Hydrogen BC

CHFCA
Clean. Efficient. Energy.

2023 April 5

Dear Ministry of Energy, Mines and Low Carbon Innovation

RE: Hydrogen BC Input for the Clean Transportation Action Plan

Hydrogen BC commends the Province for developing a Clean Transportation Action Plan to support transportation GHG emissions reductions in support of the Clean BC Roadmap to 2030.

Hydrogen BC was formed in 2020 by the Canadian Hydrogen and Fuel Cell Association (CHFCA) with the support of the Government of British Columbia, as a provincial affiliate of the national association. We represent more than 30 leading British Columbia organizations across the hydrogen value chain, encompassing more than 1,900 employees and annual revenues in excess of CAD $375,000,000. Our members' hydrogen fuel cell technology powers more than 4,500 heavy-duty vehicles worldwide: mainly buses and commercial trucks, but rail and mining vehicles and marine vessels as well.

Clean hydrogen can abate 7.2 MT CO_{2e} (megatonnes of carbon dioxide equivalent) or 11% of British Columbia's annual emissions, three-fifths (3/5) of which are expected to come from the transportation sector,[i] primarily from heavy duty transportation. [Appendix 1] As such Hydrogen BC is pleased to provide our recommendations on behalf of our members, to help British Columbia achieve its target of 27 to 32% transportation emissions reductions by 2030.

Companies from Metro Vancouver's world-renown hydrogen fuel cell cluster have exported B.C.-engineered fuel cells to 26 countries and are eager to replicate their success at home. Other Hydrogen BC members on the forefront of clean hydrogen generation, hydrogen combustion and related technologies can also contribute to the *Clean Transportation Action Plan*'s success, with the opportunity to showcase their leadership in-province before exporting globally.

We appreciate the Ministry's consideration of our response, are available for further discussion at the Ministry's convenience and offer our thanks for the opportunity to participate in this inquiry process.

Best regards,

Matthew Klippenstein
Executive Director, **Hydrogen BC**

(co-author: Pranav Chandrasekar, Member Engagement Coordinator)

Hydrogen BC's responses to Section 3 of the request for input are as follows.

1. Reduce Distance Traveled and Increase Mode Shift

a) What are the key Provincial policy actions (one to three) that need to be considered to achieve the VKT reduction and mode share targets, including in relation to the built environment/community design?

While disclaiming formal policy training, Hydrogen BC recommends the following policy actions:

1. Secure stable funding for public transit by gradually replacing the *Dedicated Motor Fuel Tax* (18.50¢/L in the Vancouver region; 5.50¢/L in the Victoria region)[ii] with an annual levy paid when drivers in these regions renew their vehicle insurance.

Securely funded, financially strong public transit systems will be needed to reduce VKTs by 25% in 2030 and achieve B.C.'s walking-cycling-transit trip share targets of 30% by 2030, 40% by 2040 and 50% by 2050. With the Province leading North America in light duty vehicle (LDV) zero emission vehicle (ZEV) adoption, revenues from the *Dedicated Motor Fuel Tax* will steadily fall. This will make it more difficult for transit systems to deploy ZEVs including hydrogen-powered buses.

Collecting the equivalent funds through an annual levy when drivers renew their insurance would provide more secure revenue for public transit; even if the number of vehicles in circulation were to decrease, it would decrease more slowly than drivers' gasoline and diesel consumption.

Policies must be politically palatable to have a chance of implementation. Shifting public transit funding from a fuel tax to an annual vehicle registration levy in a staged process would reduce the highly visible cost of gasoline and diesel in Metro Vancouver and the Capital Region District. The overwhelming majority of drivers, still owning combustion vehicles, would probably welcome this. The policy would increase costs during ICBC renewal, but that pain would only occur once per year.

2. Eliminate HOV lane access for ZEVs. Zero emission vehicles reduce GHGs and air pollution but do not reduce VKTs. Preferential access to HOV lanes could make ZEV owners less likely to mode shift, when the province wants as many drivers as possible to mode shift.

b) What are the barriers, if any, in achieving these targets?

Given the number of plug-in electric vehicle owners who both avoid the *Dedicated Motor Fuel Tax* and enjoy HOV lane access, there may be opposition to these measures from battery electric vehicle (BEV) centric organizations.

It is probably easier for a hydrogen association to advocate these measures, as hydrogen will mainly be used in heavy duty transport. Hydrogen will play a niche "Filet-o-Fish" role in LDVs, so a mode shift away from personal vehicles would have less impact on our membership.

c) What are the key actions your organization or sector can do to help achieve the VKT reduction and mode share targets, including actions in relation to the built environment/community design?

