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) and you 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

December 13, 2022

Online and In-Person Meeting

HyAxiom

Agenda

- **Welcome and Introduction by HyAxiom**– 5 min
- **Approval of Meeting Minutes of November 8, 2022** – 5 min
- **Summary of Findings and Recommendations** – 1 hour 25 min
- **Next Steps** – 10 min
- **Public Comments** – 15 min
- **Adjourn**
- **HyAxiom Tour** – following meeting

Welcome and Introduction by HyAxiom

Approval of Meeting Minutes of November 8, 2022

Summary of Findings and Recommendations

Reminder: Special Act 22-8 requires the Green Bank to convene the Hydrogen Task Force to study hydrogen in CT's "economy and energy infrastructure"

1. Provide a review of regulations and legislation needed to guide the development and achievement of hydrogen economies of scale
2. Provide recommendations for workforce initiatives to prepare the state for hydrogen-fueled energy-related jobs
3. Examine how to position the state to take advantage of competitive incentives and programs created by the federal Infrastructure Investment and Jobs Act
4. Identify funding and tax preferences for building hydrogen-fueled energy facilities at brownfield sites through the Targeted Brownfield Development Grant and Loan program.
5. Recommend funding sources for developing hydrogen-fueled energy programs and infrastructure.
6. Examine the sources of potential clean hydrogen, including, but not limited to, wind, solar, biogas and nuclear.
7. Recommend potential end uses of hydrogen-fueled energy.

The key Working Group findings have informed potential recommendations consideration by the Legislature

Key Findings	Potential Recommendations
Working Groups have been developing and vetting technical analysis and research to informed a set of fact-based findings: • Research on current state of funding, policy activities, and infrastructure best practices • Original analysis on hydrogen costs and availability based on publicly available datasets • Stakeholder feedback, recommendations, and resources	Recommendations are being developed based on key findings and stakeholder feedback, and are structured to identify potential actions that the following key groups can undertake: • Legislature • State Government Agencies • Industry and Academia

Recommendations were formed in compliance with the Policy Guiding Principles

All final recommendations from working groups should:

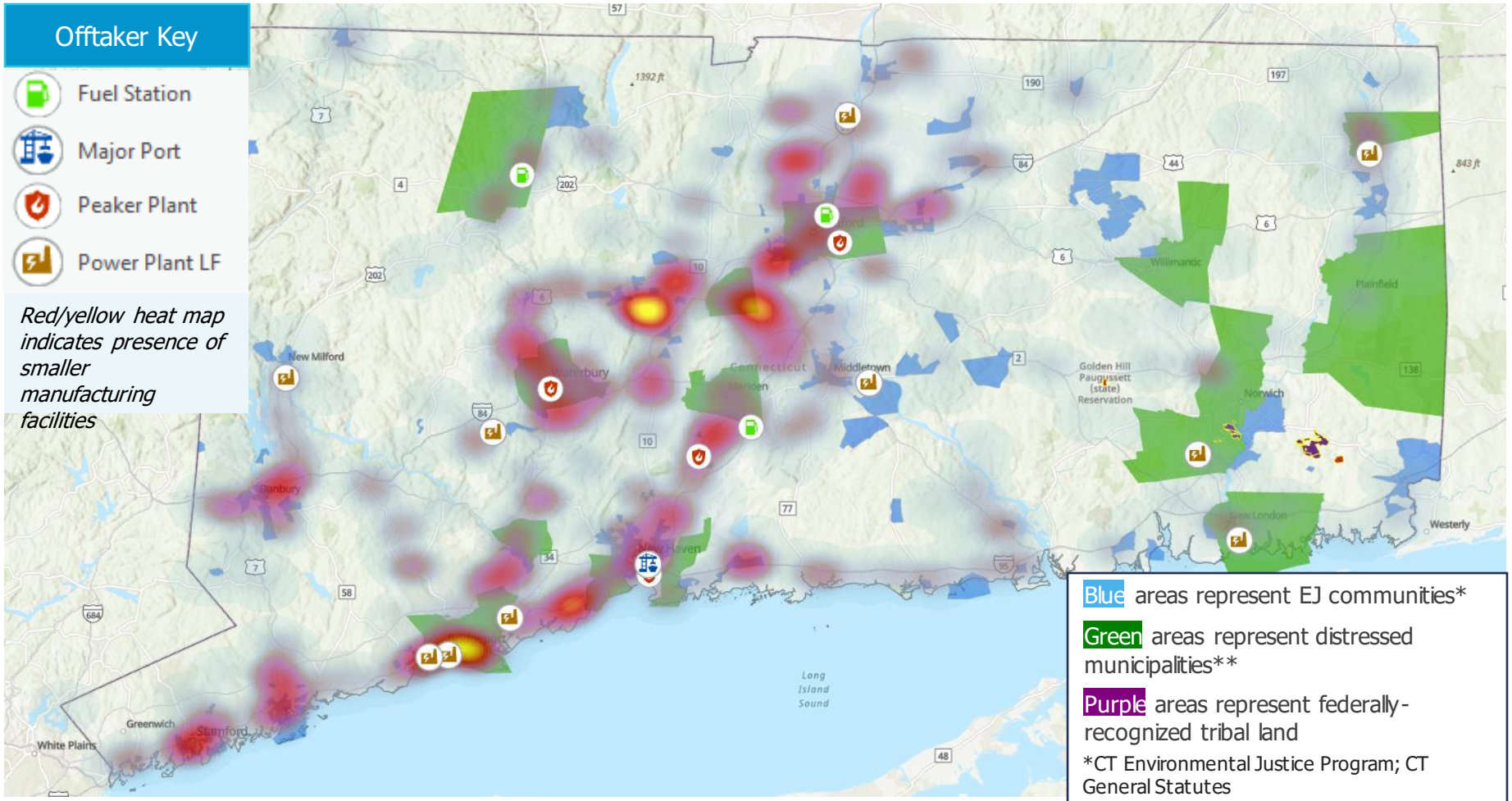
1. Be in compliance with relevant state statutes and regulations, or identify changes that would enable compliance
2. Align with state policy and active regulatory proceedings
3. Identify any fundamental underlying policy or regulatory challenges or potential enablers
4. Identify expected impacts to active policy proceedings
5. Identify or recommend relevant regulatory stakeholder proceedings that could be used to allow for additional review and vetting, or identify the need for new procedural avenues

Key Findings: Uses, Sources, and Infrastructure Working Groups

Key Findings from the Uses, Sources & Infrastructure Working Groups

- The development of a cost-effective hydrogen economy will be dependent on the deployment of at-scale hydrogen production, storage, transport, and offtake infrastructure.
- One key consideration for scaled hydrogen production via electrolysis is the total electricity required to produce needed hydrogen.
  - While Connecticut has significant resources for hydrogen production across on- and off-shore wind, solar, biogas, and nuclear, many of these resources are also expected to support the achievement of the state's zero-emissions electric sector.
- Offshore wind and solar represent the most abundant low-cost sources for hydrogen production, but additional study will be needed to ensure the simultaneous attainment of the state's existing decarbonization goals and potential new hydrogen deployment goals.
- Cost-effective delivery of hydrogen to end users will be a key factor in enabling offtake.
- Given the nascency of the hydrogen industry and the maturation of hydrogen end use applications, funding support from state and federal sources will be an important enabler to support affordability and jump start deployment of hydrogen infrastructure and offtake.

Low or zero-carbon hydrogen can provide an important tool to address economy-wide deep decarbonization and to address many issues related to energy equity, energy justice, and enabling a just and sustainable clean energy transition

