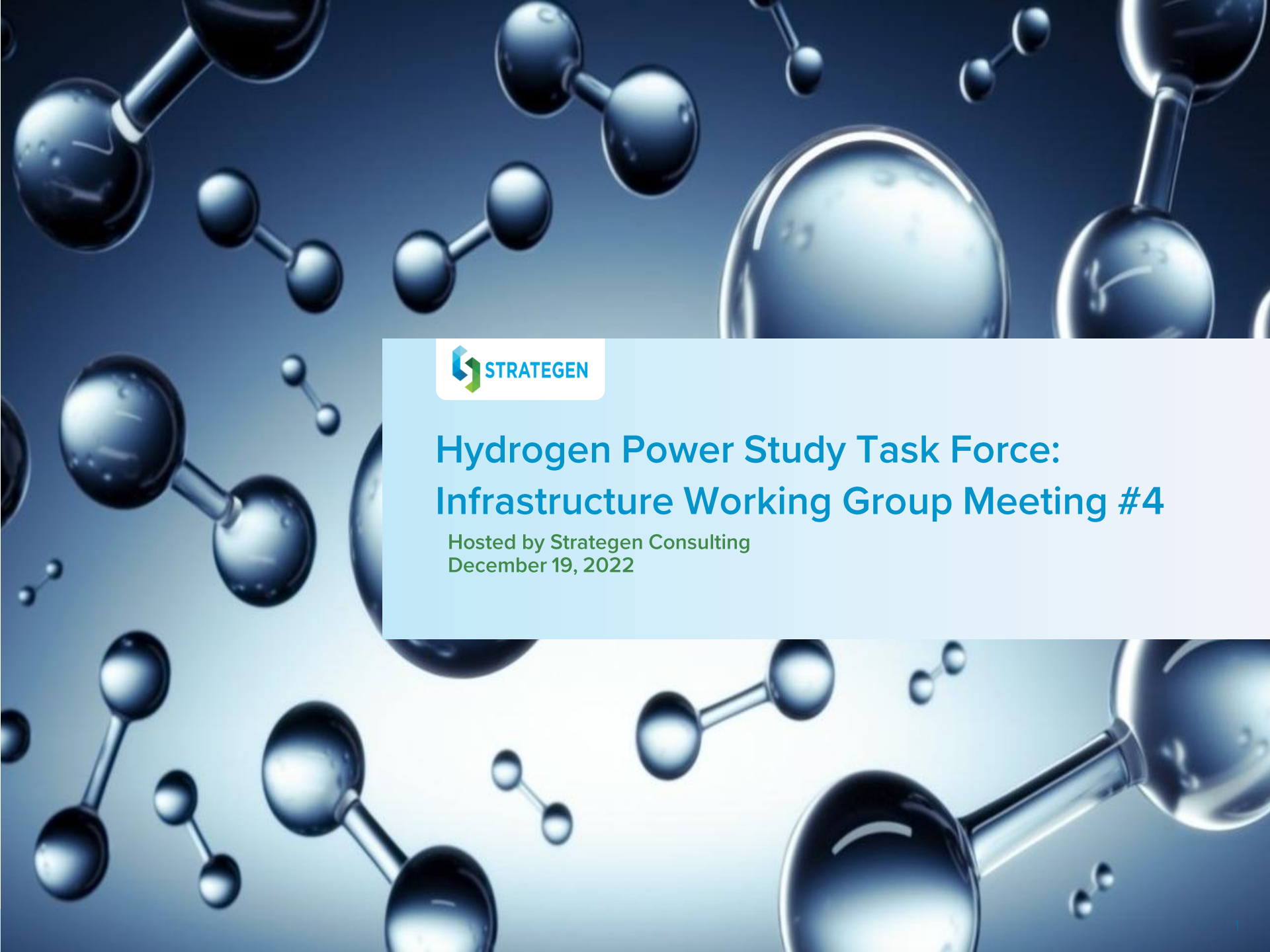


Hydrogen Power Study Task Force: Infrastructure Working Group Meeting #4

Hosted by Strategen Consulting
December 19, 2022

Meeting Logistics

- 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. Please try to limit comments in the chat as these may not be officially captured in the record.

- Recording Meeting – we will record and post the meetings at 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.