Hydrogen BC can serve as a foil if the above recommendations receive pushback from plug-in electric owners or enthusiasts, showing that some ZEV communities will support mode shifting, even at the expense of the still-ubiquitous personal light duty vehicle.

2. Adopt ZEVs

a) What key Provincial policy actions (one to three) need to be considered to achieve the ZEV targets?

While disclaiming formal policy training, Hydrogen BC recommends the following policy actions:

1. Build out refueling/charging infrastructure on a systematic, "Be Prepared" basis. No one can predict the future, so whether policymakers prefer battery-electric or hydrogen-electric vehicles for a given application, it is important to fully build out infrastructure for both. This will keep British Columbia residents' and businesses' ZEV options open.

No one expected the electric grid in several boroughs of London, England to reach capacity last year, delaying local housing starts – and, one presumes, plug-in electric vehicle infrastructure upgrades – potentially until 2035.[iii] This happened at very low ZEV LDV fleet penetration. Given how long urban electrical upgrades can take, this will probably eventually occur in other cities, and possibly in British Columbia. A parallel, complementary hydrogen refueling network makes it possible for affected residents and businesses to choose ZEV options without delay.

An aggressive build-out of hydrogen refueling infrastructure, underpinned by continued policy support, will help more British Columbians switch to zero emission transportation faster, helping the Province reach its transportation GHG emissions reductions goals, even in the event of London-style setbacks.

2. Adopt a modified medium- and heavy-duty vehicle (MHDV) ZEV mandate. A mandate aligned with California's Advanced Clean Truck Program would help bring vehicle supply to British Columbia. Hydrogen BC strongly urges that the mandate provide partial credit for hydrogen co-combustion systems, much as was offered for LDV plug-in hybrid electric vehicles (PHEVs).

Trucking is a low-margin business whose revenue depends on reliability and uptime. Operating new, more-expensive technology far from the nearest certified repair technicians would represent a big risk and difficult ask for most operators. Just as PHEVs' parallel gasoline systems gave early adopters confidence that they would be fine in the event of EV infrastructure challenges, co-combustion vehicles' parallel diesel systems will do so for truckers.

Co-combustion retrofits would reduce the emissions of the existing trucking fleet and socialize drivers to handling hydrogen, even as newly built MHDV ZEVs enter the market – helping \the Province tackle emissions from both sides.

b) What are the barriers, if any, in achieving these targets?

Zero emission transportation policy discussions sometimes centre on a "Be Efficient" as opposed to a "Be Prepared" basis. The London example above shows the short-sightedness of this approach.[iv] To any policymakers loathe for hydrogen to have more than a minimal role in transportation, Hydrogen BC would offer the analogy that a broad, comprehensive hydrogen refueling network is insurance against the best-laid plans of mice and men going awry.

Hydrogen BC sometimes encounters the meme that based on sales figures, the "market has decided" on battery electric propulsion over hydrogen propulsion. We would offer instead that different technologies scale up in different timeframes, and that a "market decided" approach would have given up on solar photovoltaics 20 years ago in favour of wind. [See Appendix 2]

c) What are the key actions your organization or sector can do to help achieve the ZEV targets?

Hydrogen BC and our members can assist through the development of infrastructure, provision of vehicles and outreach to communities, emphasizing the complementary (as opposed to competitive) nature of battery electric and hydrogen solutions.

3. Use Clean Fuels

a) What policy actions (one to three) need to be considered to achieve the low carbon fuel target?

While disclaiming formal policy training, Hydrogen BC recommends the following policy actions:

1. Maintain steady Low Carbon Fuel Regulation (LCFR) credit pricing. The value of California's low carbon fuel standard credits has dropped by two-thirds over the past two years.[v] This has greatly increased the per-kg of hydrogen for FCEV early adopters. It would be desirable to have strong guardrails in place to prevent unforeseen circumstances from crashing the LCFR credit market price. Equity markets employ so-called *circuit-breakers* for this purpose.

The power of B.C.'s LCFR credits is shown by the fact that current hydrogen prices in Metro Vancouver equate to a per-km cost roughly in line with a gasoline vehicle consuming 7 L/100 km. This pricing made it possible for zero emission courier company Geazone to add 50 FCEVs to its stable of 25 BEVs.