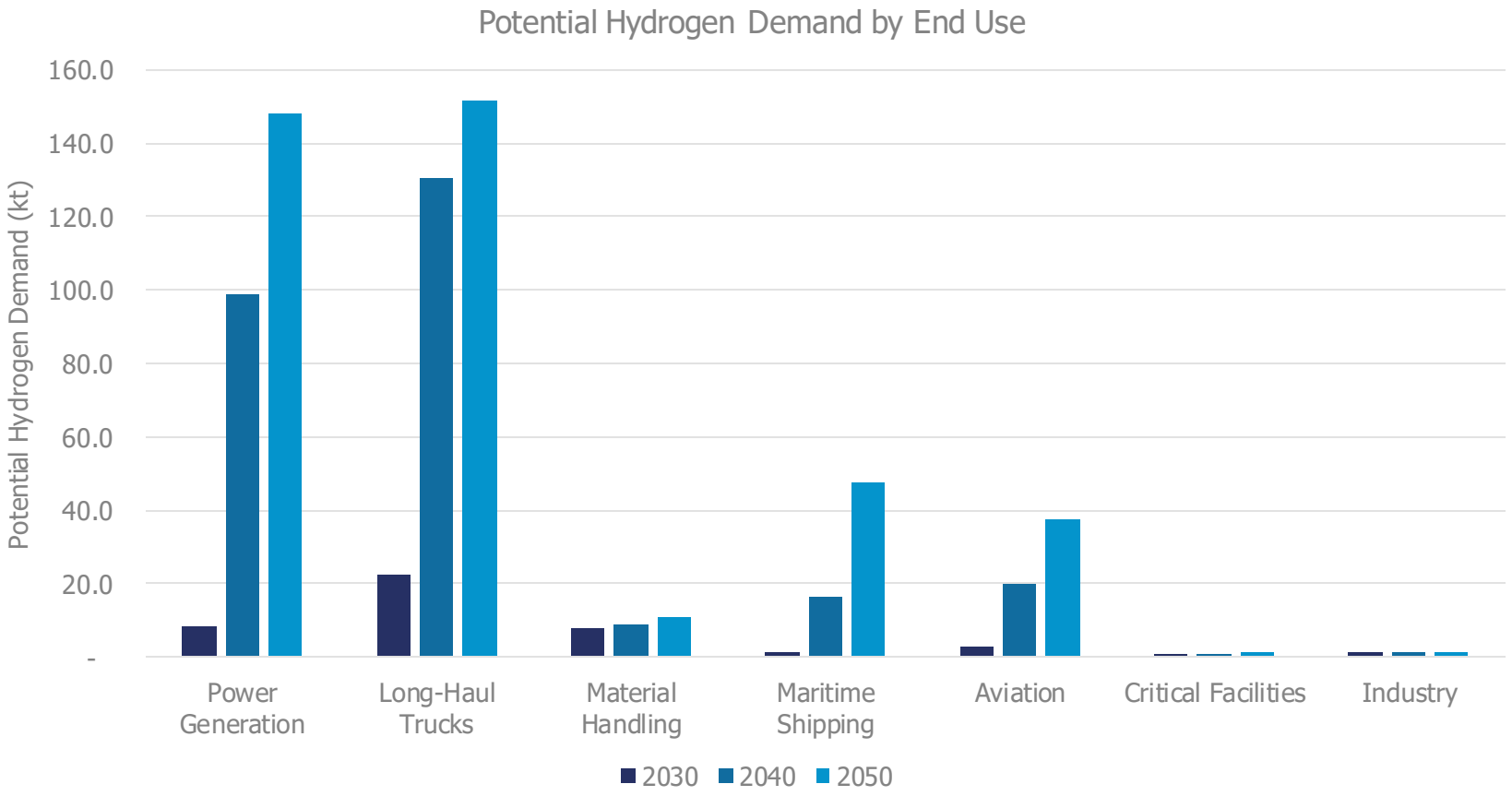


Robust stakeholder participation has helped to highlight highest priority hydrogen end uses

Highest Priority for Additional Investigation	High Priority for Additional Investigation	Other Potentially Valuable Applications
+ Critical facilities (24-hour backup need) + Aviation (long- and medium-haul) + Transoceanic cargo ships + Material handling equipment with long uptimes and charging space constraints + Long-haul heavy duty trucks + Fuel cells for peak power generation + High heat industrial processes	+ Long-distance buses + Harbor craft (e.g. ferries) + Freight rail + Fleet vehicles with long uptimes and specific refueling locations + Heavy duty vehicles with charging constraints (e.g. drayage trucks, some commuter buses) + Hydrogen blending for non-core customer (i.e. power generation and industrial heat)	+ Hydrogen blending for core customers (e.g. commercial and residential) + Buses and other heavy-duty vehicles with shorter driving ranges and no charging constraints + Privately-owned light-duty vehicles + Low heat industrial processes + Short-haul aviation
End uses that have high potential to drive demand over long term due to scale and/or underlying economics **Included in demand analysis**	Smaller-scale end uses that can provide first-mover projects and/or be integrated into larger hydrogen hubs **Not included in demand analysis**	End uses that can be kept "in view" as economics for at-scale hydrogen delivery change over time **Not included in demand analysis**

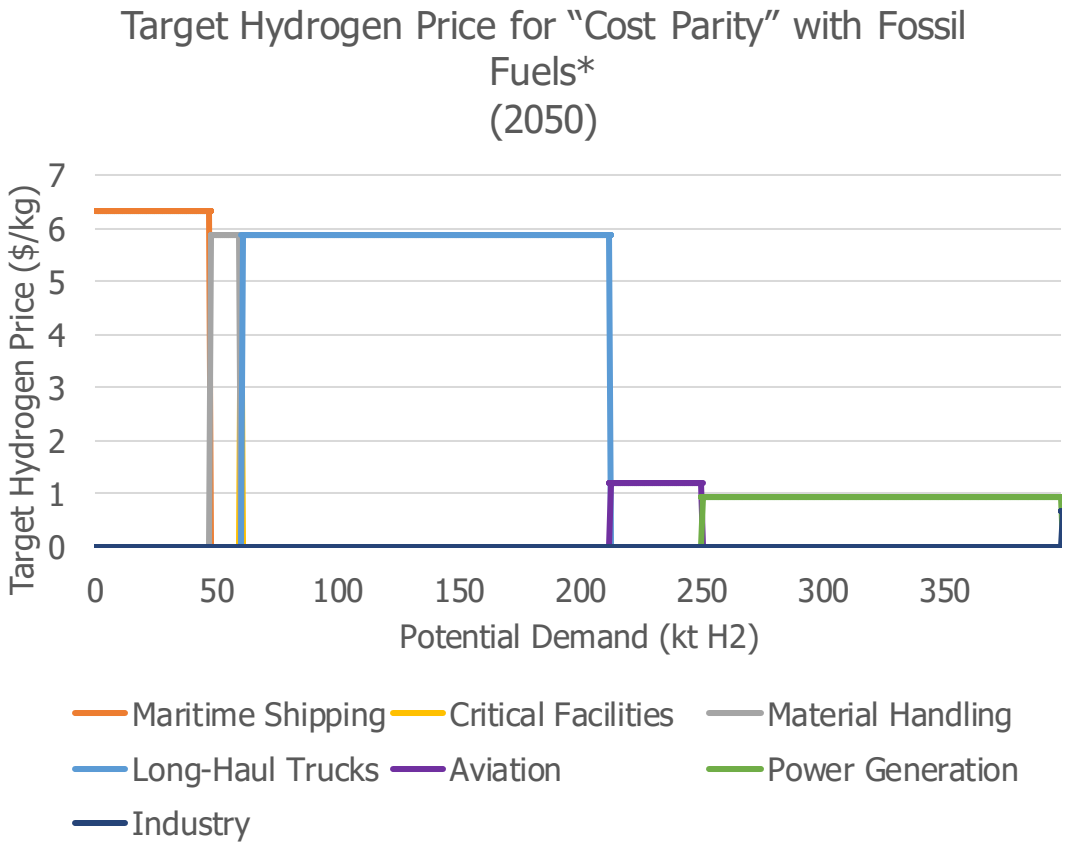
Demand analysis was focused on end uses that had highest potential to impact demand for hydrogen technology over long term

Estimated maximum potential demand from highest-priority end uses



Cost parity points for hydrogen with fossil fuels vary depending on end use

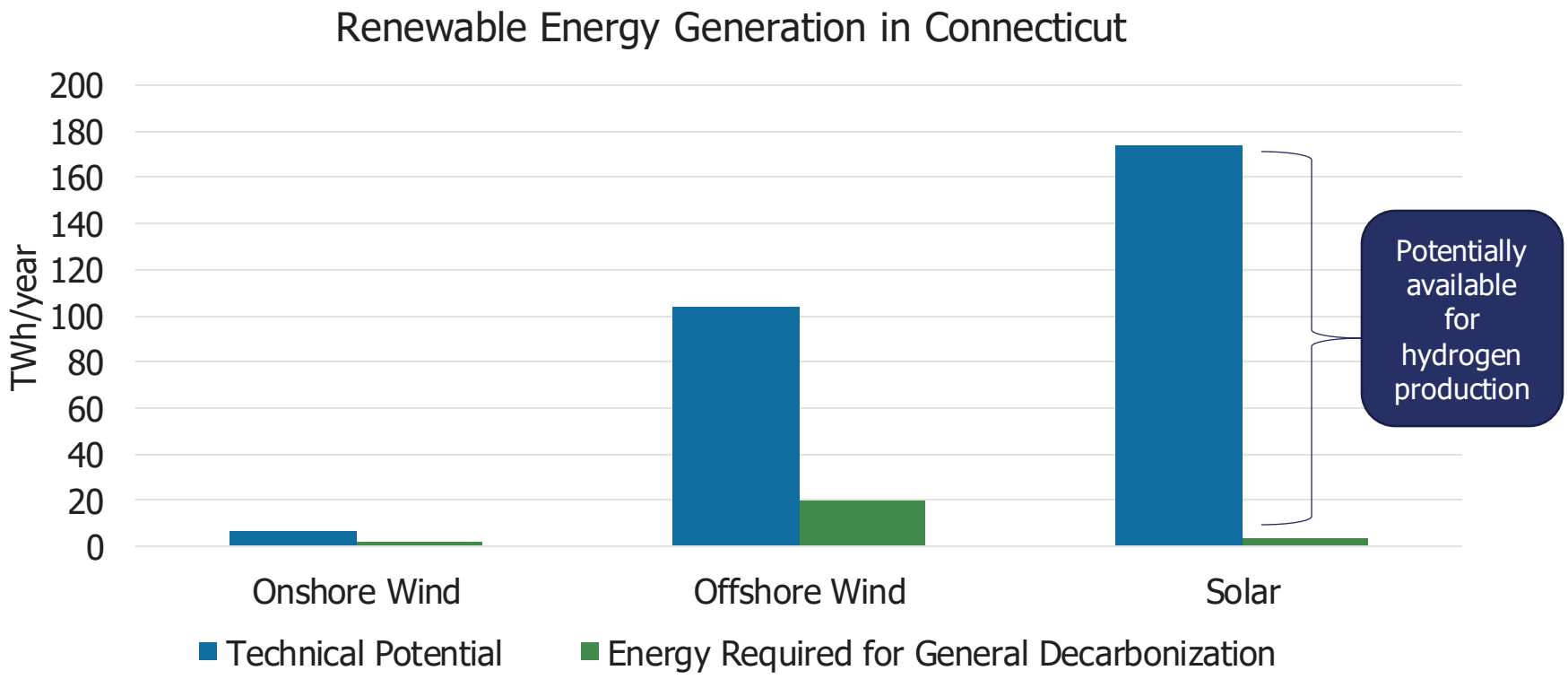
- Economics are strongest in end uses where hydrogen replaces bunker fuel and diesel, provided costs of ancillary infrastructure can be kept down
- Price points for hydrogen to replace natural gas (e.g. power generation, industry) are more difficult to hit, although may still be lower-cost than next-best decarbonization option
- Adoption in aviation sector likely to be driven by policy/industry targets due to challenging economics