Agenda

- Welcome and Introductions – 10 minutes
- Review of Working Group Deliverables – 5 minutes
- Review Key Findings – 10 minutes
- Discuss Draft Recommendations – 30 minutes
- Next Steps – 5 minutes
- Adjourn

Introductions

Please share your name, title, and organization

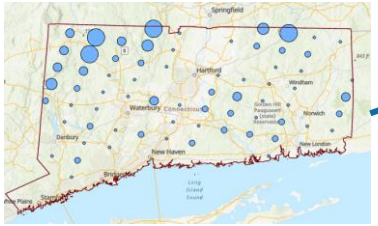
Review of Key Findings

Infrastructure Working Group Deliverables

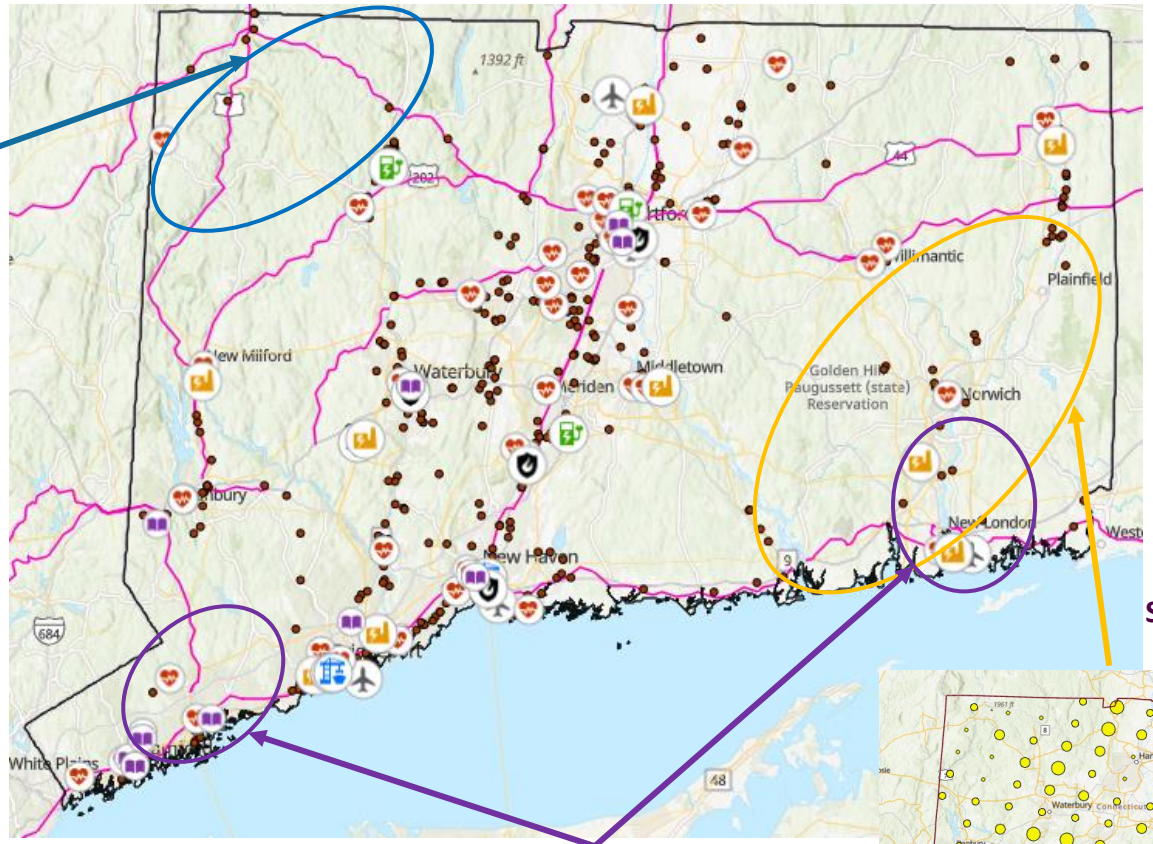
- Geographic analysis detailing the locations of existing infrastructure and proximity to hydrogen production and offtake sites.
- High-level assessment of needed infrastructure and associated costs.
- Assessment of priority areas for hydrogen infrastructure development, taking into account environmental justice and economic development objectives.