2. Remove permitting, regulatory and financial speedbumps for Clean Fuel facilities. Hydrogen BC commends the establishment of the B.C. Energy Regulator as a single-window regulator to help prospective hydrogen projects navigate permitting and regulatory considerations.

Drawing from the "entrepreneurial state" approach popularized by economist Mariana Mazzucato, Hydrogen BC recommends the development of a Hydrogen Infrastructure Fund and other measures to remove financial speedbumps promising hydrogen and Clean Fuel facility proposals may face. British Columbia didn't have a first mover advantage in wind or solar photovoltaics, but we have one in the hydrogen fuel cell space, and astute policy can help us leverage this lead.

b) What are the barriers, if any, in achieving this target?

There is a high risk of Clean Fuel projects going to competing jurisdictions. The U.S. *Inflation Reduction Act* has reshaped the worldwide landscape in several sectors. Parkland recently canceled its plans to build a renewable diesel complex at its BC refinery due to a lack of market certainty around emerging renewable fuels and U.S. legislation advantaging producers in that country.[vi]

The analogy might be that British Columbia methodically set out a small stick (carbon tax), a large stick (LCFR) and a carrot (various incentives) to incent local Clean Fuel production – only for the United States to put a 200 lb carrot on its table.

Hydrogen BC vigorously encourages the Province to incent Clean Fuels production. Consultations with industry participants may surface the most cost-effective measures. We all want Clean Fuels production and transportation emissions reductions to happen north of the 49th parallel.

The costs (capital and operating) of hydrogen and Clean Fuel production and project development also remain high. Electricity remains the single largest cost for hydrogen electrolysis projects, and members have provided feedback that even with BC Hydro's *Clean Industry and Innovation Rate*, power costs are challenging.

c) What are the key actions your organization or sector can do to help achieve the low carbon fuel target?

Hydrogen BC will work with members (and future members) to bring Clean Fuels production to British Columbia, relaying measures and actions that could help localize these facilities, helping the Province achieve its Low Carbon Fuels targets and its 2030 goal of 27 to 32% transportation emissions reductions.

4. Which of the actions in questions 1-3 should be prioritized and why?

Hydrogen BC recommends prioritizing the build-out of hydrogen fueling infrastructure on a "Be Prepared" basis. We also recommend prioritizing a MHDV mandate encompassing partial credit for co-combustion solutions, and the removal of permitting, regulatory and financial speedbumps for Clean Fuel facilities.

5. Do you have suggestions to help improve affordability and equity in British Columbia as part of the CTAP?

Measures that support mode shift including public transit at the expense of personal LDVs may improve affordability and equity in British Columbia.

Shifting from the *Dedicated Motor Fuel Tax* to a flat insurance renewal rate would lighten some of the burden of longer-distance commuters who can't afford to live close to their workplaces (and therefore buy a lot of gasoline), or small businesses requiring larger vehicles for their operations.

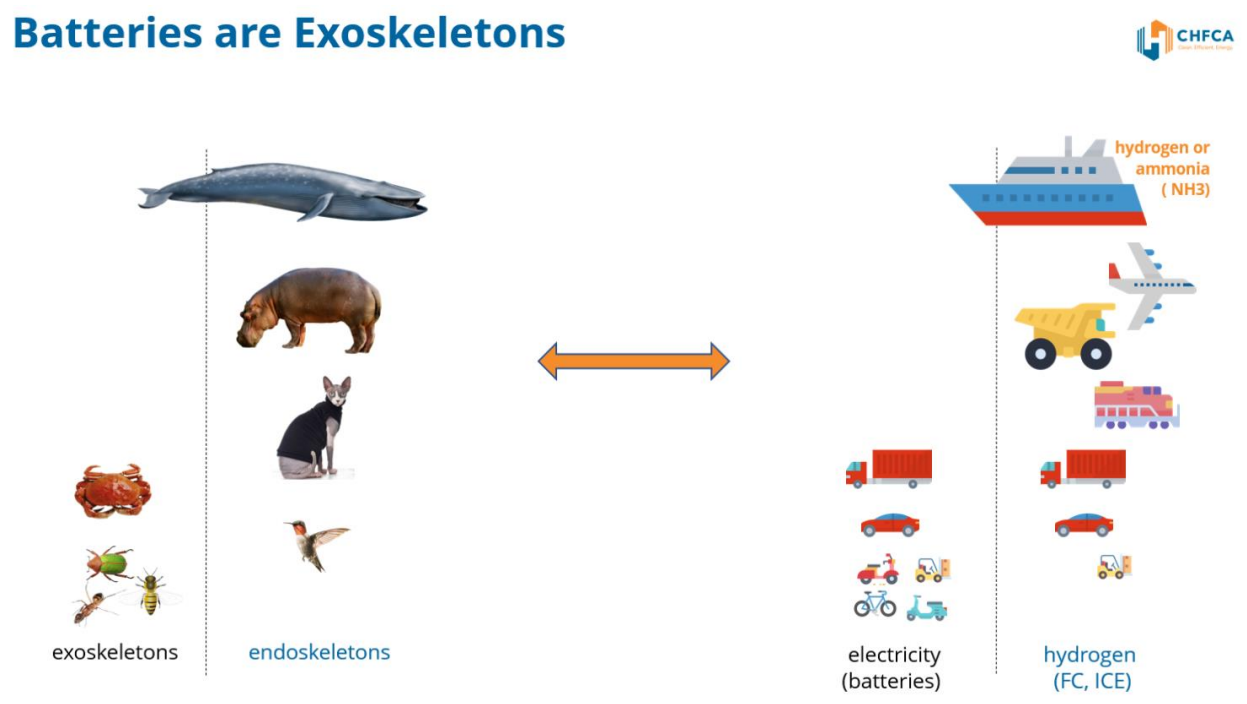
Appendix 1 - Hydrogen and Heavy-Duty Transport