*Based on cost of energy content and relative equipment efficiencies. Does not include capital costs of equipment.

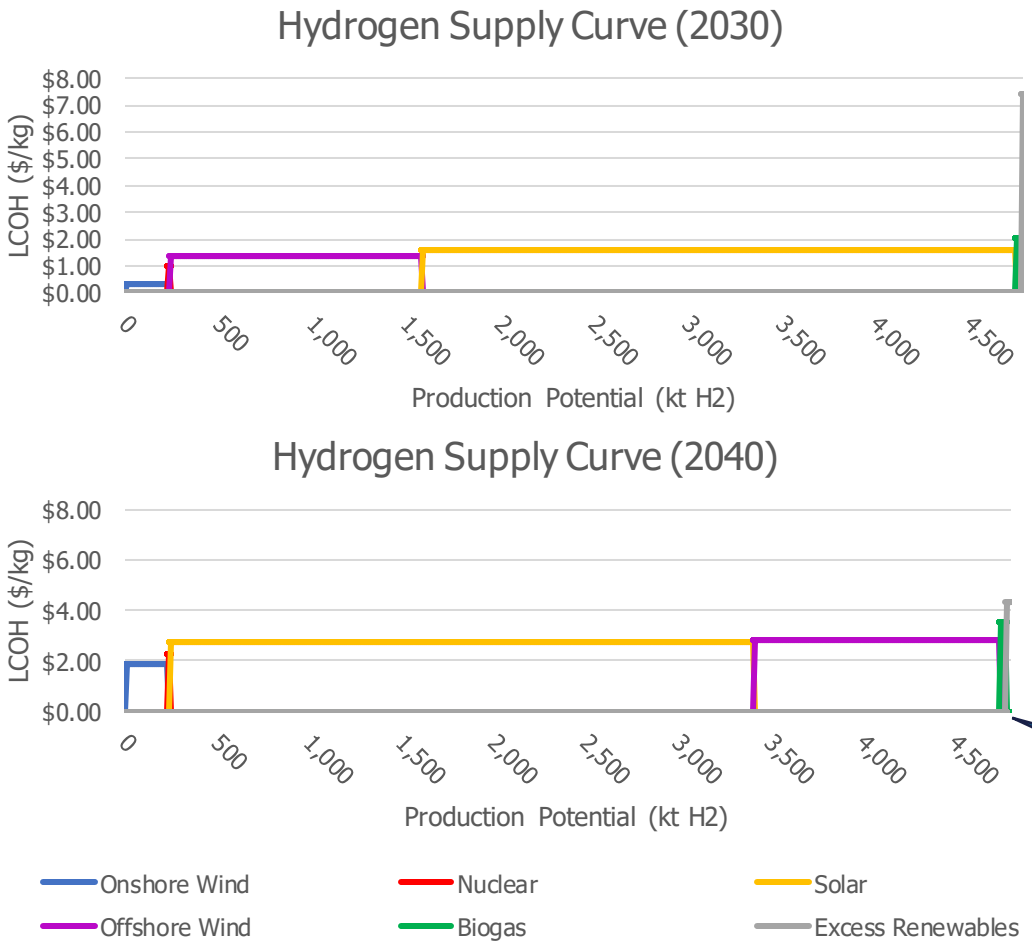
One challenge for scaled hydrogen production via electrolysis is the total electricity required to produce needed hydrogen

Solar and offshore wind have the highest resource potential when taking into account renewable energy needs for Connecticut's general decarbonization targets



Technical potential calculated from NREL supply curves. CT general decarbonization needs in line with DEEP decarbonization IRP, Electrification + Millstone Extension scenario

Supply projections shows technical potential to produce close to 5 million metric tons of hydrogen in and around Connecticut



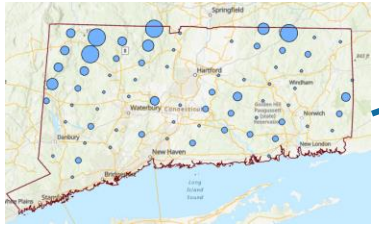
- Policy and infrastructure funding will be key factors in advancing deployment.
- Hydrogen projects installed in 2030 have cost advantage from federal tax credits, which expire in 2032.
- "Max" demand scenario would use less than 10% of technical production capacity.

Electrolyzers using grid power could be under $2/kg in 2040 if connected as transmission service customers

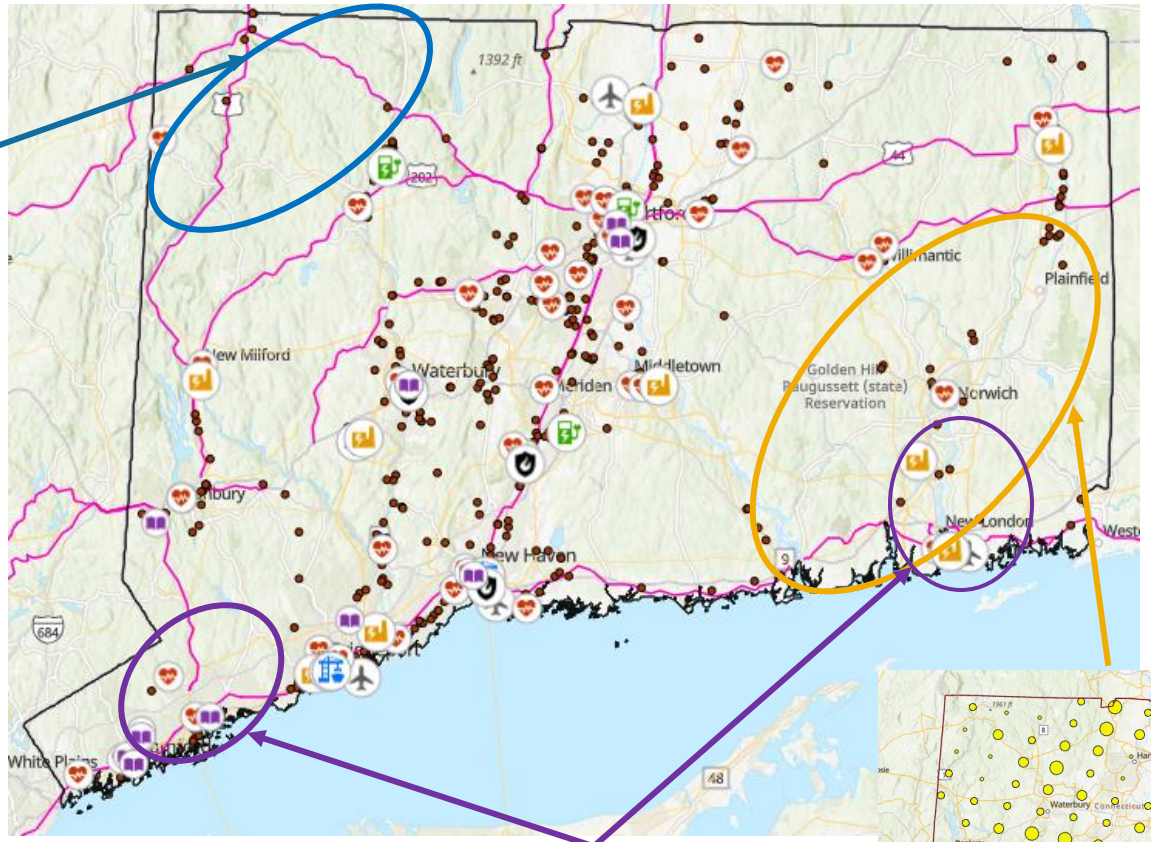
Note: LCOH represents price at point of production and does not include cost of hydrogen infrastructure (e.g. pipelines, compressors, storage). Estimates assume hydrogen producers meet labor requirements needed to receive full production tax credit under the IRA.