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

Wind Production Potential



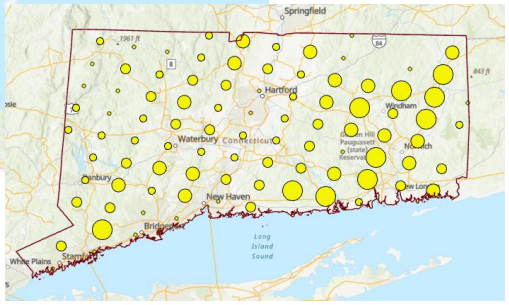
Potential Hydrogen Offtaker Locations



Offtaker Key

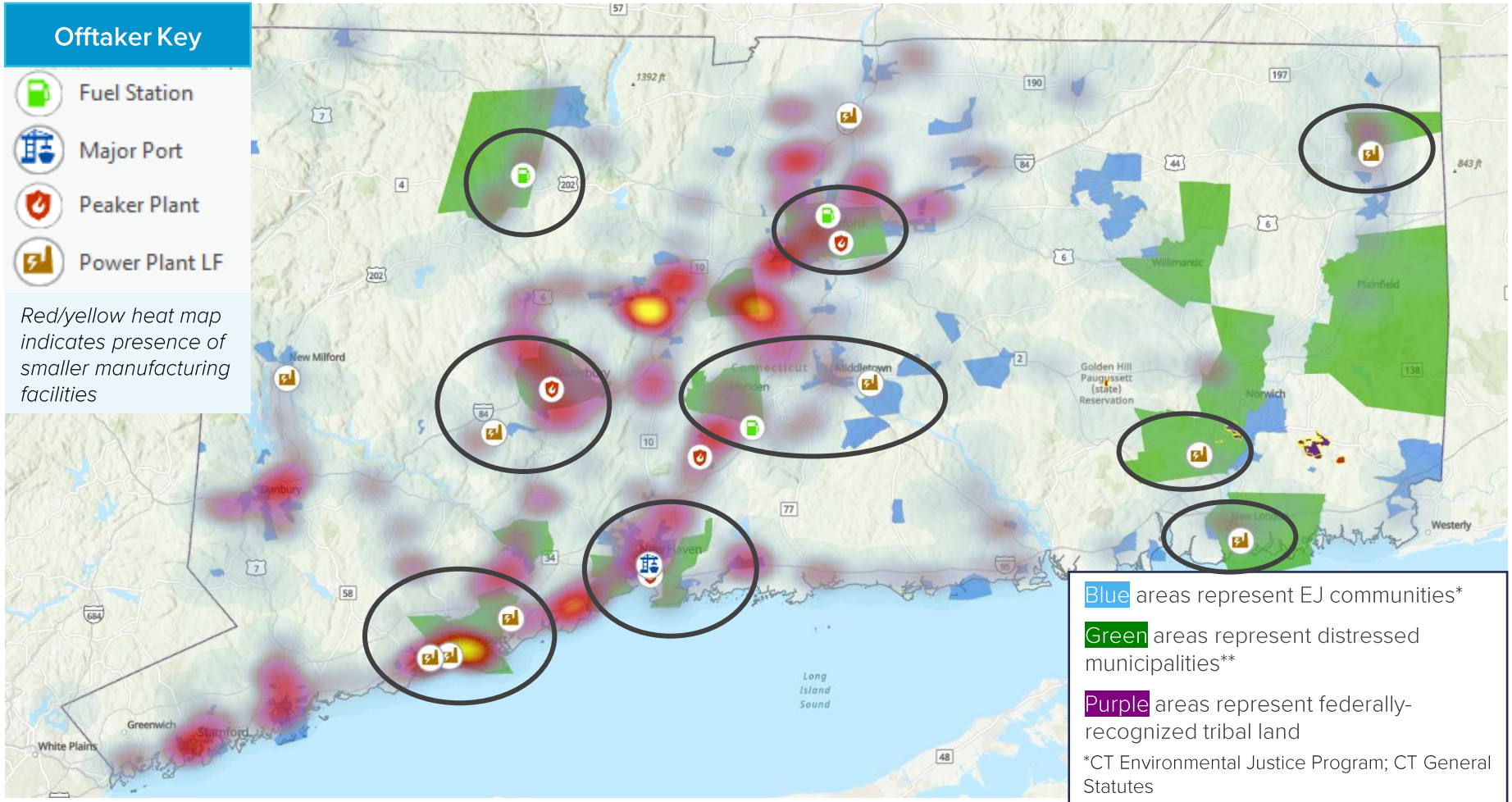
- Fuel Station
- Major Port
- Peaker Plant
- Power Plant LF
- Hospitals
- Major Highways
- Airports
- Electric Transmission
- High Heat Manufacturing

