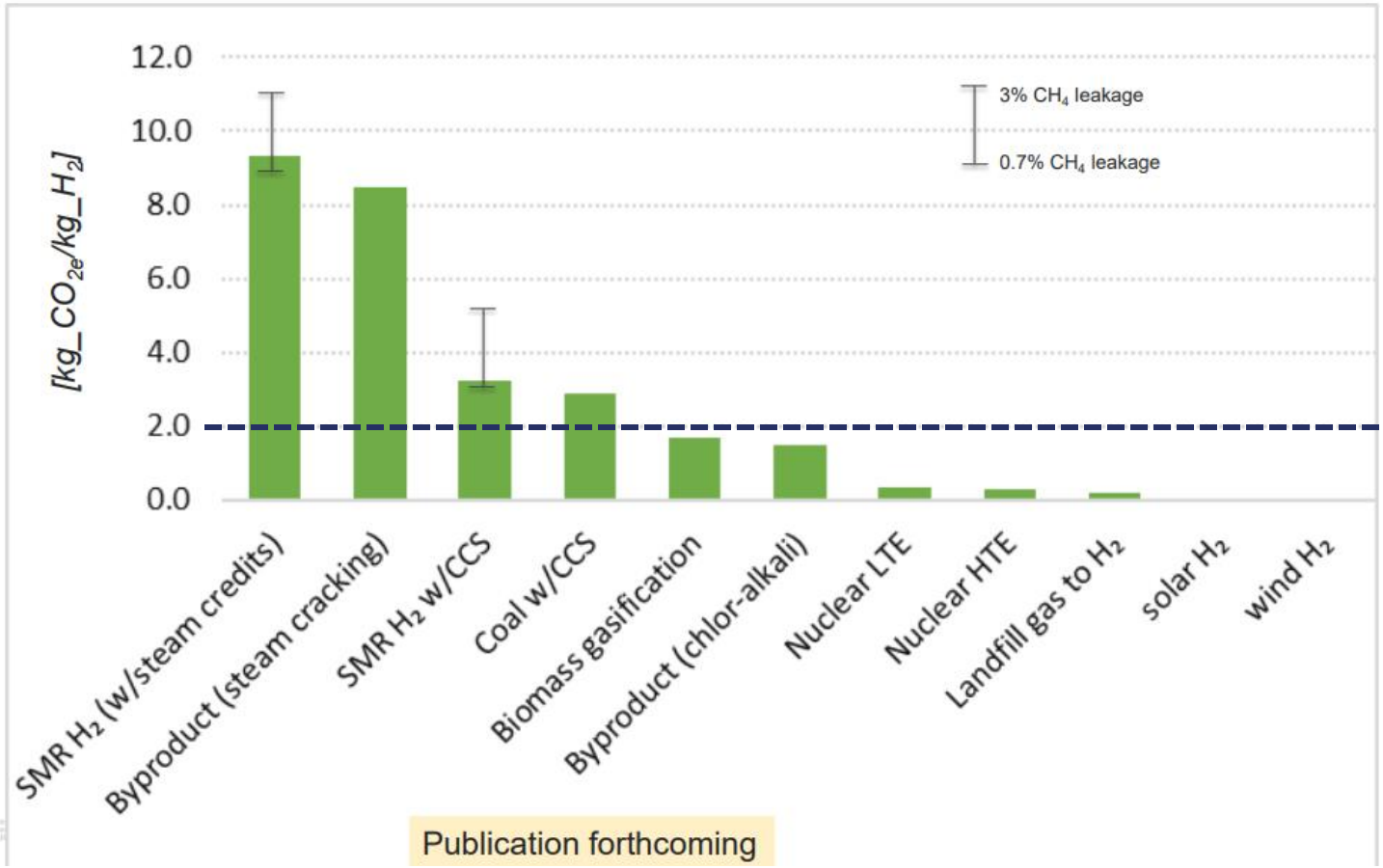
- Does it support feedstock diversity?
- Is it based on a quantifiable methodology?
- What is the hydrogen production CO_2e threshold?
- Does it consider the lifecycle impacts?
- Does it support technology-neutrality?
- How will it be certified?
- Does it align with State, Federal, and International policy/standards?

A proposed definition of clean hydrogen in Connecticut

- **Clean hydrogen** is hydrogen that is produced using non-fossil fuel feedstocks and produces zero or de minimis emissions on a well-to-gate lifecycle basis**.**
  - Eligible feedstocks would include Connecticut RPS Class 1 resources and nuclear
  - 'De minimis emissions' is defined as 2kg CO2e/kg H2 – this threshold aligns with the IIJA definition
  - A 'well-to-gate' lifecycle assessment evaluates the lifecycle emissions from feedstock through the point of production. This means emissions associated with upstream feedstock production, upstream transportation, and onsite hydrogen production.