Connecting infrastructure likely required to transport hydrogen to major offtakers at scale

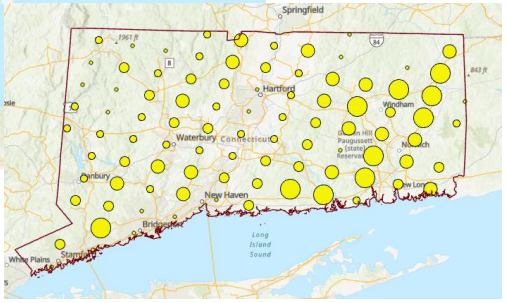
Wind Production Potential



Potential Hydrogen Offtaker Locations



Solar Production Potential

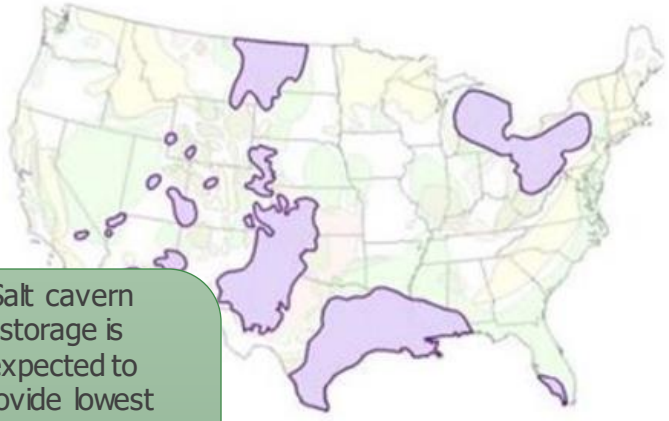


Offtaker Key

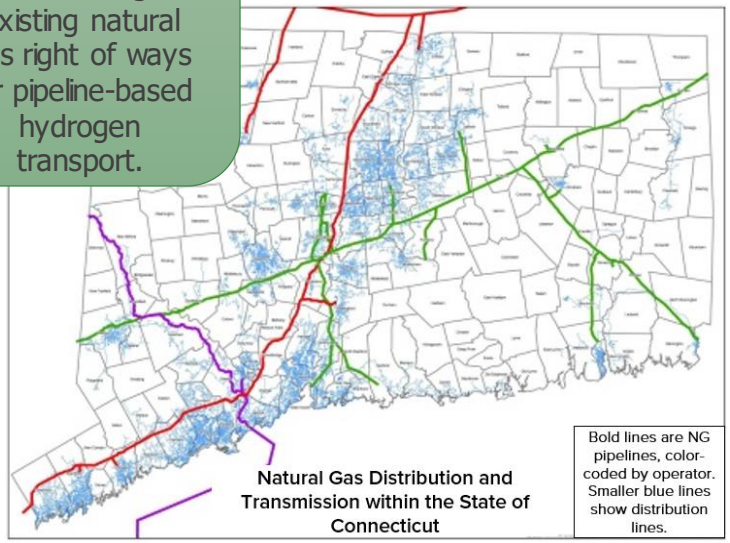
- Fuel Station
- Major Port
- Peaker Plant
- Power Plant LF
- Hospitals
- Major Highways
- Airports
- Electric Transmission
- High Heat Manufacturing

Potential Offshore Wind Interconnection Points

Known Salt Deposits in Continental U.S.



Salt cavern storage is expected to provide lowest cost bulk hydrogen storage, and can take advantage of existing natural gas right of ways for pipeline-based hydrogen transport.



The development of a large-scale hydrogen economy will be dependent on the deployment of hydrogen production, storage, transport, and offtake infrastructure

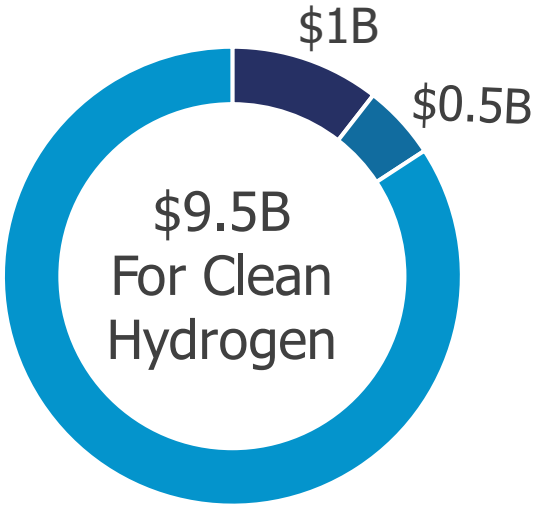
- Pipelines and at-scale storage in salt domes can significantly reduce the cost of transporting hydrogen compared to other delivery methods such as on-road transportation
- Infrastructure development requires significant demand so that costs can be spread over larger unit deliveries
- Co-locating hydrogen production and demand is a key strategy to reduce hydrogen transport infrastructure costs

Key Findings: Funding Working Group

Key Findings from the Funding Working Group

- Given the nascency of the hydrogen industry and the maturation of hydrogen end use applications, funding support from state and federal sources will be an important enabler to support affordability and jump start deployment of hydrogen infrastructure and offtake.
- Significant federal funding is available for specific hydrogen end uses. Federal funding has also been made available for enabling investments, including manufacturing, workforce development and training, and repurposing of fossil infrastructure.
- To be well positioned for competitive federal funding opportunities, applicants must:
  - Prioritize Justice40
  - Maximize match funding
- Connecticut has a suite of tools and programs that can be applied for remediation and restoration of brownfields for hydrogen development.
  - Hydrogen infrastructure and facilities are eligible for funding from these programs but must be economically viable and exhibit the highest and best use of the land.
  - Renewable energy projects are given an additional credit in their application scoring.
  - Funds are not applicable to direct costs of developing hydrogen related infrastructure and facilities, but they may be applied to pre-construction costs.

The IIJA has significant funding opportunities that can be applied to hydrogen deployment



- Electrolysis research, development, and demonstration
- Clean hydrogen Technology manufacturing and recycling R&D
- Regional clean hydrogen hubs

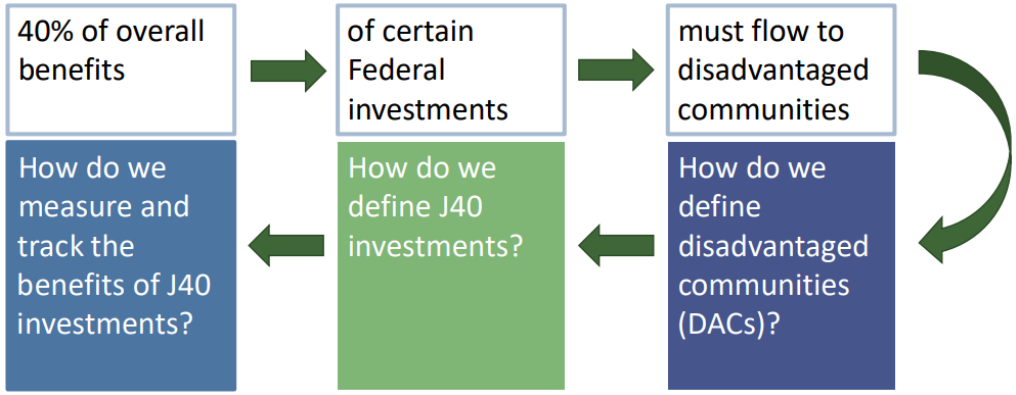
Provision	Funding
Grants for Charging & Fueling Infrastructure	$2.5 billion
Low or No Emission Bus Grants	$5.6 billion
Congestion Mitigation and Air Quality Improvement Program	$13.2 billion
Energy Efficiency and Conservation Block Grant Program	$550 million
Carbon Reduction Program	$6.4 billion
Electric or Low-Emitting Ferry Program	$250 million
Port Infrastructure Development Program Grants	$2.25 billion
Upgrading Our Electric Grid and Ensuring Reliability and Resiliency	$5 billion
Decarbonizing the Industrial Sector	$500 million

Source: White House (2022), Building a Better America.