Solar Production Potential



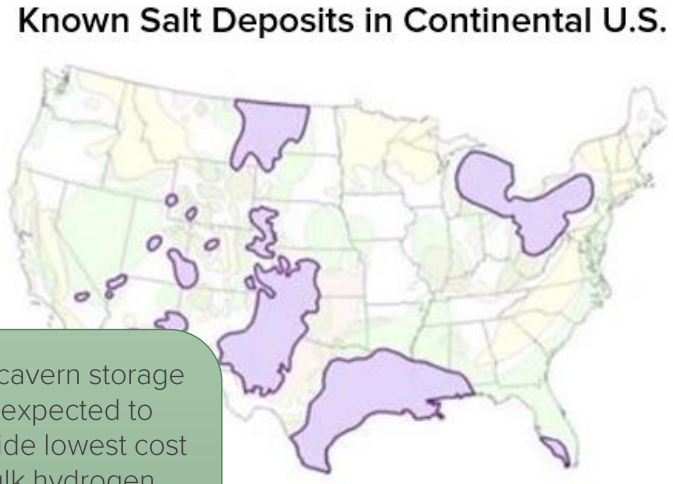
Potential Offshore Wind Interconnection Points

Location of major hydrogen offtakers creates opportunities for hydrogen transition to support environmental justice and economic development objectives

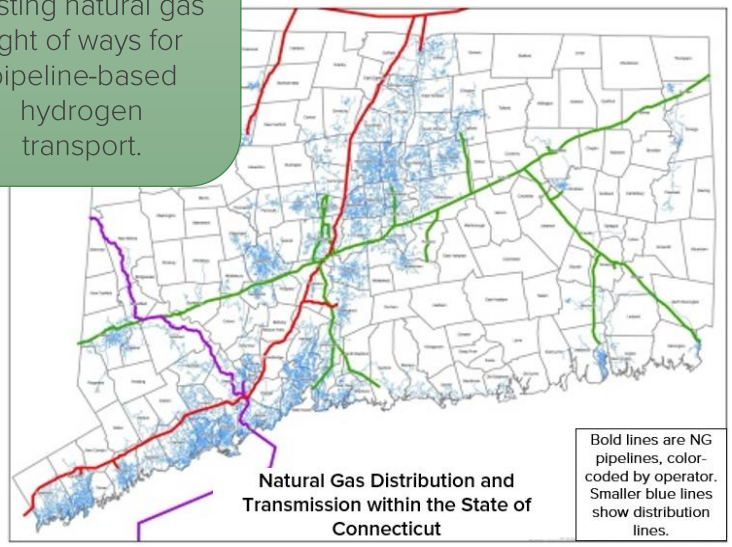


Transportation, storage, compression, and potentially liquefaction are all important pieces of the hydrogen supply chain

- **Transport: Under stable demand conditions, pipelines containing gaseous hydrogen can be the most economic form of hydrogen delivery.**
  - Analysis indicates that pipeline delivery is the lowest cost option for large market demands (>150 metric tons per day).
  - Other forms of delivery, such truck delivery, are can be competitive in applications beyond the reach of hydrogen pipeline supplies.
- **Storage: Salt caverns are considered one of the best options for Underground Hydrogen Storage (UHS) because they have low permeability (hydrogen cannot escape through the rock) and can handle high pressures.**
- **Compression: Hydrogen is produced at low pressures (20–30 bar) and must be compressed to between 200 and 500 bar to be economically transported.**
- **Liquefaction: Liquid hydrogen is often desirable compared to gaseous hydrogen due to its higher energy density and lower cost at high volumes.**



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 likely require deployment of hydrogen production, storage, transport, and delivery infrastructure.

+ Pipelines and at-scale storage in salt domes can significantly reduce the cost of transporting and storing hydrogen compared to 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 infrastructure costs.
+ Combining clean energy feedstocks (e.g. wind + solar) can reduce storage requirements by creating a more constant production profile.

