

April 2022 Meeting Minutes

Attending: Nancy Atwood, Barbara Menne, Chuck Jensen, Sue Lepore, Mary Forman, Linda Cohan, Ginny Lohr, Jim Tuttle, Jason Berkowitz, John Doherty, Elly Claus-McGahan, Evelyn Yielding (new member), Bob Wegeng.

This ZOOM meeting screen was enhanced with closed captioning.

Action Team Reports

Tabling, Linda Cohan: The [South Sound Sustainability Expo](#) was a big, fun, and busy event, well-attended in spite of some showers. We were able to do lots of networking and informing at our **two** booths (especially **Barbara Menne** at the [EN-ROADS](#) booth which drew a great deal of interest). Interaction with kids went well, with an event-sponsored scavenger hunt and our own spinner with questions and prizes.

Letters to the Editor, Chuck Jensen: Congratulations to new member **Evelyn Yielding**, whose great letter on littering and communal citizenship was published April 17. [The News Tribune](#) had no Earth Day articles at all, however, which was disappointing to say the least.

Voter Outreach Effort, Mary Forman: CCL National says “Getting environmental voters to the polls can put pressure on Congress to make climate change a priority.” There are several activist groups, such as the **Environmental Voter Project** and **Greenpeace**, organizing this campaign. Any CCL Tacoma members who would like to dedicate some time to this crucial work in an encouraging social setting can meet next Wednesday May 4 at the Forman’s from 1-3:30 pm, and 2nd Wednesdays of the month after that. [Contact Mary](#) for more details.

Presentations, John Doherty: John gave a presentation to Olympic College on the psychology of climate denial and action last week. It was well-attended, with lively conversation and interest.

Social Media: John Doherty’s “Climate Minutes” are now on Twitter, [@climateminute](#). Please check it out and retweet. **Ginny Lohr** requested help in gathering material (photos with captions) and news for **Facebook**. **Sue Lepore** reported that **CCL Tacoma** is now on Twitter [@ccltacoma](#), and Instagram, [ccl_tacoma](#). Please look, comment, retweet.

Speaker on Green Hydrogen--Chrissy Cooley, TPU

Ms. Cooley, Public Utility Board Vice-Chair for **Tacoma Public Utilities**, is also the Water Quality and Protection Program Manager for the **Tacoma-Pierce County Health Department**. Her excellent presentation slides are available [here](#).

Green Hydrogen is a high-value, storable energy product created from hydrogen generated by renewable power. When made with **electrolysis** using hydropower, as we have here in Tacoma, it is truly carbon zero, with the only byproduct being oxygen. **TPU** is very excited about green hydrogen and has put a lot behind it as a piece of a much broader context of energy sources. In the past, hydrogen was considered the “energy source of the future” but

producing it takes a very large amount of electricity. There are black, gray, blue, etc. hydrogens which do produce emissions. Unless it can be made using green energy, it's problematic. Things are moving very rapidly--Tacoma is trying to attract green hydrogen and related producers and consumers, especially at the Port. TPU has an especially low **electrofuels rate**, signaling that its producers are extremely welcome here. We'd like to be one of the four **national hydrogen hubs** funded by the **Infrastructure Bill**.

Why hydrogen?

- To address climate change, specifically GHG emissions, it is critical to decarbonize transportation fuels, energy generation and storage, and industrial processes.
- Battery electrification of transportation has its limitations, especially for heavy-duty cycle needs e.g. Class 8 trucks, marine vessels, planes, trains.
- H₂ fuel cells work well when batteries are not the most effective means of power.
- Range anxiety and recharging times are a concern, whereas H₂ powered transportation has the range and refueling time that we see in vehicles today.

Applications include transportation, synthetic kerosene fuel (which is carbon neutral, not carbon free), upgrading oil for biofuels and **green ammonia** (for maritime fuels, which could be used by MAERSK etc. and make a future green hydrogen hub at the Port of Tacoma really huge!), metals production, chemical processes, fertilizers, a drop-in fuel to replace natural gas (although it is more corrosive than methane, so studies are still needed).

Green hydrogen is not really a fuel source on its own, but valuable as a battery, as stored energy. It is particularly promising for applications like heavy maritime or heavy industrial uses that are so hard to electrify. It could also help **TPU** store its surplus energy (as formic acid) instead of being forced to sell it.

Hydrogen takes up way too much space to be practical as is, so it has to be liquified and compressed. Formic acid appears to be the best of both worlds.

Liquid Hydrogen Carriers

- Carriers are a unique way to deliver hydrogen by hydrating a chemical compound at the site of production and then dehydrating it either at the point of delivery or once it is ready to be used as power e.g. fuel cell.
- Hydrogen is regarded as a clean energy carrier; however, its low density at ambient conditions makes its storage challenging. The storage of hydrogen in liquid hydrogen carrier systems has numerous advantages over conventional storage systems.
 - liquid hydrogen carriers – e.g. ammonia (carbon-free)
 - liquid organic hydrogen carriers – e.g. formic acid (carbon neutral)

A very exciting application of **carbon neutral** hydrogen (but not truly **carbon free**) is **sustainable aviation fuel**. Interest is coming from large airlines, like Alaska, it's not just a fringe project. Not a matter of "if" but "when" it will be adopted in some capacity. There is an added application to the Port of Tacoma because of the link to **JBLM** and its huge aviation interests.