Many programs within the IIJA are covered by the Biden Administration's Justice40 Executive Order (EO 14008)

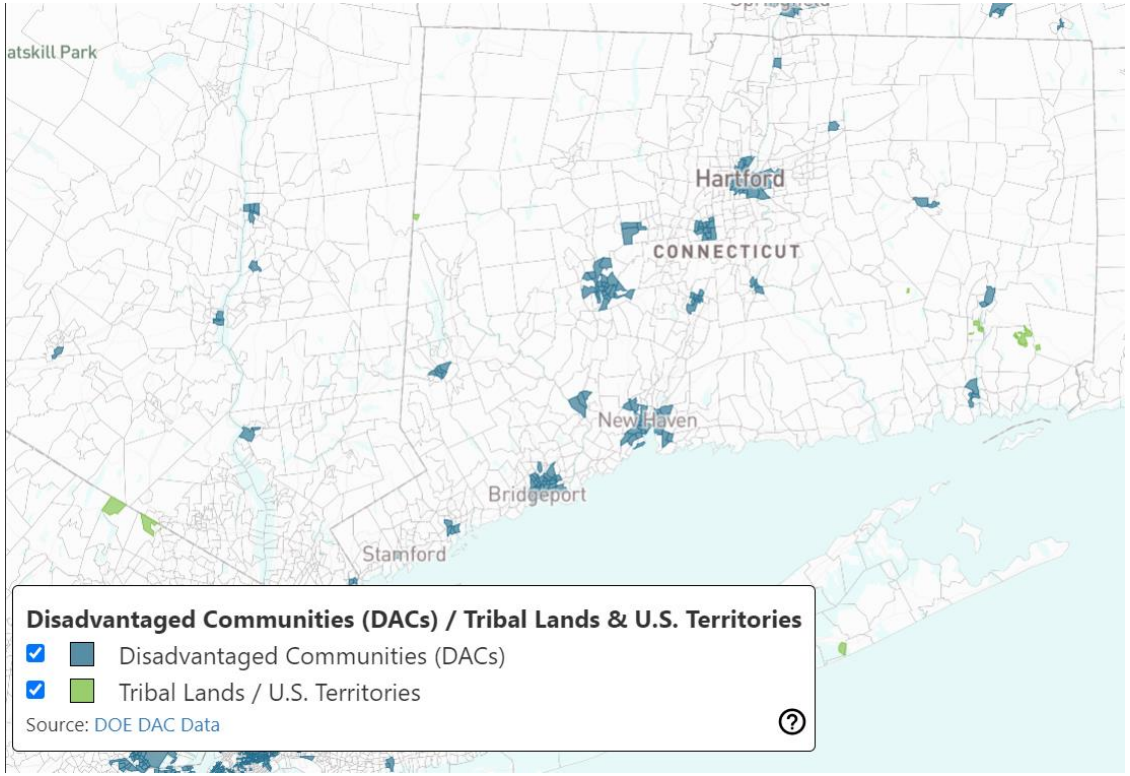
8 Policy Priorities to Guide DOE Implementation of Justice40

1. Decrease energy burden in disadvantaged communities
2. Decrease environmental exposure and burdens for disadvantaged communities
3. Increase parity in clean energy technology access and adoption in disadvantaged communities
4. Increase access to low-cost capital in disadvantaged communities
5. Increase clean energy enterprise creation and contracting (MBE/DBE) in disadvantaged communities
6. Increase clean energy jobs, job pipeline, and job training for individuals from disadvantaged communities
7. Increase energy resiliency in disadvantaged communities
8. Increase energy democracy in disadvantaged communities



*E.O. 14008, s. 223. Interim Implementation Guidance for the Justice40 Initiative. https://www.whitehouse.gov/wp-content/uploads/2021/07/M-21-28.pdf

Federal Definition of Disadvantaged Communities



- To be considered a DAC, a census tract must rank in the 80th percentile of the cumulative sum of 36 burden indicators (i.e. fossil dependence, environmental and climate hazards, etc.) and have at least 30% of households classified as low-income.
- Federally recognized tribal lands and U.S. territories, are categorized as DACs

Source: https://energyjustice.egs.anl.gov/

The Regional Clean Hydrogen Hubs FOA mandates a "Community Benefits Plan" accounting for 20% of the scoring criteria

Applicants must demonstrate how they will:

+ Carry out meaningful community and labor engagement;
+ Invest in the American workforce;
+ Advance diversity, equity, inclusion, and accessibility; and
+ Contribute to the Justice40 Initiative goal that 40% of the overall climate and clean energy investments flow to disadvantaged communities.

Community Benefits plans will be judged based upon a variety of factors, including their ability to measure and track impacts, the ability to specifically demonstrate how the H2Hub will provide societal benefit while minimizing negative impacts, support from Workforce and Community Agreements, and the presence of communities as core partners.

The IIJA grants require varying levels of match funding

Provision	Total Funding ($)	Description	Grant Type	Non-Federal Match Requirement
Grants for Charging & Fueling Infrastructure	$2.5 billion	Support development of alternative fueled infrastructure, including hydrogen fueling stations, along designated corridors.	Competitive	20%
Low or No Emission Bus Grants	$5.6 billion	Supports the purchase or lease of zero-emission and low-emission transit buses and to purchase, construct, or lease bus related facilities.	Competitive	15% for buses 10% for infrastructure
Congestion Mitigation and Air Quality Improvement Program	$13.2 billion	Added eligibility for the purchase of medium- and heavy-duty zero-emission vehicles, nonroad vehicles from construction or port-related freight, and related charging/fueling equipment.	Formula	20% typically 10% for interstate
Port Infrastructure Development Program Grants	$2.25 billion	Supports port electrification, microgrids, and hydrogen refueling infrastructure for medium or heavy-duty trucks that service the port. $400 million specifically for reducing idling truck emissions.	Competitive	20%
Upgrading Our Electric Grid and Ensuring Reliability and Resiliency	$5 billion	Demonstrate innovative approaches to transmission, storage, and distribution to enhance grid resilience and reliability	Competitive	20% for R&D 50% for commercial

Understanding Match Funding in the IIJA

- What qualifies for cost sharing?
  - Third-party financing;
  - State or local government funding or property donations;
  - Project participant funding; or
  - Donation of space or equipment.
- What cannot be used for cost sharing?
  - Any partial donation of goods or services;
  - Revenues or royalties from the prospective operation of an activity beyond the project period;
  - Proceeds from the prospective sale of an asset of an activity;
  - Federal funding or property (e.g., federal grants, equipment owned by the federal government); or
  - Expenditures that were reimbursed under a separate federal program.

Opportunities for state-level match funding are diverse and extensive:

- Funding from existing hydrogen-related programs
- Funding from newly established hydrogen-related programs
- Funding from participating developers
- Legislative appropriations
- Local government funding
- Donations of property from the government
- Donations of property, or equipment from participating partners

Connecticut has existing programs that may be able to provide match funding

Program	Administrator	Description
Smart-E Loans	CT Green Bank	Provides low-interest financing with flexible terms for home energy performance upgrades.
C-PACE	CT Green Bank	Provides building owners access to affordable, long-term financing for qualifying clean energy and energy efficiency options
Capital Solutions	CT Green Bank	Seeks to provide access by project developers and capital providers or investors to Green Bank capital.
Brownfield Remediation Grants and Loans	DECD	Provides loan financing or grants to eligible entities for costs associated with the investigation, assessment, remediation and development of a brownfield.
The Manufacturing Innovation Fund Apprenticeship Program	DECD	Supports a combination of on-the-job training and classroom instruction for apprentices in Connecticut's manufacturing industry.
The Innovative Energy Solutions Program	PURA	Provides funding projects for developers and utilities to test and demonstrate technologies.
Non-Residential Renewable Energy Solutions Program	DEEP	Provides 20-year tariffs for commercial energy projects, providing tariff and Renewable Energy Certificate payments.
Shared Clean Energy Facility Program	DEEP	Provides a 20-year tariff term for projects between 100kW and 4,000 kW. Credits are applied to bills of participating electric customers at no cost.
Microgrid Grants and Loans	DEEP	Helps to support local distributed energy generation for critical facilities

The Funding Working Group explored the suite of tools to encourage remediation and development of brownfields

- Grants (Municipalities and Economic Development Agencies)
- Liability Relief Programs
- Low-Interest Loans (Developers, Municipalities, Agencies)
- The Brownfield Land Bank Program

The end use of remediated and repurposed land is not designated by the programs – projects should exhibit highest and best end use

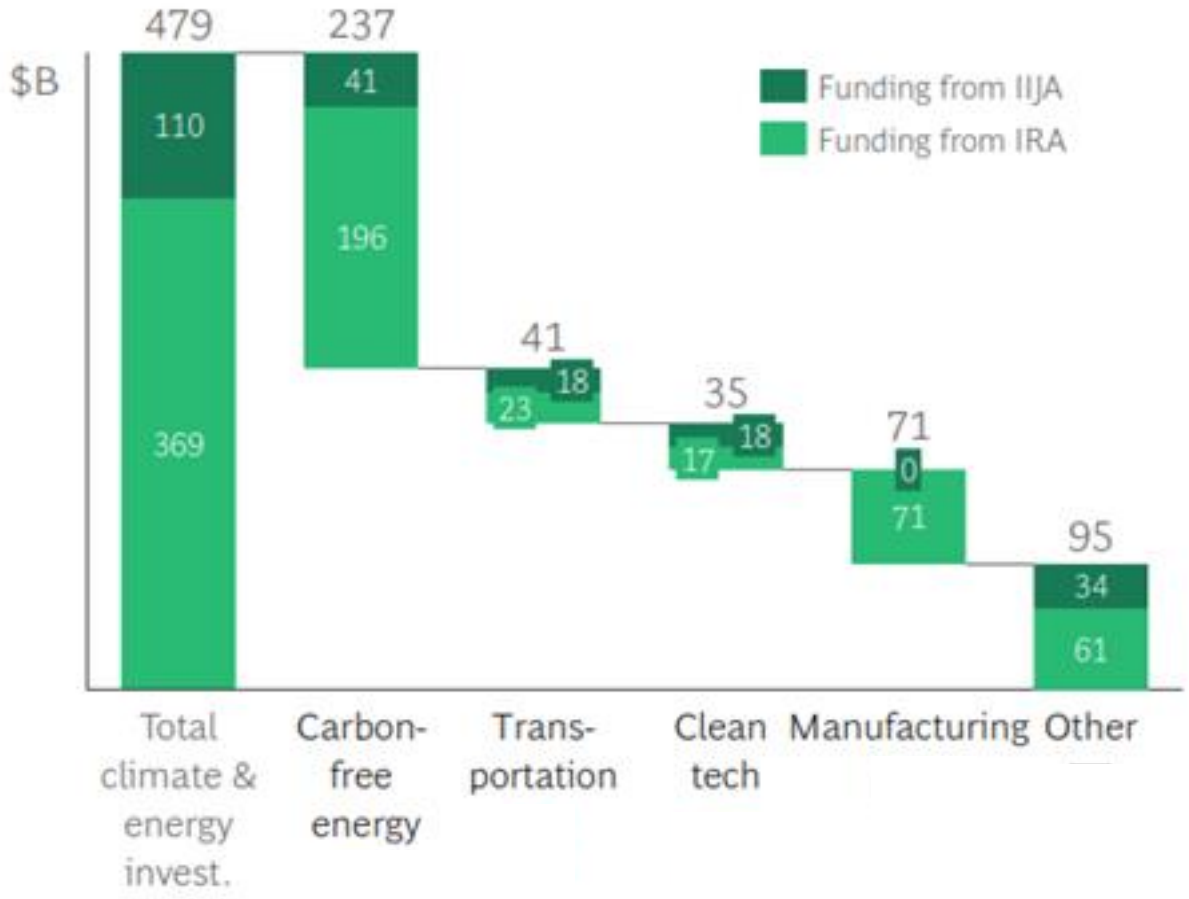
- No additional clarification would be needed to ensure hydrogen-fueled energy facilities are eligible for funding from these programs
- Renewable energy projects have been given an additional credit in their application scoring
- Projects must be economically viable to secure this funding