The interplay between electricity and hydrogen in a net zero transportation system is best thought of using an analogy from biology.

In nature smaller creatures tend to have exoskeletons (exterior skeletons) because at small scales exoskeletons have tremendous advantages, such as an exceptional strength to weight ratios. These advantages break down at larger sizes, so almost all creatures above the size of a crab are vetebrates; they have endoskeletons (interior skeletons).

An analogy can be made between electricity (batteries) and hydrogen (in various forms) in transportation. For smaller vehicles, from e-scooters through to light duty vehicles, batteries are a fantastic solution. Their advantages break down as vehicles get larger; among other factors, battery weight becomes a disadvantage, reducing payload capacity or range. Just as larger animals tend towards interior skeletons, larger vehicles in heavy duty transportation will tend towards hydrogen in some form.

There are exceptions of course. On the heavy duty transport side, batteries are a fantastic solution some buses, trucks and even some short-distance ferries. On the smaller side, hydrogen fuel cell vehicles (FCEVs) will have a “Filet-o-Fish” type niche in light duty vehicles, and more than 50,000 hydrogen fuel cell forklifts have been deployed worldwide at distribution centers for retailers such as Wal-Mart, Amazon.



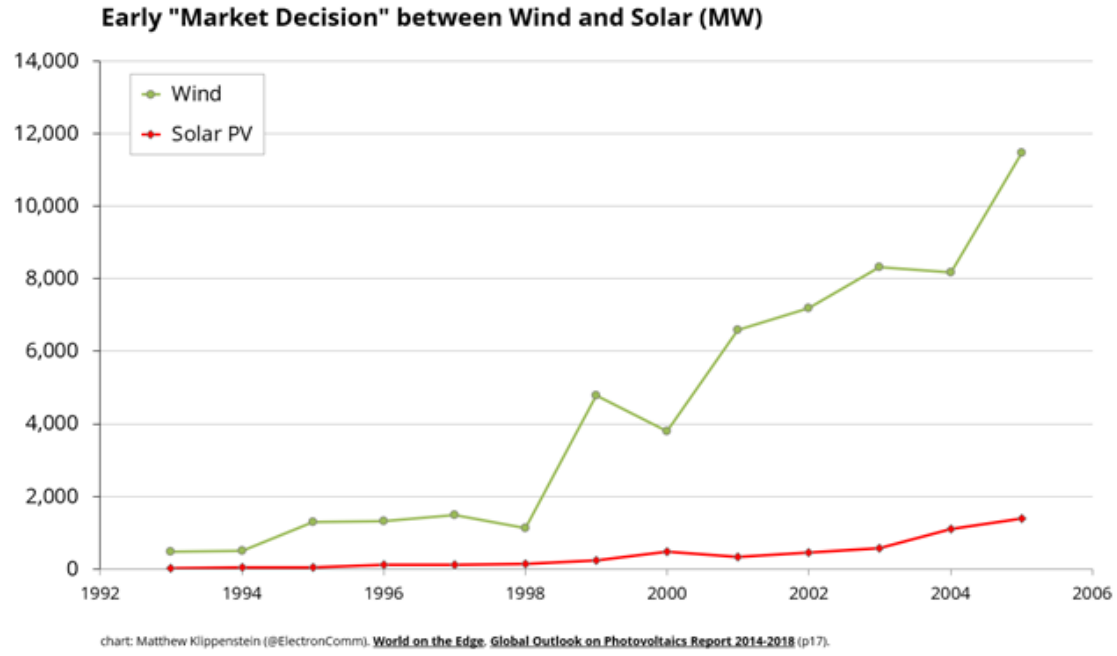
Appendix 2 - Wind, solar, and "the market decided"

