# 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

November 8, 2022

**Online and In-Person Meeting**

Dominion

# Agenda

- **Welcome and Introduction by Dominion**– 5 min
- **Approval of Meeting Minutes of October 11, 2022** – 5 min
- **Task Force Logistics** – 5 min
- **Environmental Justice and Equity – A Discussion with the Connecticut Roundtable on Climate and Jobs** – 30 min
- **Working Group Updates** – 1 hour
- **Public Comments** – 15 min
- **Dominion Millstone Tour** – following meeting

# Welcome and Introduction by Dominion

# Dominion Energy Nuclear Connecticut

## Overview Presentation | November 2022

## Millstone Power Station

**Waterford, Connecticut**

# At Millstone Power Station, Safety Comes First

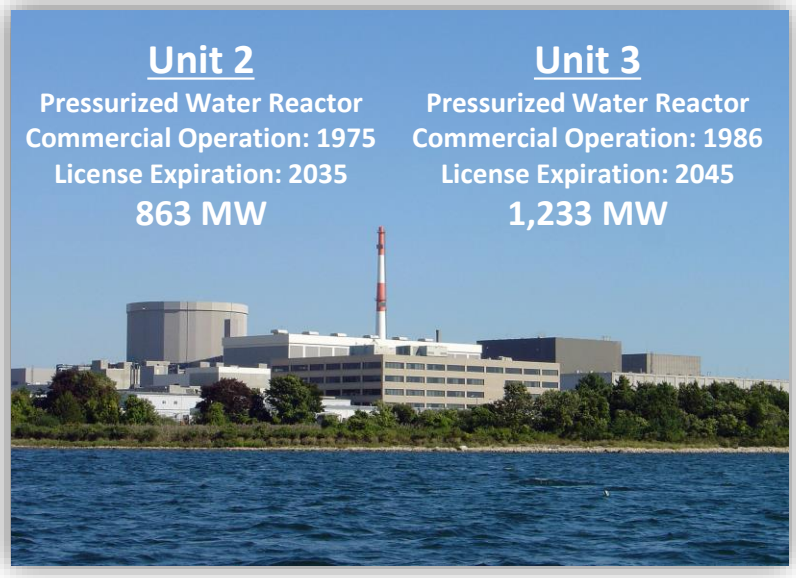
- Millstone was designed and built and is operated and guarded with **multiple, redundant layers of safety and security**
- Operators are licensed by the independent U.S. Nuclear Regulatory Commission (NRC) and spend **20% of their time** in a continuous training regimen that includes sessions in full-scale control room simulators
- Millstone's Emergency Preparedness program is **highly coordinated and rigorously tested**, involving station personnel and local, state, and federal agencies
- Millstone has been recognized by the nuclear industry for its **exemplary performance**




Dominion Energy

# Millstone Power Station Is the Foundation for a Clean, Affordable, and Reliable Electric Grid

- Millstone is a **2,100 MW** nuclear power station that produces 16 to 17 million megawatt-hours of **carbon-free** electricity each year
  - Represents the largest carbon-free resource in New England
  - Accounts for more than 90 percent of the carbon-free power produced in Connecticut
  - Prevents more than four million tons of carbon dioxide from being released into the atmosphere each year




**Note**: In 2019, total retail sales of electricity in Connecticut were roughly 28 million megawatt-hours. https://www.eia.gov/electricity/state/Connecticut/.

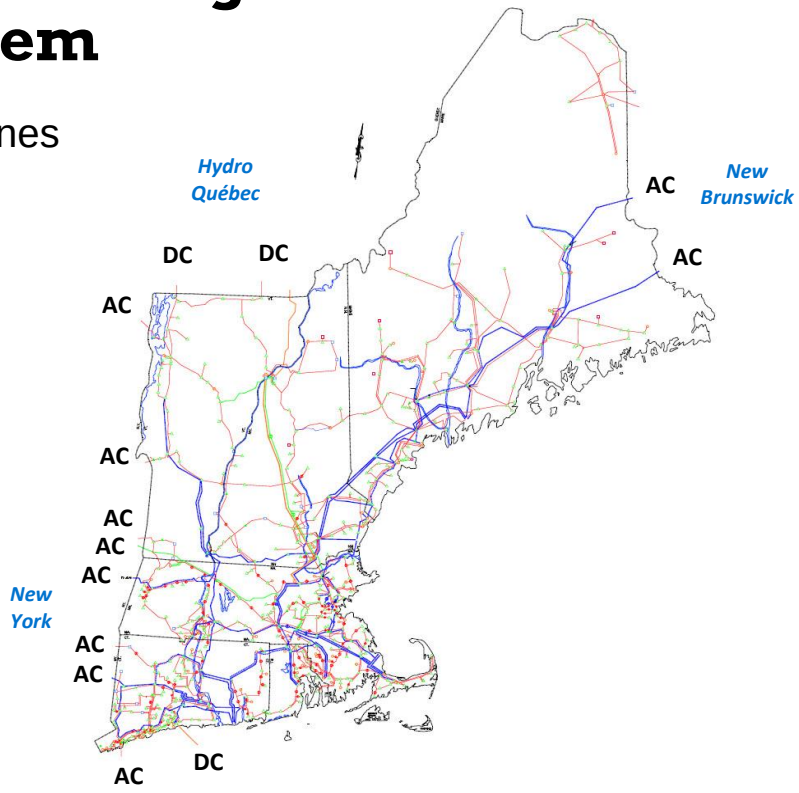
Source: https://www.iso-ne.com/static-assets/documents/2022/04/2022_celt_report.xlsx