Funds may be applied to pre-construction costs of hydrogen projects

Costs associated with the investigation and redevelopment of a brownfield:

+ Soil, groundwater and infrastructure investigation
+ Assessment
+ Remediation
+ Lead and asbestos abatement
+ Demolition
+ Hazardous materials or waste disposal
+ Long-term groundwater or natural attenuation
+ Other institutional controls
+ Attorney fees for environmental consulting
+ Planning, engineering and environmental consulting
+ Building and structural issues
+ Environmental insurance

There is federal funding from other sources, such as the IRA, available to support the growth of a hydrogen economy



Source: EPA, CBO, BCG analysis

Funding Working Group Resource: List of Opportunities

Category	Federal Funding Component/Program	IIJA/IRA/Oth	Administra	Sub-Admin	Total Funding ($)	Description	Funding Type	Non-Federal Match Requirement
Manfuacturing	Advanced Energy Project Tax Credit	IRA	Treasury	IRS	$10 million available, 30% of amount invested	Tax credits for the cost of new or upgraded factories to build specified renewable energy components (fuel cells qualify)	Tax Credits (competitive application)	
Manufacturing	Advanced Technology Vehicle Manufacturing	IRA	DOE	Loan Programs Office	$3 billion	Expands authorities to lend under this program, which aims to produce advanced technology for medium and heavy-duty vehicles, trains or locomotives, maritime vessels, aircraft, or hyperloop technology	Loans	None
Aviation	Airport Infrastructure Grant Program	IIJA	DOT	Federal Aviation Administration	$15 billion	Grants for airport infrastructure projects that increase safety and expand capacity	Competitive Grants	None
Aviation	Airport Terminal Program	IIJA	DOT	Federal Aviation Administration	$5 billion	Grants for airport terminals including replacing aging terminals and airport-owned control towers	Competitive Grants	None
Aviation	Alternative Fuel and Low-Emission Aviation Technology Program	IRA	DOT		$46.5 million	Support projects related to low-emission aviation technologies, a broadly defined term that encompasses any technologies that improve fuel efficiency, increase the utilization of SAF, or reduce aircraft emissions	Competitive Grants	None
Heavy Duty Trucks Buses	Alternative Fuel Refueling Property Tax Credit	IRA	Treasury	IRS	6% base, 30% with added requirements	Tax credits for the cost of an alternative fuel vehicle refueling property. Property must be sited within a low-income or rural censust tract area	Tax Credits	
Cargo Ships Materials Handling	America's Marine Highway Program Grants	IIJA	DOT	Maritime Administration	$25 million	Develop and expand marine highway service options and facilitate their further integration into the current U.S. surface transportation system	Competitive Grants	20%
						Pre-disaster mitigation program supporting states, local communities,		25% typically, 10% for small and

We welcome your feedback on any provisions we may have missed!

Key Findings: Policy & Workforce Development Working Group

Key Findings from the Policy and Workforce Development Working Group

- Connecticut has existing policies intended to enable decarbonization, which provide general ecosystem support hydrogen development
- Connecticut has policies or programs that specifically reference hydrogen, but there is opportunity for policy to be furthered or strengthened
- Best practices point toward the importance of developing a definition of clean hydrogen, to achieve its promise as a tool for decarbonization
- Further policy or regulatory action could help drive the development of an at-scale hydrogen ecosystem, including potential actions that:
  - Provide support for workforce development and labor transitions
  - Incorporate community engagement principles in hydrogen development
  - Encourage general market development
  - Support priority hydrogen end-uses

Summary of Key Working Group Findings

Sources	On-shore and off-shore wind, as well as solar, represent the most abundant and lowest cost sources for hydrogen production in Connecticut. However, compliance with the state's existing decarbonization policy may present competition for limited non-fossil fuel resources.
Uses	Highest priority applications for hydrogen include end uses that are: • Very likely to use hydrogen due to underlying economics • Have the potential to create substantial societal benefits; or • Are end uses where hydrogen is the only known zero-carbon energy source
Infrastructure	Development of a cost-effective hydrogen economy will be dependent on the deployment of at-scale hydrogen infrastructure and offtake opportunities.
Funding	Significant federal funding is available for hydrogen. Connecticut should capitalize on its competitive advantages to maximize access to federal resources.

Connecticut policy provides general ecosystem support for the development of clean hydrogen

- Public Act 22-5 (2022) requires 100% zero emission electricity supplied to electricity customers in the state by 2040.
- Conn. Gen. Stat. 22a-200a. (2019) requires greenhouse gas emission reduction of 45% by 2030, 80% by 2050 below 2001 levels.
- Renewable Portfolio Standard. Sets renewable targets for resources including fuel cells, which are included in the definition of Class I Renewable Resource in Conn. Gen. Stat. 16-1.
- Conn. Gen. Stat. 22a-174-22e (2016) & Conn. Gen. Stat. 22a-174-22f (2016) set limits for NOx of emissions from fuel-burning equipment at major stationary sources of NOx (i.e. combustion turbines).
- Multi-State Medium and Heavy Duty Zero Emission Vehicle MOU. Sets goals to achieve 30% ZEVs by 2030 and 100% by 2050.

Connecticut has limited hydrogen-specific policy, but there are some policies or programs that reference hydrogen

- Special Act 22-8 (2022) Establishes the Hydrogen Power Study Task Force.
- Conn. Gen. Stat. 31-53d. (2022) States that a developer of a 2 MW or greater project shall take all reasonable actions to ensure that a community benefits agreement is entered into and take appropriate actions to ensure a workforce development program is established.
- Conn. Gen. Stat. 16-244y. (2018) Sets a competitive process for EDCs to acquire new fuel cell electricity generation projects with preference given to projects that 1) use utilize equipment manufactured in CT or 2) are sited on brownfields or landfills.
- Conn. Gen. Stat. 16a-3f-h. (2018) States that the DEEP commissioner may solicit proposals from providers of Class I renewable resources (includes fuel cells) to provide a certain percent of EDC load.
- Multi-State Medium and Heavy Duty Zero Emission Vehicle MOU. Sets goals to achieve 30% ZEVs by 2030 and 100% by 2050.
- Conn. Gen. Stat. 13b-38dd. (2020) Directs the development of a zero-emissions buses implementation plan.
- Executive Order 21-3. Directs DEEP to include in the next Comprehensive Energy Strategy, a set of strategies to: (1) provide for more affordable heating and cooling (2) achieve reductions in GHG emissions from residential buildings and industrial facilities; and)3) improve the resilience of the state's energy sector.
- Integrated Resource Plan (2020). Discusses hydrogen as a strategy to reduce in-state emissions.

Within existing legislation there are opportunities for hydrogen to receive funding and incentive opportunities

- Conn. Gen. Stat. 22a-202. (2020) establishes the Connecticut Hydrogen and Electric Automobile Purchase Rebate Board to provide rebates that total at least three million dollars annually.
- Conn. Gen. Stat. 32-7f. (2019) authorizes the CEDC to establish an economic development grants program to expand hydrogen and fuel cell industries.
- Conn. Gen. Stat. 16-245hh. (2019) requires the Connecticut Green Bank to establish a "condominium renewable energy grant program."
- Conn. Gen. Stat. 16-245aa. (2018) requires the Connecticut Green Bank to establish a renewable energy and efficient energy finance program.
- Conn. Gen. Stat. 12-81. (2012) provides property tax exemptions for Class I renewable energy resources and for Level 2 EV charging stations.
- Conn. Gen. Stat. 16-50k. (1971) states that in-state fuel cells of 150 kW or less do not require a CPCN.
- Conn. Gen. Stat. 16-245cc. (2018) states that demand charges for fuel cells are waived if there is power loss due to a problem at a distribution resource or due to off-peak shutdowns of the fuel cell.