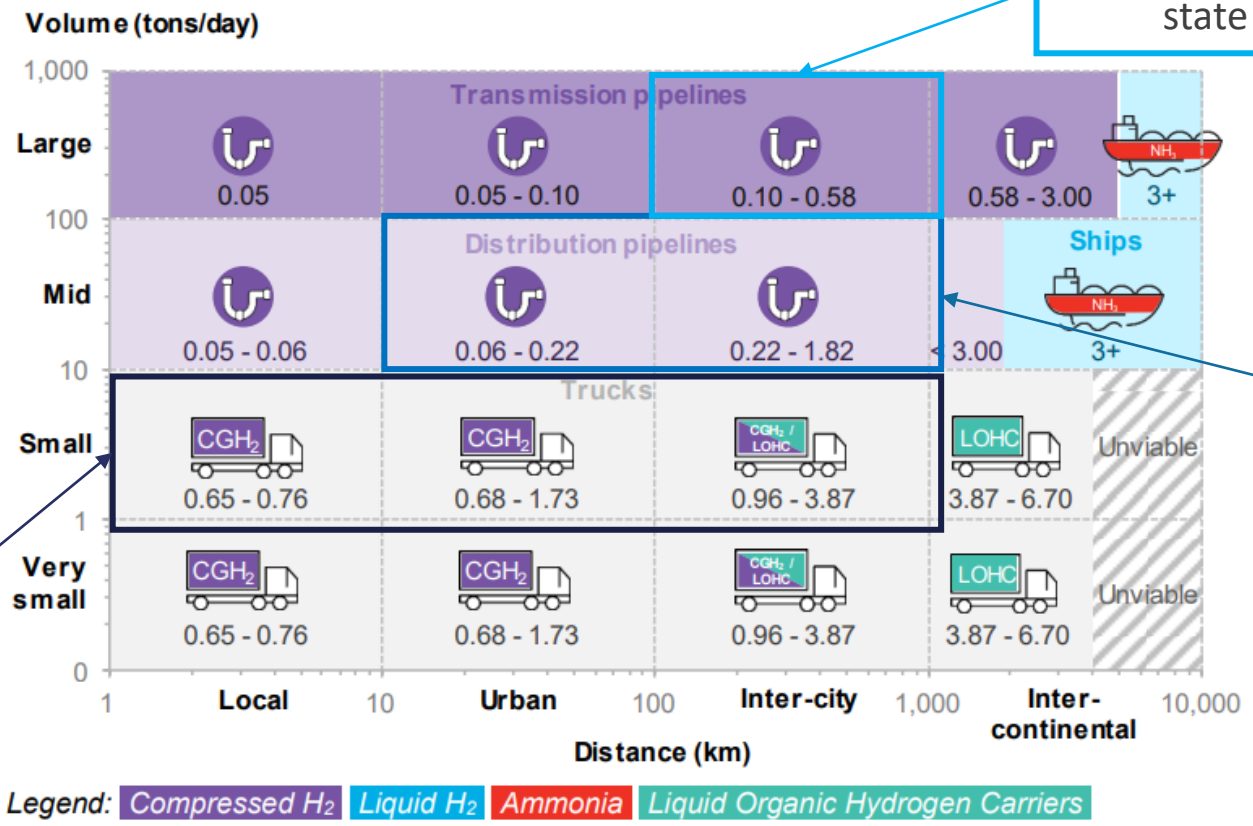
Costs of connecting infrastructure vary with volume and distance