It has been argued that recent sales statistics show that "marketplace has decided" on battery electric propulsion instead of hydrogen propulsion. This Appendix explains why Hydrogen BC sees this as a mistaken conclusion.

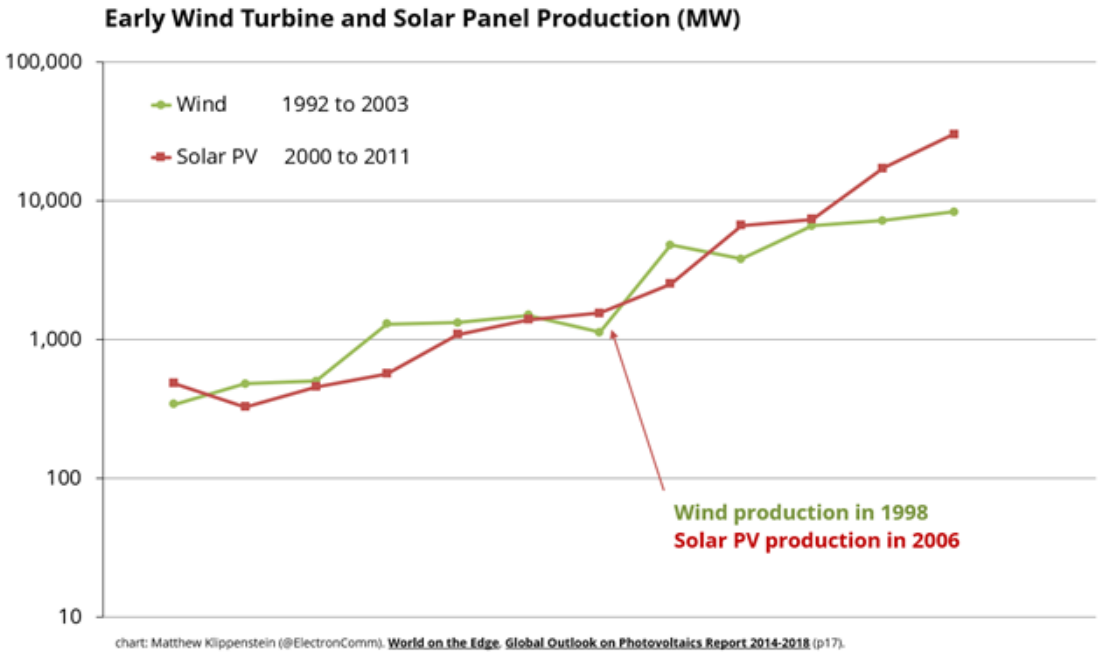
In many cases, sales figures for competing technologies reflect their level of maturity or scale of production. Based on landline telephone vs cellphone sales figures for 1983, 1985, 1987, 1989, 1991, 1993 and probably several more years, one could have concluded that "the marketplace had decided" landlines were the future: not just with telephones, but fax machines and high-throughput fiber-optic technology. This would have been premature.

Cellphones' lower sales were simply the result of still-limited networks and limited manufacturing capacity. The technology was simply at an earlier stage of commercialization.

Turning to energy carriers, we saw the same thing with renewable electricity generation. Early observers, seeing wind had a sustained ten-fold lead over solar, may have remarked that "the marketplace had decided" that wind energy was the future, and solar photovoltaics weren't.