Diverse feedstocks are compatible with a definition of clean hydrogen that limits well-to-gate lifecycle emissions to less than 2kg CO2e/kg H2



Source: Argonne National Laboratory

This definition of clean hydrogen achieves the following objectives

Align with State Policy

Align with Federal Policy

Align with International Standards

Support Technology Neutrality

Be Based on a Quantifiable Methodology

Alignment between clean hydrogen and Connecticut policy

- Connecticut's renewable portfolio standard (RPS) currently requires each electric supplier and each electric distribution company wholesale supplier to meet at least 48% of its retail load with eligible renewable energy by January 1, 2030, with annual targets set in the interim.
  - Class 1: solar power, wind power, a fuel cell, geothermal, ocean thermal power, wave or tidal power, landfill methane gas, anaerobic digestion, or other biogas, low emission advanced renewable energy conversion technologies, and hydropower and biomass under specific circumstances
  - Class 2: trash-to-energy
  - Class 3: waste heat recovery, waste heat from combined heat and power, energy savings from conservation and load management programs, demand side management projects
- In 2011, Connecticut enacted legislation amending the RPS and creating two new classes of renewable energy credits (RECs): Zero Emission Renewable Energy Credits (ZRECs) and Low Emission Renewable Energy Credits (LRECs). This program was set to run for 10 years, with the final year being 2021.
  - Zero Emission Eligible Resource: Class 1 REC technologies that do not produce emissions (i.e. wind, solar)
  - Low Emission Eligible Resource: Class 1 REC technologies that produce no more than 0.07 pounds per MWh of nitrogen oxides, 0.10 pounds per MWh of carbon monoxide, 0.02 pounds per MWh of volatile organic compounds, and one grain per 100 standard cubic feet (i.e. biomass or landfill gas)
- The Non-Residential Solar Renewable Energy Solutions Program is a successor program to the LREC/ZREC Program and Virtual Net Metering (VNM) programs. The program is statutorily authorized to run for six (6) years and to select up to sixty (60) MW of clean energy annually.

The proposed clean hydrogen definition also aligns with federal policy and international guidance

- Connecticut

  Clean hydrogen is hydrogen that is produced using non-fossil fuel feedstocks and produces zero or de minimis emissions on a well-to-gate lifecycle basis**.**

- Canada

  "Low-carbon hydrogen" is hydrogen with a carbon intensity less than that of the reference carbon intensity level for the relevant compliance period (i.e. 89.2 gCO2e/MJ in 2022) in the Clean Fuel Regulations.

- European Union – CertifHy Project

  "Clean hydrogen" is hydrogen produced with a carbon intensity threshold of approximately 4.37 kilograms of CO2 per kilogram of hydrogen, including upstream emissions.

- United States – IIJA

  "Clean hydrogen" is hydrogen produced with a carbon intensity equal to or less than 2 kilograms of carbon dioxide-equivalent produced at the site of production per kilogram of hydrogen produced

This definition will enable Connecticut to produce clean hydrogen while allowing flexibility over the lifecycle of the hydrogen to ensure participation eligibility in federal and national markets.

A carbon intensity approach provides several additional benefits

- Allows flexibility to create specific life cycle emissions thresholds
- Removes ambiguity when developing hydrogen eligibility guidelines
- Supports development of incentive and tariff design
- Increases project finance certainty for developers
- Spurs competition between technology players by remaining technology agnostic
- Provides a pathway for emerging technologies to compete
- Allows for a common framework for regional and national collaboration

It is important that mechanisms are in place to ensure that clean hydrogen is genuinely clean

+ In the near-term, existing infrastructure and systems that have worked for decades in the renewable electricity and gas markets should be leveraged to accelerate clean hydrogen market development.

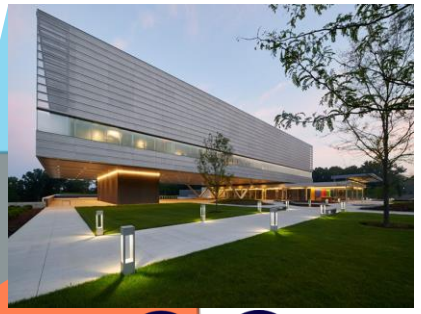
Near-term (current – late 2020s)	Long-term (late 2020s – beyond)
"Book-&-Claim" principle allows certificates to be traded separately from the physical product • Helps ramp-up phase of H2 market • Allows for flexibility for producers and end-users • Increases competition • Addresses near-term barriers due to lack of built infrastructure	**"Mass Balancing"** principle links the certificate with the respective delivery • Able to trace renewable energy to use • A physical link is established throughout the value chain • Supports additionality and physical delivery • Establishes a temporal correlation • Reduces resource shuffling

Public Comment

Engage

Organizing Tours of Various Facilities

FuelCell Energy



C2E2 Center for Clean Energy Engineering

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Next Meeting – September 13, 2022

Nel Hydrogen

Dial-In	**Webinar**	**In Person**
(949) – 346 – 4134	Click here to join the meeting	Nel Hydrogen
ID: 781 548 359#	Meeting ID: 276 913 467 857	10 Technology Drive
	Passcode: QgeLuG	Wallingford, CT 06492

For access to Task Force materials, visit:

www.ctgreenbank.com/hydrogentaskforce

Thank You

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