Dominion Energy

# Millstone Is Interconnected to New England's High-Voltage Transmission System

- More than **9,000 miles** of high-voltage transmission lines crisscross the New England region
- 13 transmission lines connect New England to **neighboring power systems** in New York, Québec, and New Brunswick
  - 16% of the region's energy needs were met by imports of power in 2021
- More than **350 generators** are connected to the high-voltage transmission system with roughly **32,000 MW** of total generating capacity
- The flow of power is managed by the region's grid operator **ISO New England**



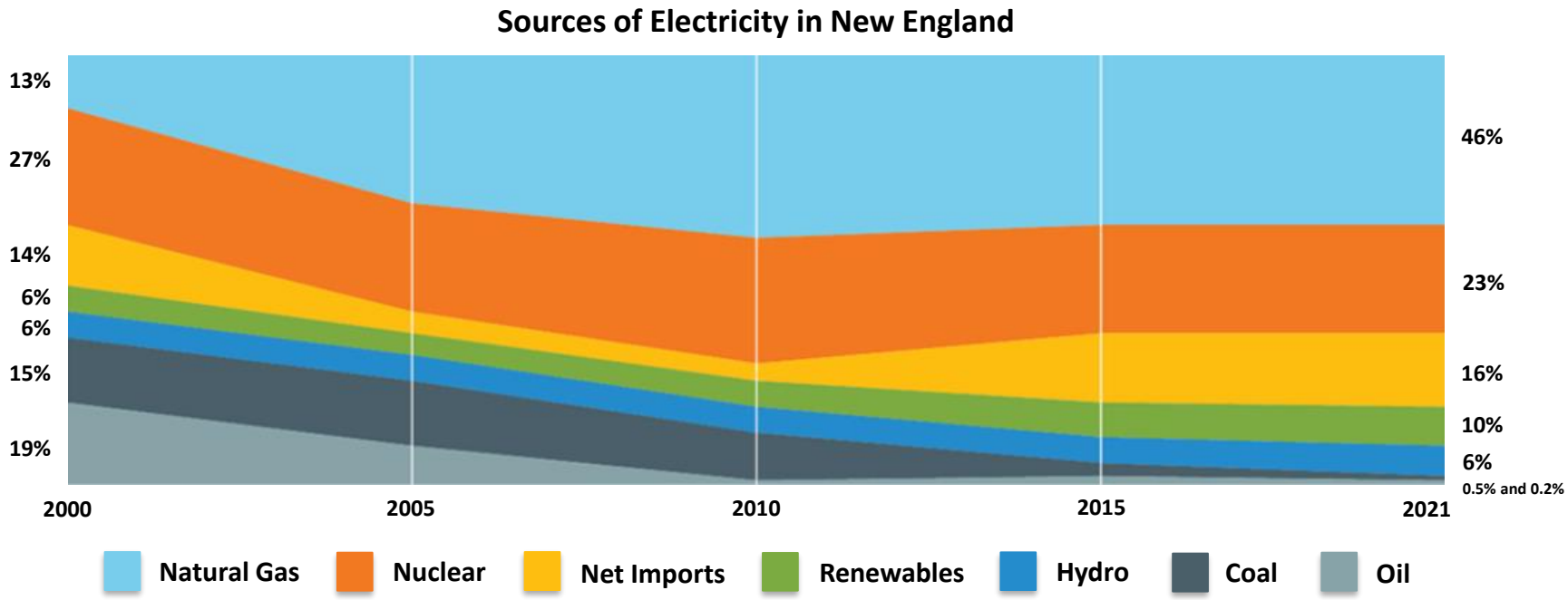



November 8, 2022

**Source**: https://www.iso-ne.com/about/key-stats/maps-and-diagrams

Dominion Energy

# Carbon-Free Nuclear Power Is An Important Part of the Resource Mix in New England






**Source**: ISO New England Net Energy and Peak Load by Source Report
https://www.iso-ne.com/isoexpress/web/reports/load-and-demand/-/tree/net-ener-peak-load

Dominion Energy

# Dominion Energy Is Proud to Partner with Connecticut in Achieving its Ambitious Carbon-Reduction Goals

- After a competitive procurement process for **zero-carbon resources**, Dominion Energy executed long-term power purchase agreements with the state's investor-owned utilities for **nine million megawatt-hours** of Millstone's energy each year (≈ 55% of output)
  - Millstone's carbon-free energy and 100% of the plant's environmental attributes are locked in at a **low, fixed price** of 4.999 cents per kilowatt-hour (cents/kWh) for 10 years
  - Millstone continues to be one of the **lowest-cost**, **carbon-free** resources procured by CT to date

Press Releases

STATE OF CONNECTICUT
GOVERNOR NED LAMONT

09/18/2019

Governor Lamont Applauds PURA Approval of Millstone Contract Between Dominion, Eversource, and United Illuminating

(HARTFORD, CT) – Governor Ned Lamont is applauding the approval of a contract today by the Public Utilities Regulatory Authority (PURA) between Dominion Energy, owner of the Millstone Nuclear Facility, and Eversource and United Illuminating, the state's two electric distribution utilities, regarding the future of Millstone. The governor said the decision is good news for the region's grid, the environment, the state's economy, and ratepayers.