Coordinated policy and regulatory drivers are informing and driving public and private sector investment

Definitions

States and Countries are defining clean hydrogen eligibility in similar ways.

Increasingly, definitions based on a carbon intensity range are emerging.

Additional specification focuses on feedstock type (i.e., must be renewable or must be non-fossil fuel).

Legislation

In the last 3 years, hydrogen specific legislation has skyrocketed. Hydrogen bills have typically been focused on a particular end use, such as:

Mobility
Gas and Electric Generation
Industrial Uses

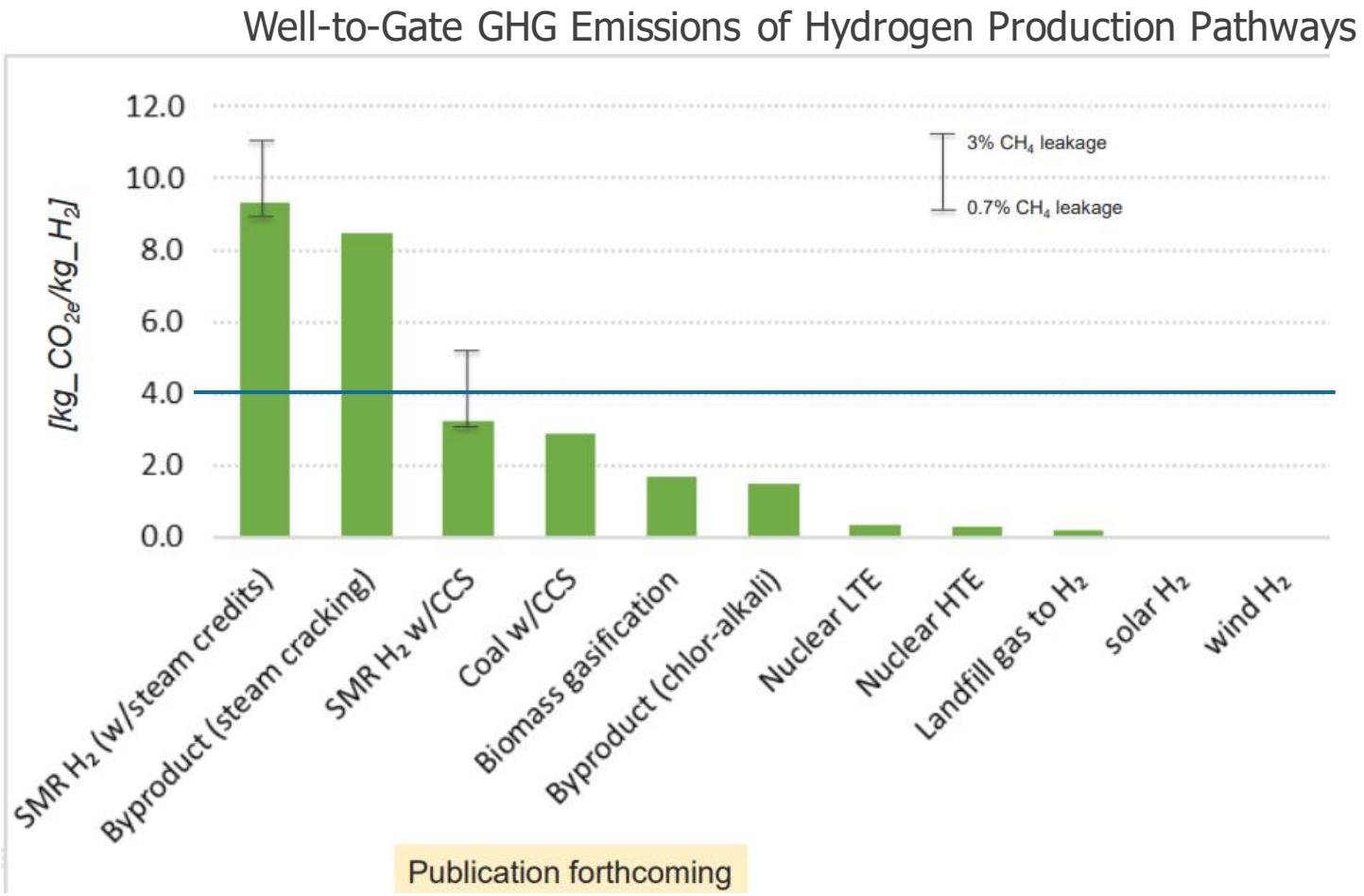
A smaller set of hydrogen related bills provide specific grant funding, authorize specific studies, or address safety provisions

Market Development

Over 50 public and private renewable hydrogen activities have been identified, with this number growing every week. This includes research studies, pilots, demonstrations, and full-scale deployment.

Key topics include production, pipeline injection and distribution, power generation, and LDES.

Hydrogen can only achieve its promise as a decarbonization tool if the full lifecycle production of hydrogen produces de minimis GHG emissions



Clean Hydrogen Production Standard limit

Source: Argonne National Laboratory: GREET Model for Hydrogen Life Cycle GHG Emissions (June 15,

States and national governments are beginning to adopt definitions for clean, renewable, or green hydrogen

	Hydrogen Type (e.g. clean, renewable, green)	Based on a carbon intensity calculation	Technology agnostic (e.g. includes biomass, biogas, electrolysis, nuclear)	Electrolysis with renewables only	Excludes use of fossil fuels
US DOE	Clean	X	X		
Montana	Green		X		X
Washington State	Renewable		X		
Oregon	Renewable		X		X
Australia	Clean		X		
Canada	Green			X	X
Canada	Low Carbon Intensity	X	X		
Chile	Green			X	X
France	Renewable	X		X	X
France	Low Carbon	X	X		
Germany	Green			X	X
Sweden	Renewable/Clean		X		
CertifHy	Green	X	X		X
CertifHy	Low Carbon	X	X		

A carbon intensity-based definition removes the ambiguity with the "colors of hydrogen"

From complexity
(hydrogen colors)

To one indicator based on CI
(e.g., kgCO2e/kgH2, gCO2e/MJ…)

- **A carbon intensity framework is a technology-neutral approach** to assessing the GHGs associated with hydrogen production. It opens the debate about competition between various hydrogen production routes that meet the required carbon intensity at the least cost.
- A carbon intensity framework can adopt a **threshold** and **certification scheme** to rigorously account for GHGs arising both at the site of production and upstream of production.

Key Considerations for a Carbon Intensity-Based Definition

- Is it based on a quantifiable methodology?
- What is the hydrogen production CO2e threshold?
- Does it consider the lifecycle impacts?
- Does it support technology-neutrality?
- How will it be certified?

Federal guidance from the proposed Clean Hydrogen Production Standard has established "clean hydrogen" as that with less than 4 kg of CO_2e/kg H_2 on a lifecycle basis (well-to-gate).

Workforce Development Findings

Community outreach is beneficial for developing local workforce capability and engagement with community leaders and groups provides additional pathways to involve traditionally underrepresented populations in training or upscaling efforts.

Community benefit agreements are a critical tool for creating local job opportunities. Key provisions can include commitments to use the local workforce, offer prevailing wages, and partner with existing apprenticeship and training programs.

Existing training programs, such as those offered through the Connecticut State Building Trades Training Institute, are in place to aid in workforce transition and provide a framework through which training can be deployed and potentially expanded as appropriate to include new skillsets related to the development of hydrogen projects.

The fuel cell and insurance industries have a strong presence in the state and the University of Connecticut has deep expertise in hydrogen technologies, which can be leveraged for developing necessary future workforce capabilities.

Draft Recommendations

Recommendations cover actions that can be taken in Connecticut to support hydrogen deployment and development in the state

Legislature	State Government Agencies	Industry & Academia
+ Address required changes to statute and tax codes + Create transparency regarding hydrogen development and funding + Consider funding for necessary community engagement and to support federal match	+ Conduct further investigation related to hydrogen production, infrastructure, and end uses + Identify and expand relevant incentives or programs + Evaluate additional funding needs + Provide transparency and promote community engagement	+ Pursue federal funding opportunities + Identify opportunities to support development of the hydrogen workforce + Advance technological research

Recommendations are still draft! We will continue to refine recommendations based on feedback through the December Working Group meetings.

Actions to be taken by the Legislature

- Community Engagement and Resources
  - Create a transparent source for municipalities, cities, and other local applicants to access resources, such as match funding and/or application guidance.
  - Provide funding to increase community engagement and decrease burden of engagement on communities.
  - Consider amending requirements for community benefit agreements, through Public Act 21-43, to lower the minimum project size from 2 MW to 1 MW.

- Support for High Value End-Uses
  - Consider appropriating grant funding to support federal match requirements and multi-sector enabling infrastructure, such as public-access fueling stations for trucks, commuter buses, ports, and material handling equipment, etc.
  - Consider tax exemptions for hydrogen vehicles and critical facilities that produce or use clean hydrogen.
  - Evaluate broader policies that would ensure the decarbonization of hard-to-electrify sectors, including aviation, shipping, and industrial processes.