- SAF is a biofuel used to power aircraft that has similar properties to conventional jet fuel but with a smaller carbon footprint. Depending on the feedstock and technologies used to produce it, SAF can reduce life cycle GHG emissions dramatically compared to conventional jet fuel.
- SAF is a clean substitute for fossil jet fuels. Rather than being refined from petroleum, SAF is produced from sustainable resources such as waste oils from a biological origin, agri-residues, or non-fossil CO₂.
- SAF is a so-called drop-in fuel, which means that it can be blended with fossil jet fuel and that the blended fuel requires no special infrastructure or equipment changes.

SAF production

- Direct Air Capture modules pull carbon dioxide from the air
- Using an electric current, water is electrolyzed to produce green hydrogen and oxygen
- CO₂ is reduced to CO using Reverse-Water Gas Shift
- Fischer-Tropsch synthesis combines CO and H₂ to form kerosene and a range of additional hydrocarbons
- The fuel is sent to the airport using existing pipelines
- Fuels are used by planes; CO₂ is emitted into atmosphere, and then recaptured using the Direct Air Capture modules
- The entire process uses a renewable energy source

There are some concerns about the safety of hydrogen, but it has been in use for a long time and there are many codes, standards, and regulations in place.

How safe is hydrogen?

- H₂ has been in industrial use for more than 50 years
- Codes, standards, and design practices have been developed to enable its safe use
- 70 million metric tons are produced each year and growing
- Like other fuels, H₂ must be used with care in systems designed around its unique properties
- H₂ presents less risk than other fuel sources as it is nontoxic, is lighter than air, and dissipates rapidly when it is released

Types of projects for hydrogen in the Tacoma area

Green H₂ production facilities – gaseous and liquefaction

- Green ammonia - a carbon-free fuel for marine vessels and fertilizer • Experimental formic acid - power backup and shore power
- H₂ fuel cell electric vehicle (FCEV) manufacturers
- H₂ powered passenger ferries and aircraft
- Sustainable Aviation Fuel (SAF)
- Distribution and Refueling Stations

Development hurdles

Nascent Industry

- Starting something from scratch – takes time to pull all the pieces together • Industry still developing its narrative and value proposition
- Suitable Sites
- Industrial land in short supply
- Especially lots larger than 15 acres
- Developers hesitant to lease to a new and unfamiliar sector
- Supply and Demand
- Producers don't have a well-established end-user market • End-users don't have well established supply network

Development incentives

WA Low Carbon Fuel Standard

- **WA Climate Commitment Act** – Cap & Invest • SB 5910
- Creates **Office of Renewable Fuels**
- Tax exemptions
- Provides for up to \$2 million to prepare application for **Hydrogen Hub**
- **DOE Hydrogen Earth Shot (1:1:1)**
- Seeks to reduce the cost of clean hydrogen by 80% to \$1 per 1 kilogram in 1 decade
- **DOE Hydrogen Hub Program**
 - \$8 billion in funding to at least four hydrogen hubs - most likely more than four will be funded
 - State of Washington will submit an application

There's a lot of funding out there for hydrogen through **Biden's Infrastructure Bill**. We hope to be well-poised in WA to be chosen as one of these hydrogen hubs. (**Gov. Inslee** is strangely unsupportive, but **TPU** is in frequent communication and hopes to change that). The **Port of Rotterdam** had a world hydrogen conference recently and is really doing some fantastic stuff with hydrogen. **TPU** and the **Chamber of Commerce** want to see a full-blown hub in Tacoma (preferably on the Port), not just one business. The goal is to bring in producers and consumers both, creating an "economic hydrogen ecosystem." **TPU** is already training its workforce to transition to this emerging field. We do keep coming up against the hurdle of scarcity of land on the Port, so existing companies with land would be best. And we must be strict about the legal definition of green hydrogen as truly green only.

Therefore the big launch announcement last week by **U.S. Oil** was very welcome! Things are really falling into place. They are looking for a 45-megawatt system to be installed on their existing site of 6 acres on the **Port**, pivoting their business away from fossil fuels. They have a preexisting pipeline and relationship with **JBLM**, so could get SAF piped directly to one of the biggest users of aviation fuel in the country. To think of what **JBLM** could do with green hydrogen--applying their research since they are a leader in sustainability in the DOD! An exciting "match made in heaven."

Q--How is TPU planning for coming demand or shortfall with NW coal plants shutting down by 2025 or 2030 and so much electrification expanding the grid?

A-The usage/need for electricity would indeed increase a great deal. For instance, Seattle's recent study says it will **double** if they meet their electrification goals. However, according to the latest climate change assessments, **TPU** won't be impacted since it typically has so much surplus power (this year alone **TPU** sold \$20 million worth of excess surplus green power on the energy imbalance market!). In addition, if our area experienced a shortfall, we would balance our market first before selling any surplus. This area is very fortunate.

We closed with another of CCL Tacoma member **John Doherty's** "[Climate Minutes](#)"