"Had this contract not gone forward, the facility would be in danger of closing down which would have increased greenhouse gas emissions by 25 percent across the New England region," **Governor Lamont said**. "This important step keeps Connecticut and all of New England from back sliding on addressing climate change. Now we can renew our focus on offshore wind and other renewable energy resources to fully transition to a clean energy grid by 2040."

The contract requires the utilities to purchase approximately 50 percent of Millstone's output, or 9 million MWH/year, for ten years, starting this year. The contract confers to Connecticut 100 percent of the plant's environmental attributes. The Connecticut Department of Energy and Environmental Protection (DEEP) selected the contract in last year's zero carbon RFP.



Source: https://portal.ct.gov/Office-of-the-Governor/News/Press-Releases

Dominion Energy

# Key Takeaways

- Millstone produces 16 to 17 million megawatt-hours of carbon-free electricity each year – the largest carbon-free resource in New England
- Millstone's energy is locked in at a low, fixed price through 2029
- Dominion Energy wants to secure Millstone's future and expand its role as the clean energy hub of Connecticut and New England

Dominion Energy is leading a consortium of industry participants in the construction of the first **Jones Act-qualified** offshore wind turbine installation vessel.

*Charybdis* is expected to be sea ready by late 2023 and first deployed out of State Pier in New London to support offshore wind projects being developed by Ørsted and Eversource.

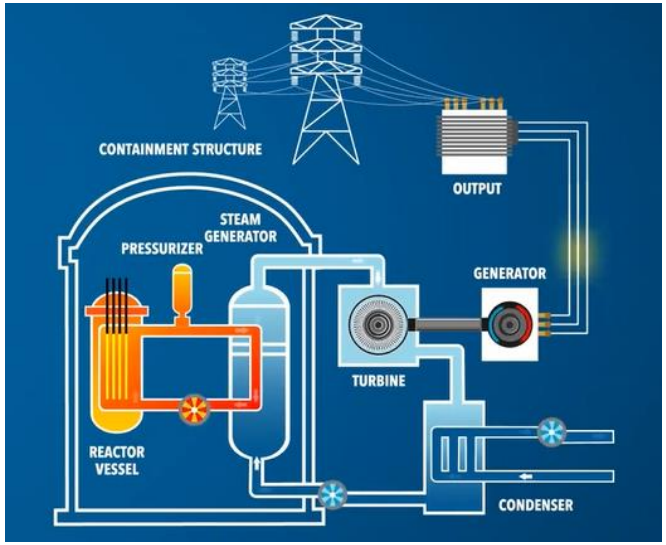



Dominion Energy

# How Carbon-Free Nuclear Power Is Generated at Millstone Power Station

- Nuclear power is generated through a process called **nuclear fission**
- During nuclear fission, a neutron collides with a uranium atom and splits it apart, releasing a large amount of energy in the form of heat
- Heat is used to produce steam to spin a turbine, which drives a generator to make electricity
- Because nuclear power plants do not combust fuel, they do not produce greenhouse gas emissions

**Pressurized Water Reactor**




Note: More than 65% of commercial reactors in the U.S. are pressurized water reactors.
https://www.eia.gov/energyexplained/nuclear/nuclear-power-plants-types-of-reactors.php

An atom has a nucleus (or core) containing protons and neutrons, which is surrounded by electrons. Protons carry a positive electrical charge, and electrons carry a negative electrical charge. Neutrons do not have an electrical charge. Enormous energy is present in the bonds that hold the nucleus together. This nuclear energy can be released when those bonds are broken. The bonds can be broken through nuclear fission, and this energy can be used to generate electricity. See https://www.eia.gov/energyexplained/nuclear/ for more information on the basics of nuclear power.