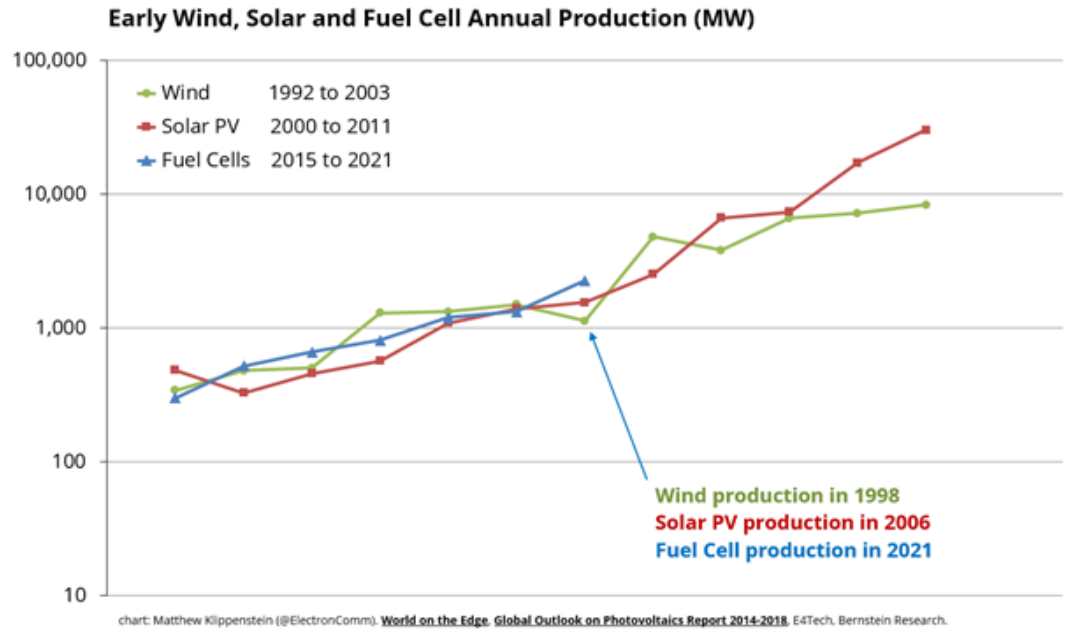


The mundane reality was that the solar photovoltaics were scaling up exactly along the trajectory of the wind sector – just eight years later. (Note that this second chart is logarithmic.)



Fuel cells have been steadily scaling up along the same trajectory as wind and solar. Author Klippenstein wrote about this in 2017 while helping co-author the *Fuel Cell Industry Review*.[vii] The parallel holds through 2021. Data from 2022 will be added soon, and the parallel is expected to continue.

With respect to transportation, hydrogen FCEVs won't threaten BEVs' sales lead any decade soon. They will continue to steadily grow as hydrogen infrastructure, fuel availability and vehicle options increase – much as happened with cellphones.



[i] BC Hydrogen Strategy, page 19. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/electricity-alternative-energy/electricity/bc-hydro-review/bc_hydrogen_strategy_final.pdf

[ii] Ministry of Finance Tax Bulletin MFT-CT 005, revised April 2023, page 5. Accessed on April 05 at: https://www2.gov.bc.ca/assets/gov/taxes/sales-taxes/publications/mft-ct-005-tax-rates-fuels.pdf

[iii] BNN Bloomberg, *London Home Projects Face Delays to 2035 on Electricity Capacity.* 2022 July 28. Accessed 2023 April 05. https://www.bnnbloomberg.ca/london-home-projects-face-delays-to-2035-on-electricity-capacity-1.1798206

[iv] California redwoods -- the largest trees in the world, and relatives of the Douglas Fir -- offer a counterpoint to the efficiency-centric approach from the natural world. In contrast to their radial leaves, redwoods' *axial* leaves are poor at photosynthesis, concentrating instead on moisture uptake. Rather than efficiency, the axial leaves deliver resilience -- in much the way a hydrogen refueling infrastructure does.
TheConversation.com, *Redwood trees have two types of leaves, scientists find – a trait that could help them survive in a changing climate*, 2022 April 13. Accessed on 2023 April 05 at: https://theconversation.com/redwood-trees-have-two-types-of-leaves-scientists-find-a-trait-that-could-help-them-survive-in-a-changing-climate-179812

[v] Neste, California Low Carbon Fuel Standard Credit price. Accessed 2023 April 05. https://www.neste.com/investors/market-data/lcfs-credit-price

[vi] Business in Vancouver, *Parkland cancels plans to build stand-alone renewable diesel complex at B.C. refinery*, 2023 March 03. Accessed 2023 April 05. https://biv.com/article/2023/03/parkland-cancels-plans-build-stand-alone-renewable-diesel-complex-bc-refinery

[vii] Klippenstein, GreenTechMedia.com, *Fuel Cells in 2017 are Where Solar Was In 2002*, 2017 Dec 27. Accessed 2023 April 05 at: https://www.greentechmedia.com/articles/read/fuel-cells-in-2017-are-where-solar-was-in-2002