



Meeting Minutes¹

Thursday, November 17, 2022
3:00 p.m. – 4:00 p.m.

The third meeting of the Infrastructure Working Group was held on November 17, 2022.

All participants joined via the Teams conference call.

Task Force Members Present:

Sara Harari (Connecticut Green Bank)

Others Present:

Nikki Bruno (Eversource), Sam Dynowski (Sierra Club), Jon Feinstein (Zone Flow), Nina Hebel (Strategen), Sridhar Kanuri (HyAxiom), Ana McMonigle (Conservation Law Foundation), Trent Molter (Skyre), Collin Smith (Strategen), Becca Trietch (DEEP)

1. Call to Order

- Collin Smith, a Senior Consultant at Strategen providing technical support for the Infrastructure Working Group, called the meeting to order at 3:03 p.m.

2. Welcome and Introductions

- Mr. Smith provided an overview of the meeting agenda including attendee introductions. Each participant introduced their name and organization. Following this, Mr. Smith discussed the working group meeting schedule for the coming months.
- Mr. Smith reviewed a schedule of upcoming working group meetings through December.

3. Connecticut's Hydrogen Infrastructure Discussion

- Mr. Smith discussed hydrogen's physical characteristics in relation to other fuels such as natural gas and resulting needs for compression and associated costs.
- Sara Harari asked if hydrogen needs to be compressed regardless of if it is being used on site or being transported.
 - Mr. Smith confirmed that it is necessary to compress hydrogen in almost all applications due to the low pressure at production.
- Nikki Bruno asked if the Strategen team is working with Original Equipment Manufacturers (OEMs) to develop this information, and if sources can be provided.
 - Mr. Smith noted that the presented information is from Strategen's research and acknowledged the importance of validating information with OEMs. Further, he confirmed that source information can be circulated following the meeting.

¹ For access to the meeting recording – <https://www.ctgreenbank.com/hydrogentaskforce/>

- Jon Feinstein agreed with the notion that in a pipeline, hydrogen does not carry as much energy as alternatives such as natural gas, which is a downside.
- Mr. Smith clarified that the numbers presented are a general baseline and will not be included in our modeling efforts, but rather to inform a baseline.
- Sridhar Kanuri noted previous examples in which fuel cells have been established at sites with curtailed hydrogen and did not require compression.
- Mr. Feinstein noted that in heating and combustion applications, low pressure hydrogen is acceptable, however for transportation, it requires compression. Mr. Feinstein referenced use cases in England where low pressure PVC tubing is sufficient in residences.
- Trent Molter noted that it is not uncommon for hydrogen to be trucked 200-300 miles from generation to end user because there are not many sources of production. Further, Mr. Molter noted that in the US there is a strong liquid infrastructure for hydrogen, and there are many liquid production sites within the country to support users who consume larger amounts of hydrogen.
 - Mr. Smith agreed that truck delivery is not an optimal solution even in cases of liquefaction, compared to alternatives such as pipeline transport.
- Mr. Smith shared analysis on local hydrogen storage, and its key role in enabling the use of hydrogen in several applications.
- Mr. Smith reviewed liquefaction as a method of increasing energy density. He noted, while more expensive than compression, liquefaction is more economical in transporting hydrogen over longer distances.
- Ms. Harari asked how the analysis presented is connected to the efforts of the Sources and Uses Working Groups.
 - Mr. Smith responded to this, saying that we aim to first identify through the demand assessment how much liquefaction would be required, and what are the associated costs. From this we can understand what additional support would be needed to make hydrogen a competitive fuel in the respective end uses.
- Mr. Smith discussed derivative fuels, such as ammonia and synthetic fuels that can be derived from hydrogen, and their applications, including acting as an energy carrier and being converted back to hydrogen or being used as fuels themselves.
 - Mr. Smith spoke further regarding the conversion process to and from ammonia, as well as the safety implications of such processes and transport.
- Mr. Smith presented analysis on auxiliary infrastructure in Connecticut, as it relates to liquefaction and derivative fuel production siting, as well as compression.
- Mr. Smith discussed pipeline safety concerns for hydrogen, such as embrittlement, flammability, and other safety concerns.
- Mr. Smith noted implications of auxiliary infrastructure safety concerns, such as leakage, low ignition energy, and potential for combustion and embrittlement. Mr. Smith references numerous safety mechanisms already in place for liquid hydrogen transportation, such as overfilling protection, pressure relief valves and rupture disks.
- Mr. Smith discussed hydrogen electrolyzer and fuel cell supply chain needs, as well as pipelines.
 - Mr. Smith noted implications of imports for materials such as graphite, iridium, platinum, strontium and yttrium that may raise supply chain concerns, as well as ongoing efforts to develop domestic sources of supply for such resources.

- Mr. Smith explained that supply chains for hydrogen infrastructure have less challenges than electrolyzers and fuel cells.
- Mr. Feinstein identified permitting as a primary difficulty of pipelines, and asked if that will be a part of the discussion.
 - Mr. Smith agreed it is a primary concern and was discussed in the previous working group. Mr. Smith also identified rights of way for natural gas pipelines as the primary, but not perfect, method of permitting. Further, he mentioned public buy-ins as a way of making sure such developments are beneficial for everyone involved.
- Ms. Dynowski asks if there has been any analysis done on Connecticut's gas system, specifically regarding pipeline replacement. Ms. Dynowski also added to this, asking what processes would need to be in place for community engagement and having community members decide whether they want projects that may have potential safety concerns in their areas.
 - Mr. Smith responded acknowledging the connection between safety and environmental justice, and that such criteria will be considered when making sure that everyone is benefiting from any infrastructure that is put in place. Mr. Smith adds to this that he is not aware of any analysis on Connecticut's gas system specifically, and its readiness to accept hydrogen blends. Furthermore, it is important to test blends on the infrastructure directly rather than pulling assumptions from elsewhere.
- Ms. Dynowski asks whether will we fall short of our greenhouse gas reduction targets at a blend of 2-5% of hydrogen.
 - Mr. Smith responds that such a blend would not get Connecticut to the goals that the state has committed to hitting, and that in such a scenario blending would not be the complete solution.

4. Adjourn

- Mr. Smith adjourned the meeting at 4:03 PM