Dominion Energy

# Approval of Meeting Minutes of October 11, 2022

# Task Force Logistics

# Task Force

## Still Waiting on Two Political Appointee Members

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

# Upcoming Task Force Meetings

**December 13**

- Discussion of Draft Final Working Group Findings and Recommendations
- Environmental and Climate Justice Fireside Chat
- Tour of Facility – HyAxiom

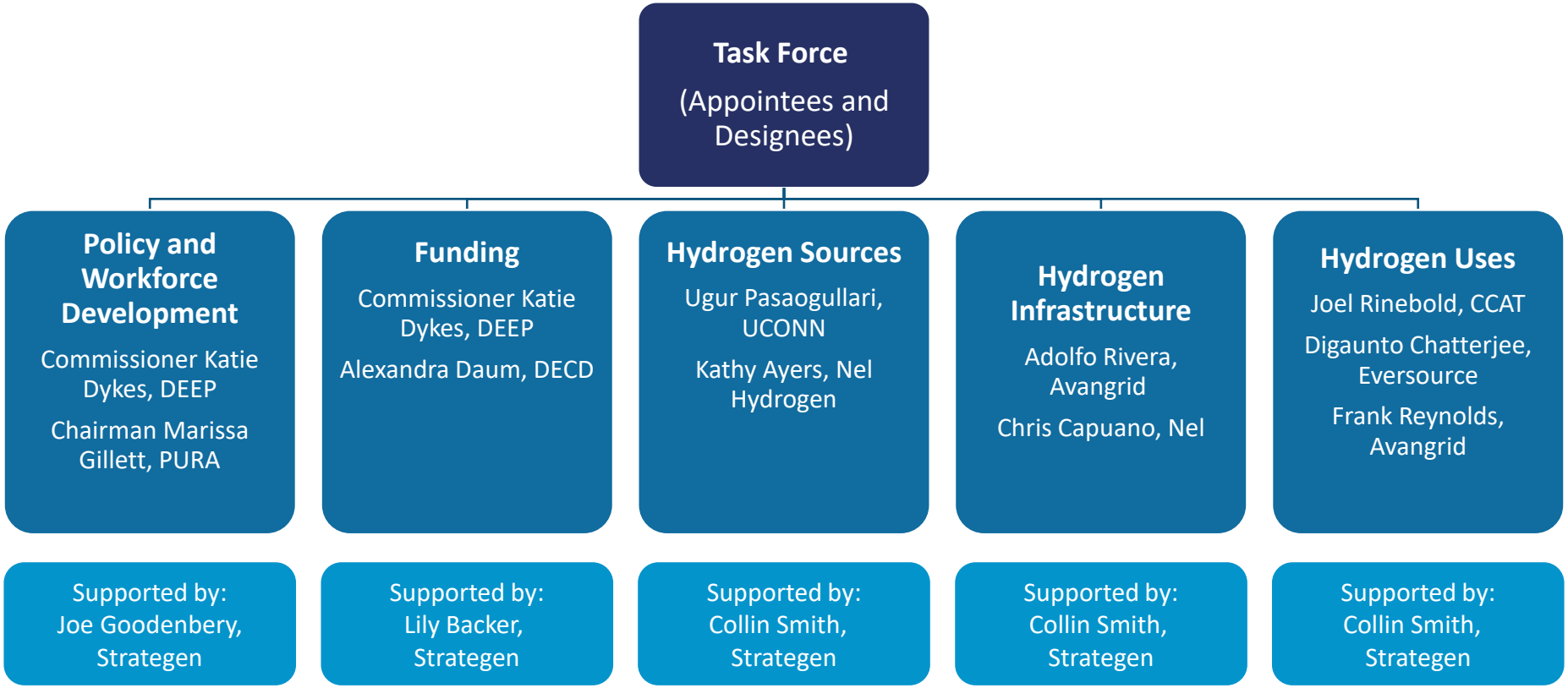
**January 10**

- Task Force Planning for Report Submission
- Tour of Facility – TBD

# Environmental Justice and Equity – A Discussion with the Connecticut Roundtable on Climate and Jobs

# Working Group Updates

# Working Groups are Coordinated and Supported by Strategen



# Public Working Group Meetings Are Held Monthly

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

Please reach out to Jennifer Gorman (jgorman@strategen.com) to get involved.

# 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.

# We have identified a series of research activities intended to help fulfill the legislative directives of Special Act 22-8

- Policy Guiding Principles (Policy & Workforce Development): establish a common approach to policy recommendations that ensures findings are aligned with existing state statute and goals (Supports Objective 1)
- Hydrogen Policy Assessment (Policy & Workforce Development): provide an overview of existing CT policy and policy needs that can be informed by the activities of other states (Supports Objective 1, 2)
- Assessment of the Brownfield Grants and Loan Program (Funding): develop an understanding of incentives for hydrogen developments on brownfields (Supports Objective 4)
- Toolkit of Hydrogen Incentives (Funding): understand the suite of federal and state level funding that is available to support hydrogen development (Supports Objective 3, 5)
- Clean Hydrogen Production and End Use Potential Analysis (Sources & Uses): assess gaps in hydrogen supply and demand needs (Objective 6, 7)
- Geographic Analysis of Infrastructure (Infrastructure): provide an understanding of infrastructure needs and proximity of existing infrastructure to hydrogen supply and demand sources (Supports Objective 5)
- End Use Prioritization Framework (Uses): assess the feasibility and relative importance of hydrogen end uses (Supports Objective 7)

# Uses, Sources, and Infrastructure Workgroups will identify priority focus areas for additional research by the Policy and Funding Workgroups

The Uses, Sources, and Infrastructure Workgroups have:

+ Developed a high-level framework for prioritizing end uses applications that warrant additional consideration
+ Created preliminary estimates of hydrogen production costs from different types of renewable energy, and provided comparisons to fossil fuel costs
+ Started to assess levels of clean hydrogen supply, as well as demand from potential end uses for hydrogen

Policy and Funding Workgroups will leverage these findings to evaluate actions needed to enable cost-effective and scaled deployment:

+ Where is additional stakeholder engagement and policy action needed to enable near-term deployments?
+ Where could state or federal funding significantly impact cost-effectiveness?
+ What actions should be taken directly by the legislature versus state agencies?
+ Where can action be taken through existing policymaking venues, and where might new venues be needed?