CT's max potential 2050 demand: ~1000 tons/day

Connection to out-of-state storage

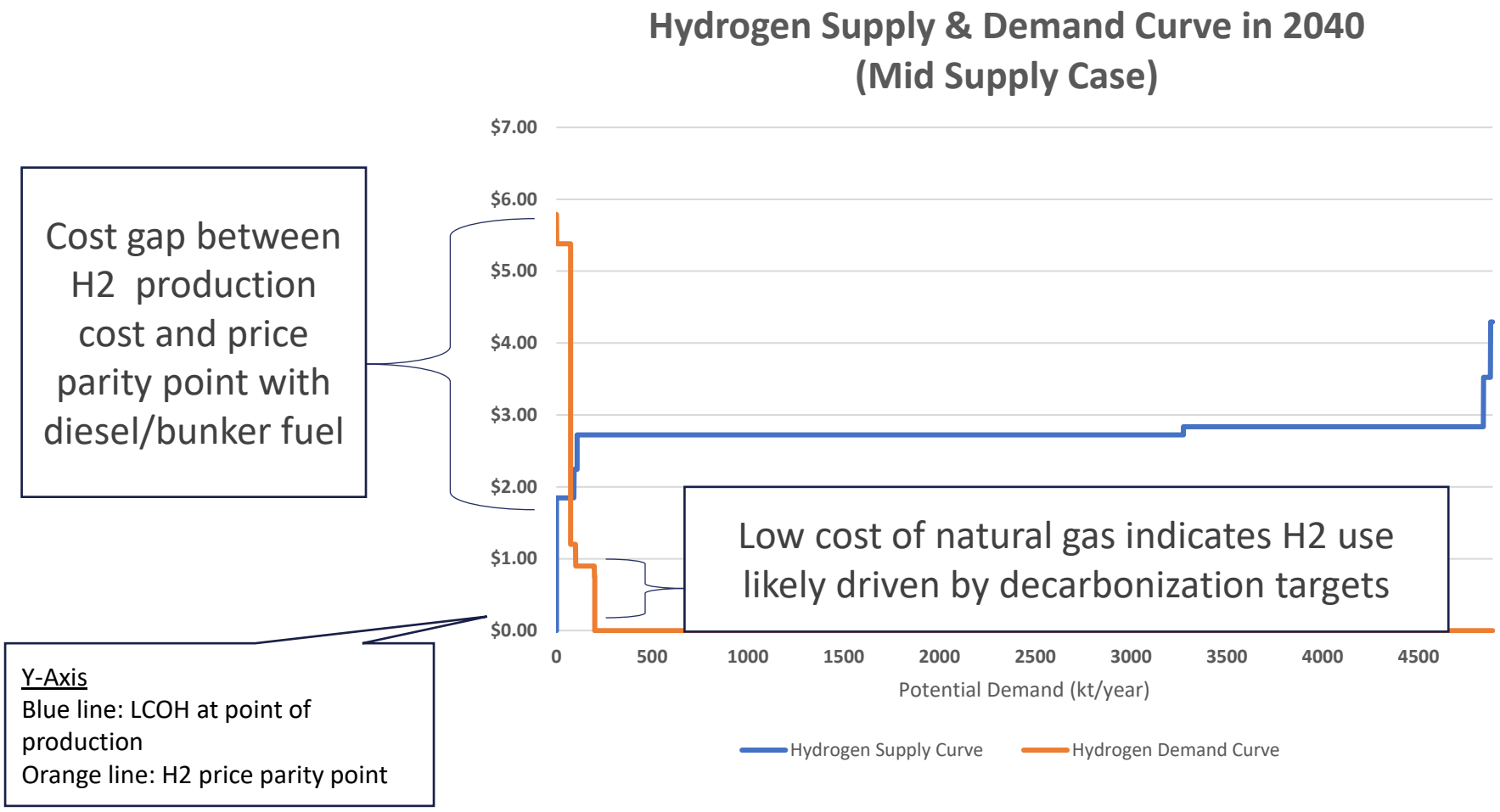
Delivery to distributed end users (e.g. fueling stations, critical facilities)

Delivery to concentrated end users (e.g. ports, industrial facilities)



Source: [BloombergNEF: Hydrogen Economy Outlook](#) (March 30, 2020)

Cost of infrastructure likely to make-or-break economic case for hydrogen in competition with some transportation fuels



Draft Recommendations

Draft Recommendations for Review

- **DEEP should lead interstate and interagency coordination to develop a hydrogen roadmap and strategy that identifies…approaches to a clean hydrogen backbone to enable cost-effective scaled transport, as well as other research and infrastructure investment opportunities to inform policy development, funding, and R&D strategy in consultation with ecosystem stakeholders. This could include:**
  - Current technologies available for hydrogen transport (e.g. pipelines vs. electrical transmission with on-site hydrogen production).
  - The role of hydrogen transport costs in overall delivered cost.
  - Cost and funding mechanisms for any enabling infrastructure and clean hydrogen production.
  - Alignment with state policies and goals.
  - Alignment with regional hub activities.

Draft Recommendations for Review (cont.)

- **DEEP should investigate the need for hydrogen fueling stations to support multi-sectoral mobility applications, and as appropriate, coordinate with CT DOT to develop more specific strategies for optimizing siting and funding.**
  - This could include an assessment of major transit routes to determine refueling locations that would best serve regional transit needs.

- **DEEP should clarify and work with relevant agencies and stakeholders to explore the acceleration of permitting for hydrogen infrastructure.**
  - To scale development at the speed needed to transition to a clean economy, it is important to ensure that permitting requirements are transparent and readily understood by all stakeholders.
  - An example of work that supports this goal is the Governor's Office of Business and Economic Development in California, which published the "Hydrogen Station Permitting Guidebook" with the explicit goal of streamlining the permitting process.

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	