Actions to be taken by State Government Agencies

DEEP

Focus on activities core to energy and environmental planning for the state.

PURA

Address opportunities to incorporate hydrogen into EDC planning

DECD

Support the suite of brownfield funding opportunities.

OWS

Address hydrogen-related workforce development needs.

DEEP's role in energy and environmental planning will be a key enabler for a state-wide vision for clean hydrogen

- Hydrogen Production
  - Conduct further investigation to ultimately establish a definition of clean hydrogen that would be most appropriate for Connecticut.
  - Continue to evaluate the sufficiency of zero-emission electricity sources to meet both electric sector decarbonization goals and hydrogen production targets.
  - Consider accounting mechanisms that encourage hydrogen producers to certify the carbon intensity of produced hydrogen.

- Hydrogen End Uses
  - Consider further investigation and the possibility of focused policy and market development support for clean hydrogen production and use in the highest priority end uses.
  - Consider further investigation into high priority hydrogen end uses and the possibility of coordinating support measures with other hydrogen efforts.
  - Explore market-based approaches to incent reductions in the carbon intensity of fuels.
  - Identify and potentially expand clean transportation incentives to include on-site port handling equipment, harbor crafts, and ocean-going vessels in collaboration with other state and federal agencies.

- Ecosystem Engagement
  - Lead interagency and interstate coordination on hydrogen policy development and funding, potentially including the development of a Connecticut hydrogen roadmap and research strategy.
  - Solicit feedback and guidance from the Connecticut Equity and Environmental Justice Advisory Council (CEEJAC) to advance community impact, environmental justice, and energy equity discussions on hydrogen and to support the development of a framework that outlines both a vision and goals for CT's clean hydrogen policies.
  - Develop a state-wide vision for a clean hydrogen backbone and infrastructure development plan in Connecticut, through consultation and engagement with ecosystem stakeholders.

State government agency action is required to determine how to incorporate hydrogen into appropriate planning venues coordinate hydrogen funding and workforce development

PURA

- Evaluate the role of stationary fuel cells for critical backup power and peak power generation and identify approaches to incorporate recommendations into appropriate planning venues.
- Consider whether existing renewable energy, flexible and/or interruptible load tariffs could be applied to electrolytic hydrogen production and determine if a specific electrolytic tariff would be required.

DECD

- Evaluate the need for additional funding for Brownfield Loan and Grant programs to help meet the clean energy needs of the state and its subsequent land requirements.

OWS

- Lead coordination between existing entities to establish a comprehensive program for engagement with local experts to understand workforce development needs and potential specific to hydrogen.
- Partner with local universities with expertise in hydrogen technologies to further advance the development of a skilled hydrogen workforce.

Interagency coordination will be required to address hydrogen infrastructure, safety, and community protection

Infrastructure

DEEP and PURA may wish to consider promoting the use of hydrogen end uses that are currently commercially viable through the existing clean energy programs. Consideration should include how any changes would affect the programs' existing objectives and cost-effectiveness.

DEEP and DECD should continue maintaining the Connecticut Brownfields Inventory as a resource for potential developers to identify prospective project sites.

Permitting and Safety

DEEP should clarify and work with relevant agencies and stakeholders to explore the acceleration of permitting for hydrogen infrastructure.

State agencies should identify appropriate leads to coordinate on hydrogen safety with local and federal organizations to allow for alignment and clear flow on best practices, policy developments, trainings, and certifications

Community Protection

DEEP and PURA should consider implementing an intervener compensation program to increase community participation in hydrogen-related proceedings.

DEEP and DECD should continue supporting development of clean energy projects on brownfields and projects that have community support and/or have completed community benefits agreements.

Industry and academia will play a key role in developing the hydrogen workforce and supporting ecosystem development

- Eligible entities should pursue federal funding for manufacturing capabilities for electrolyzers and fuel cells, to further advance development in the state.
- Regarding hydrogen infrastructure insurance, steps should be taken to ensure clear rules and policies for hydrogen infrastructure to support insurance industry workforce opportunities.
- UCONN should identify opportunities to support development of the hydrogen workforce and advance research and development in hydrogen electrolyzers and fuel cells, and should identify resources and funding needs to implement

Next Steps

Upcoming Task Force Milestones

Date	Description
Dec. 15 – 20, 2022	Final Working Group Meetings • **Funding:** Dec. 15 from 10:30 am to Noon • **Policy & Workforce Development:** Dec. 15 from Noon to 1 pm • **Infrastructure:** Dec 19 from 3 pm to 4 pm • **Sources & Uses:** Dec 20 from 1 to 2:30 pm
Dec. 16, 2022	Distribution of Draft Final Report for Task Force Review
Dec. 23, 2022	Task Force Feedback Due on Draft Final Report
Jan. 6, 2023	Final Report Text Distributed to the Task Force
Jan. 10, 2023	January Task Force Meeting (Vote out on final report)
Jan. 15, 2023	Report Due to the Legislature

Working Group Meeting Schedule

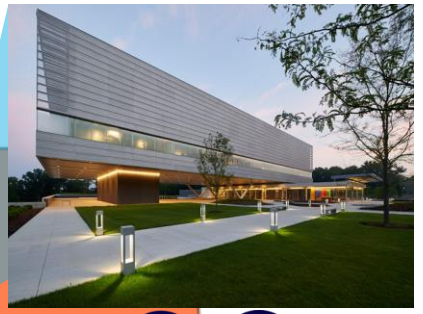
	September	October	November	December
Funding	9/27 4-5pm	10/26 10:30am-12 pm	11/18 10:30am-12 pm	12/15 10:30am-12:00 pm
Infrastructure	9/28 2-3pm	10/24 2-3pm	11/17 3-4pm	12/19 3-4pm
Policy & Workforce Development	9/26 3-4pm	10/20 12-1pm	11/29 12-1pm	12/15 12-1pm
Sources	9/27 1-2pm	10/25 2-3:30pm	11/17 11am-12pm	12/20 1-2:30pm
Uses	9/27 12-1pm		11/22 12-1pm	

Public Comment

Engage

Organizing Tours of Various Facilities

FuelCell Energy



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Next Meeting – January 10, 2022

Dial-In
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Access Code: 781 548 359#

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Meeting ID: 276 913 467 857
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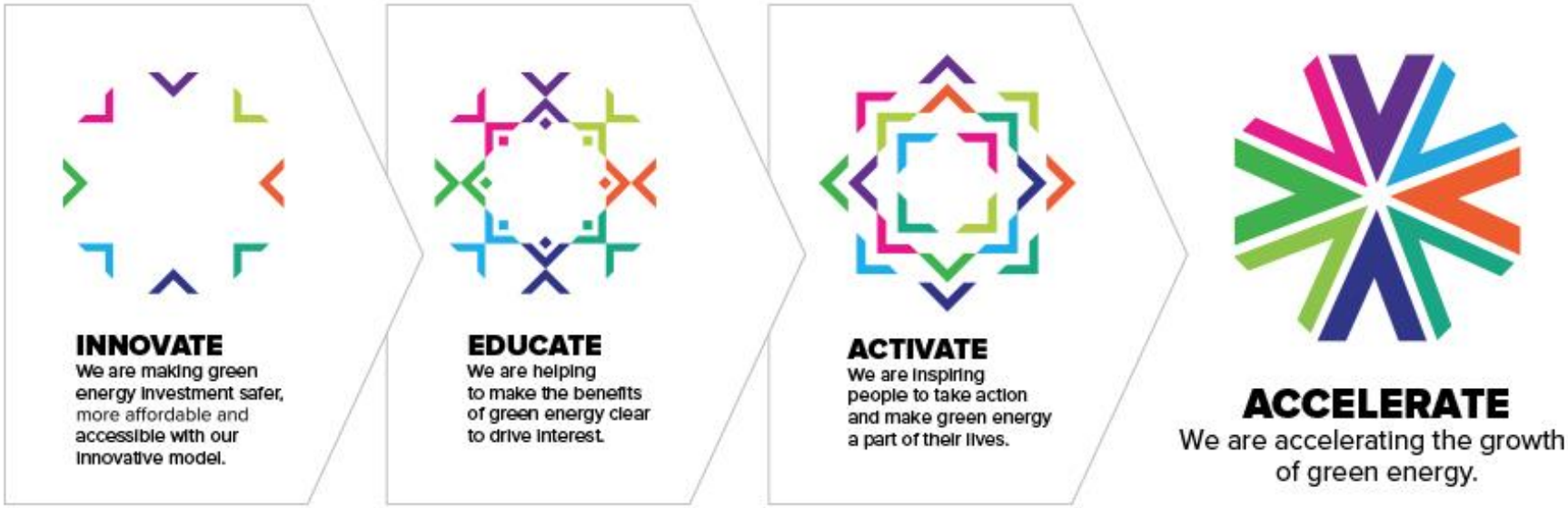
In Person
TBD



For access to Task Force materials, visit:

www.ctgreenbank.com/hydrogentaskforce

Thank You

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