# High-level prioritization of opportunities will be helpful to ensure appropriate focus and attention

- **State and regional efforts will have resource and time constraints impacting their engagement on hydrogen hub and other deployment activities**
  - Funding, regulatory resources, convening opportunities, and stakeholder engagement support are all in high demand to facilitate regional hub activities
- **The ability to identify areas of highest interest for near-term action will help to enable targeted engagement in priority areas**
  - If we recommend too many actions or priorities, we may dilute meaningful action on tangible, high-value opportunities
- **Lower prioritization should not be taken as a lack of opportunity! Hydrogen strategy and deployment will be a multi-year process, we just need to figure out where to get started today**

**Accordingly, we are seeking to identify a set of highest priority opportunities that the funding and policy workgroups can further pursue. We are not seeking to prohibit or prevent progress on other use cases, but rather provide direction on where to prioritize effort and engagement**

# Use Cases were evaluated on against multiple criteria, and on stakeholder preferences

**Cost-Competitiveness**
Is H2 the most cost-effective way to decarbonize this end use?

**GHG Reduction**
What portion of CT's carbon emissions does this end use represent?

**Commercial Readiness**
When could hydrogen start to be deployed for this end use?

**Infrastructure Requirements**
How much ancillary infrastructure would need to be developed?

**Environmental Justice**
How would hydrogen use impact disadvantaged and frontline communities?

**Workforce Development**
How would hydrogen use impact local workforce needs?

**Resilience Value**
What would be the value of improving resilience via a more diversified fuel supply?

**Safety Regulation**
What additional safety procedures would need to be developed?

Use case prioritization also incorporated stakeholder feedback on:

- Potential AQ Emissions and impact on disadvantaged communities
- Alignment with state policy and environmental goals
- Industry engagement or market development activity
- Workforce development opportunities

# Use Cases Have Been Prioritized by Potential for Societal Benefits

## Highest Priority for Additional Investigation

- Focused on end uses that:
  - Are very likely to use hydrogen due to underlying economics
  - Create substantial societal benefits (e.g. GHG reduction, workforce development)
- Proposed end uses include:
  - Critical facilities (24-hour backup need)
  - Aviation (long- and medium-haul)
  - Cargo ships
  - Material handling equipment (w/ long uptimes and charging space constraints)
  - Long-haul heavy duty trucks
  - Fuel cells for peak power generation
  - High heat industrial processes

## High Priority for Additional Investigation

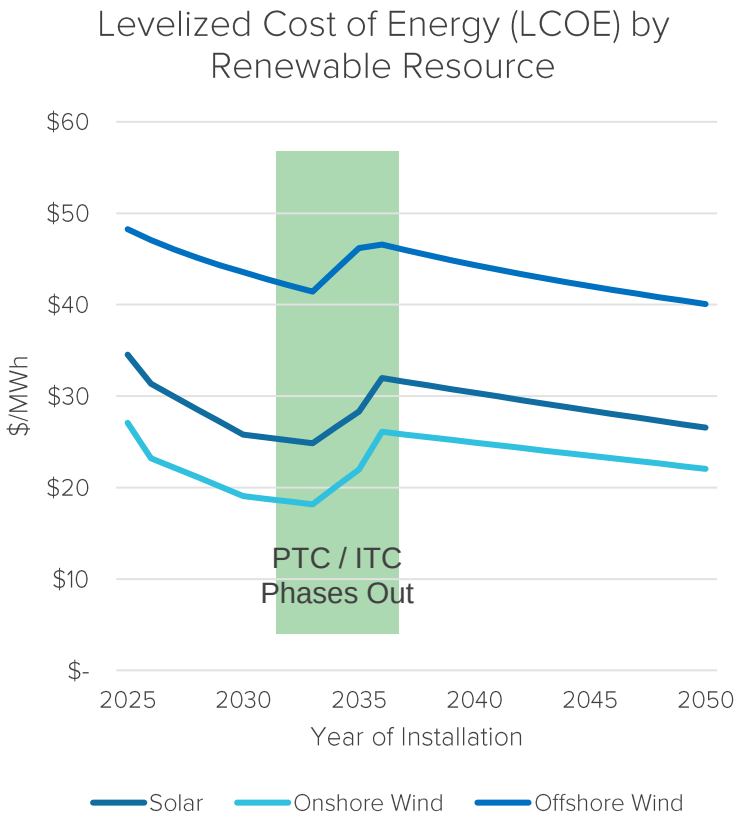
- Focused on end uses that:
  - Have a strong financial case for hydrogen use
  - Create societal benefit, but on a smaller scale due to size of industry
- Proposed end uses include:
  - Long-distance bus routes
  - Ferries
  - Freight rail
  - Fleet vehicles with long uptimes and specific refueling locations
  - Hydrogen blending in natural gas pipelines for non-core customer (i.e. power generation and industrial heat)

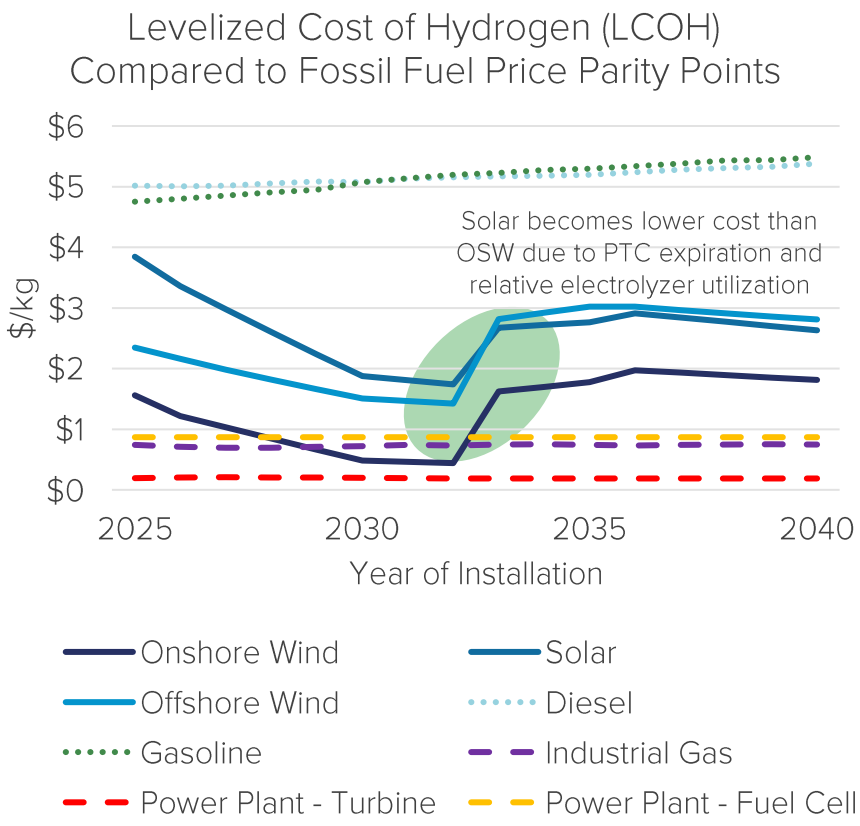
## Other Valuable Applications

- Focused on end uses that:
  - Can be kept “in view” as economics of hydrogen vs. alternatives develop
  - Could provide additional opportunities for market development
- Proposed end uses include:
  - Hydrogen blending for commercial and residential customers
  - Commuter buses
  - Heavy duty trucks with lower daily driving ranges
  - Privately-owned light-duty vehicles
  - Low heat industrial processes
  - Short-haul aviation

A technical assessment considered a wide range of applications connected to the identified end uses (e.g. commuter rail, short-range harbor craft, forklifts with shorter uptimes) but research suggested that these end uses present stronger cases for electrifications due to economics and technological development.

# Preliminary sources analysis provides insights into hydrogen's cost-competitiveness against fossil fuels



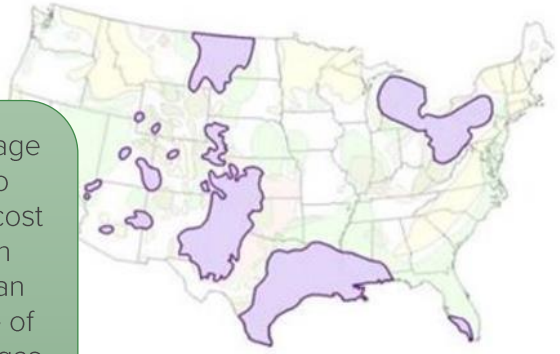



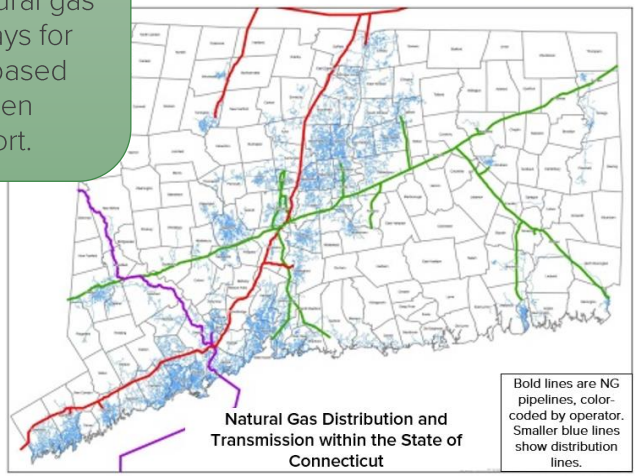

Solid lines show cost of hydrogen produced from different feedstocks for projects. Dashed lines show required H2 price to be competitive with equivalent fossil fuel by energy content. Hydrogen costs represent LCOH at point of production and excludes additional costs from transportation or delivery infrastructure.

# The Infrastructure Working Group has focused on the role of enabling storage and transport infrastructure

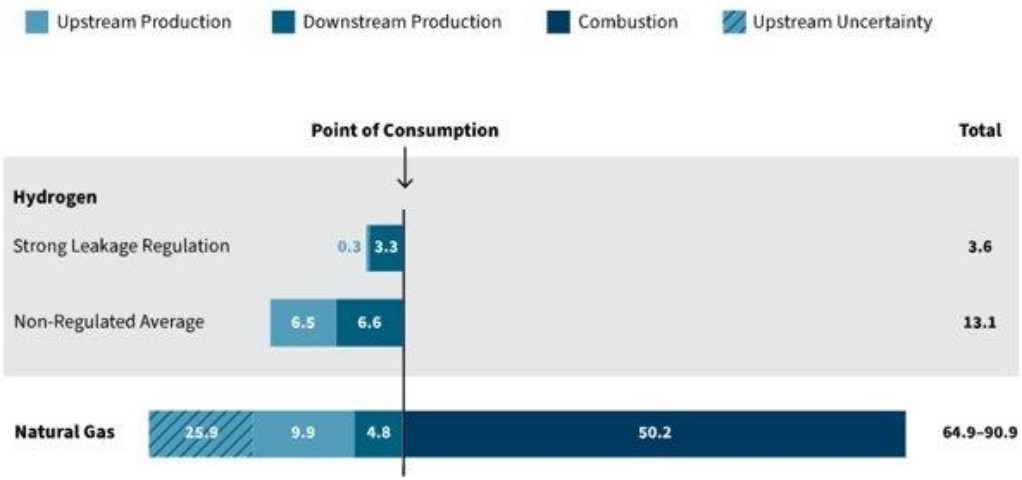
Salt cavern storage is expected to provide lowest cost bulk hydrogen storage, and can take advantage of existing natural gas right of ways for pipeline-based hydrogen transport.

Known Salt Deposits in Continental U.S.






Green Hydrogen and Natural Gas Supply Chain Leakage (g $CO_2$e/MJ)




A growing body of research shows hydrogen can have an indirect climate warming impact. Analysis shows that hydrogen leakage rates are lower than natural gas, but strong regulation is needed to minimize leakage and maximize climate benefits.

Sources: RMI (2022), https://rmi.org/hydrogen-reality-check-1-hydrogen-is-not-a-significant-warming-risk/; Lord et al. (2014). Geologic storage of hydrogen: Scaling up to meet city transportation demands. Int. J. Hydrogen Energy, 39, 15570-15582; https://portal.ct.gov/PURA/Gas-Pipeline-Safety/What-transmission-pipelines-serve-CT

# The Policy and Funding workgroups will carry forward the Uses & Sources findings into concrete actions

| Determination of Priority End Uses | Identification of Potential Existing Funding Avenues | Assessment of Necessary Additional Policy Support |
|---|---|---|
| Focused on end uses that:<br>• Are very likely to use hydrogen due to underlying economics<br>• Create substantial societal benefits (e.g. GHG reduction, workforce development) | • What existing state and federal funding can be deployed to support hydrogen infrastructure development?<br>• Where are the priority areas to begin initiating processes to access additional funding sources?<br>• What steps should Connecticut take to be most competitive in pursuing federal funding opportunities? | • Where can policy action jump-start cost effective adoption of hydrogen for highest priority use cases?<br>• What rules and regulations would need to be clarified in order to fund and facilitate deployment?<br>• Where can policymaking processes help to drive consensus around no-regret investments?<br>• What best practices from other jurisdictions could be relevant?<br>• What are the best policymaking venues to pursue policy action? |

# Stakeholders have shared important perspectives that will be incorporated into final report findings

We've heard thematic areas of feedback from stakeholders around the following topics:

+ The hydrogen economy is nascent; it is important to support a wide portfolio of potential hydrogen end uses and sources
+ Hydrogen could be an important part of our decarbonization toolkit, but we need to be careful not to invest in harmful or low-value end uses; or to slow the deployment of other necessary decarbonization investments
+ There is an imperative to ensure that hydrogen is truly a decarbonization solution, and we must focus on non-fossil sources for hydrogen production and minimizing reliance on carbon-based electric sources
+ Hydrogen investment represents a significant opportunity for our communities; a significant focus on workforce and environmental impacts is critical to ensure that these investments create benefits across the state
+ The legislation establishing the Task Force calls out the study of hydrogen in the state's "economy and energy infrastructure," so workforce development and compatibility with existing infrastructure should be primary areas of focus when prioritizing end uses for additional consideration
+ There is a lot that we're still learning about hydrogen, and we don't want to rush into any major investment or policy decisions without understanding the broader ramifications, especially for large interconnected systems like the natural gas pipeline system
    + Safety and emissions are salient concerns for hydrogen blending and must be effectively studied and addressed

# Stakeholder Engagement has Reinforced the Need for Feedback

- **Thank you to our engaged stakeholders!**
  - Engagement in Working Group and Task Force meetings has been critical to developing the findings and process that we're sharing today
  - We recognize that different stakeholders have different perspectives on these issues, and we appreciate the productive and thoughtful dialogue
- **We believe that is essential to the objective and legislative mandate of this Task Force to understand and represent stakeholder feedback**
  - Hydrogen has the potential to significantly impact the state's economy and energy infrastructure; we believe it is important to reflect stakeholder views and preferences on how the state should pursue opportunities and implement changes
- **The Task Force intends to issue a Request for Written Comment to better capture stakeholder feedback and incorporate into the final report, to be due Dec 9**

# We are intending to continue to solicit stakeholder feedback via Request for Written Comment

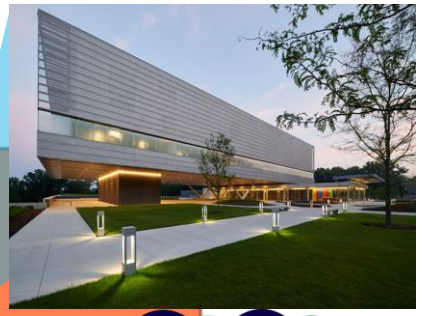
- **Green Bank intends to issue a Request for Written Comment to provide opportunity for stakeholders to offer written feedback on Task Force and Working Group findings to-date and potential next steps**
- **These questions are expected to cover topics including:**
  - Defining Hydrogen
  - Stakeholder Engagement and Equity
  - Hydrogen Supply
  - Hydrogen Infrastructure
  - Hydrogen Funding and Policy Activities
- **Responses will be due December 9th**

# Public Comment

# Engage

## Organizing Tours of Various Facilities

FuelCell Energy



C2E2 Center for Clean Energy Engineering


HyAxiom
A Doosan Company

PROTON PART OF nel ON SITE

Dominion Energy

# Next Meeting – December 13, 2022

**Dial-In**
(949) 346-4134
Access Code: 781 548 359#

**Webinar**
Click here to join the meeting
Meeting ID: 276 913 467 857
Passcode: QgeLuG

**In Person**
HyAxiom
195 Governors Hwy
South Windsor, CT 06073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For access to Task Force materials, visit:

www.ctgreenbank.com/hydrogentaskforce


# Thank You

**Connecticut Green Bank**
75 Charter Oak Avenue, Hartford
(860) 563-0015
www.ctgreenbank.com
www.greenlibertybonds.com

# Appendix

# Request for Written Comment Questions

1. Based on Federal guidance in the Infrastructure Investment and Jobs Act and the Inflation Reduction Act, clean hydrogen is defined as hydrogen that is produced through a process that results in a lifecycle greenhouse gas emissions rate of not greater than 4 kilograms of CO2e per kilogram of hydrogen and with less than 2 kilograms of CO2e per kilogram of hydrogen at the point of production. Do you believe that Connecticut should pursue a more stringent definition for clean hydrogen than the one that has been established by the Federal government? If so, why? If not, why not?
2. When and how should the state of Connecticut engage with environmental justice and disadvantaged communities throughout the clean hydrogen planning and development process? What steps can the state take to support EJ and disadvantaged communities engagement in these processes?
3. What steps should the state of Connecticut take to ensure that the clean hydrogen economy provides equitable benefits for environmental justice and disadvantaged communities?
4. The Hydrogen Task Force has been exploring hydrogen end uses including: critical facilities, aviation, cargo ships, material handling equipment, long-haul heavy duty trucks, fuel cells for peak power generation, high heat industrial processes, buses, ferries, rail, hydrogen blending in pipelines, and light-duty vehicles. How should the state address differing stakeholder perspectives about hydrogen end use prioritization? Which specific end uses are of greatest concern, and why? What actions can or should the state take to continue to solicit stakeholder feedback?
5. If local (in-state) hydrogen supply is expected to limit in-state hydrogen end use applications, should the state consider the role of hydrogen imports in meeting supply needs?
6. What additional processes should the state consider to ensure that use of pipeline infrastructure for hydrogen transport is implemented safely, and supports community and climate goals?
7. What enabling infrastructure do you believe is highest priority for the state to pursue to support the development of Connecticut's hydrogen economy, and why?
8. What portions of the hydrogen value chain (uses, sources, transport, storage) would be most benefited by further development of additional policy or regulatory guidance? Why, and what gaps should these policies be seeking to address?
9. Federal funding is hoped to represent a significant portion of hydrogen funding but is not expected to meet all funding needs. Which hydrogen investments (infrastructure, manufacturing, end use equipment, workforce training, etc.) would be the most important for the state to consider funding? Why?
10. What are the best mechanisms for state agencies to gain visibility into federal funding opportunities pursued by individual commercial actors or other organizations? What actions can the state take to support these applications?