

Intro to CHFCA

For Surrey Board of Trade
Environment Team

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2023 Sept 14



CHFCA

Clean. Efficient. Energy.

CHFCA acknowledges we are situated on the unceded traditional territories of the xʷməθkʷəy̓əm (Musqueam), Skwxwú7mesh (Squamish), and səliłwətał (Tsleil-Waututh) Nations.

About CHFCA: Canadian Hydrogen and Fuel Cell Association

Voice of the Sector

- Advocacy
- Government Relations
- Communications
- Networking and Trade Missions

Hydrogen BC

 *Hydrogen
Alberta*

HBC
Hydrogen Business Council

 *atlantic
hydrogen
alliance*

About CHFCA: Canadian Hydrogen and Fuel Cell Association

Voice of the Sector

- Advocacy
- **Government Relations**

Clean Hydrogen ITC

Advocacy days in:
Ottawa (fall 2022, fall 2023),
Victoria (spring 2023),
Edmonton (fall 2023)

*Positioning as trusted advisor
to governments*

- Communications
- **Networking and Trade Missions**

6 international events
during calendar 2022



Advocacy Day in Ottawa, Oct 2022



Canada-Germany Hydrogen Alliance Signing, Aug 2022



MOU with Japan Hydrogen Association, Mar 2023

Why join CHFCA?

Since 2021...

25 Support
Letters

45 Submissions to
Government

28 MP & MLA
meetings

Benefits:

Board and Committee Opportunities, participation in Advocacy Days at legislatures.

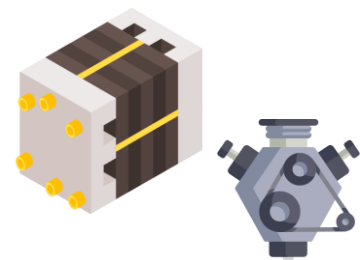
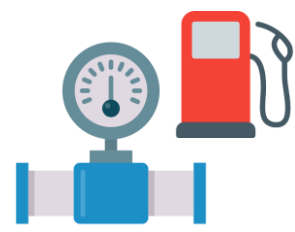
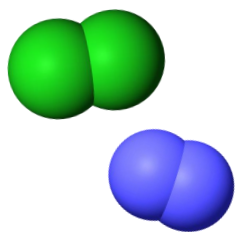
Monthly provincial meetings; monthly technical and member-introduction webinars. Event, exhibitor and travel discounts to international conferences.

Exposure through CHFCA's LinkedIn (11,000+ followers) and social media outreach.



CHFCA Members at-a-glance

Some of our 190+ Members Across the Value Chain



Energy producers	Hydrogen producers	Distribution and infrastructure	Fuel cell and engine makers	OEMs and end users
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BECOME A MEMBER

Grow your business while advancing Canada's world recognized hydrogen and fuel cell industry.

ADVOCACY

Communicate with government and influence decision-making. Promote the development of regulations, codes, and standards. Secure funding support.

TRADE

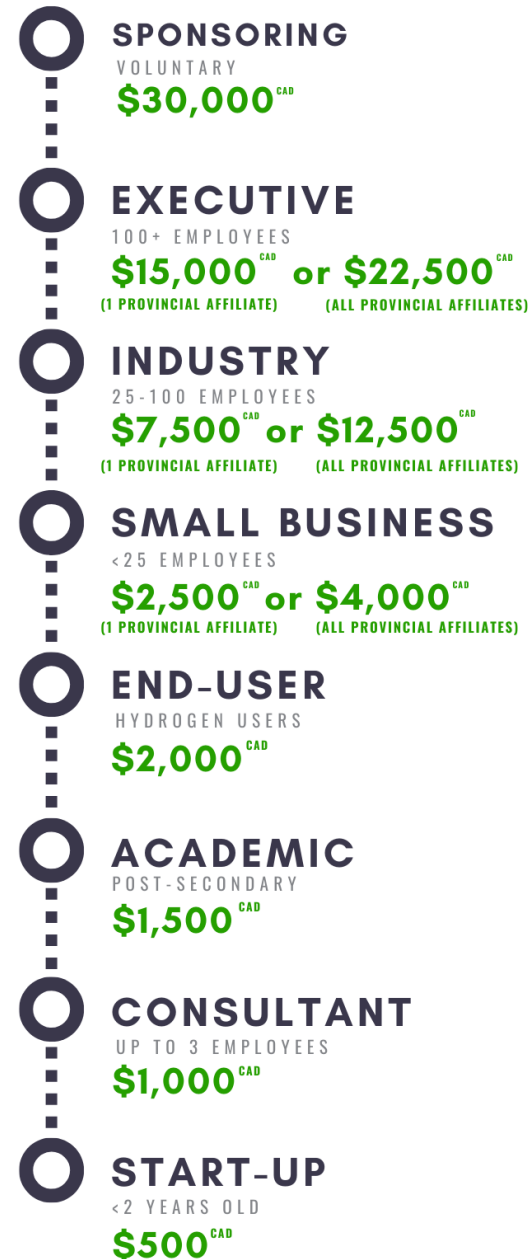
Benefit from B2B matchmaking. Increase sales by participating in international trade missions. Receive event, exhibitor, and travel discounts to key events.

NETWORKING

Meet policymakers, industry leaders, technical experts and fellow members through meetings, committees, webinars and networking activities.

RESOURCES

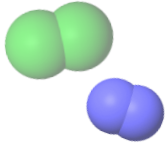
Raise visibility through CHFCA's social media, website, publications, newsletters, and presentations. Take advantage of speaking and outreach opportunities.



Appendix



1999



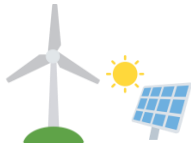
1999-2015



2007



2013 -



2015 - 2017



2017 Fuel Cell Industry Review

2018 Fuel Cell industry Review



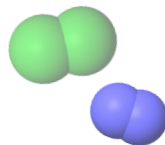
2018 - 2019



150x



100x



2019 - now

About Matthew:

After getting a chemical engineering degree I worked in hydrogen fuel cells (except for a brief detour into theatre) and later moved to renewable energy consulting.

I started writing about the Canadian EV market ten years ago and later led outreach for the BC government EV charger rebate program for apartments and stratas.

Now I'm back in hydrogen.



Why is hydrogen newsworthy now?

Clean hydrogen wasn't needed for **incremental** climate policy. But it's key to **transformational** climate policy. That's why today's hydrogen hype is different from 2000: hydrogen is recognized as having an important role.



pre-2019

Not needed for
-20% or -40%
GHG targets

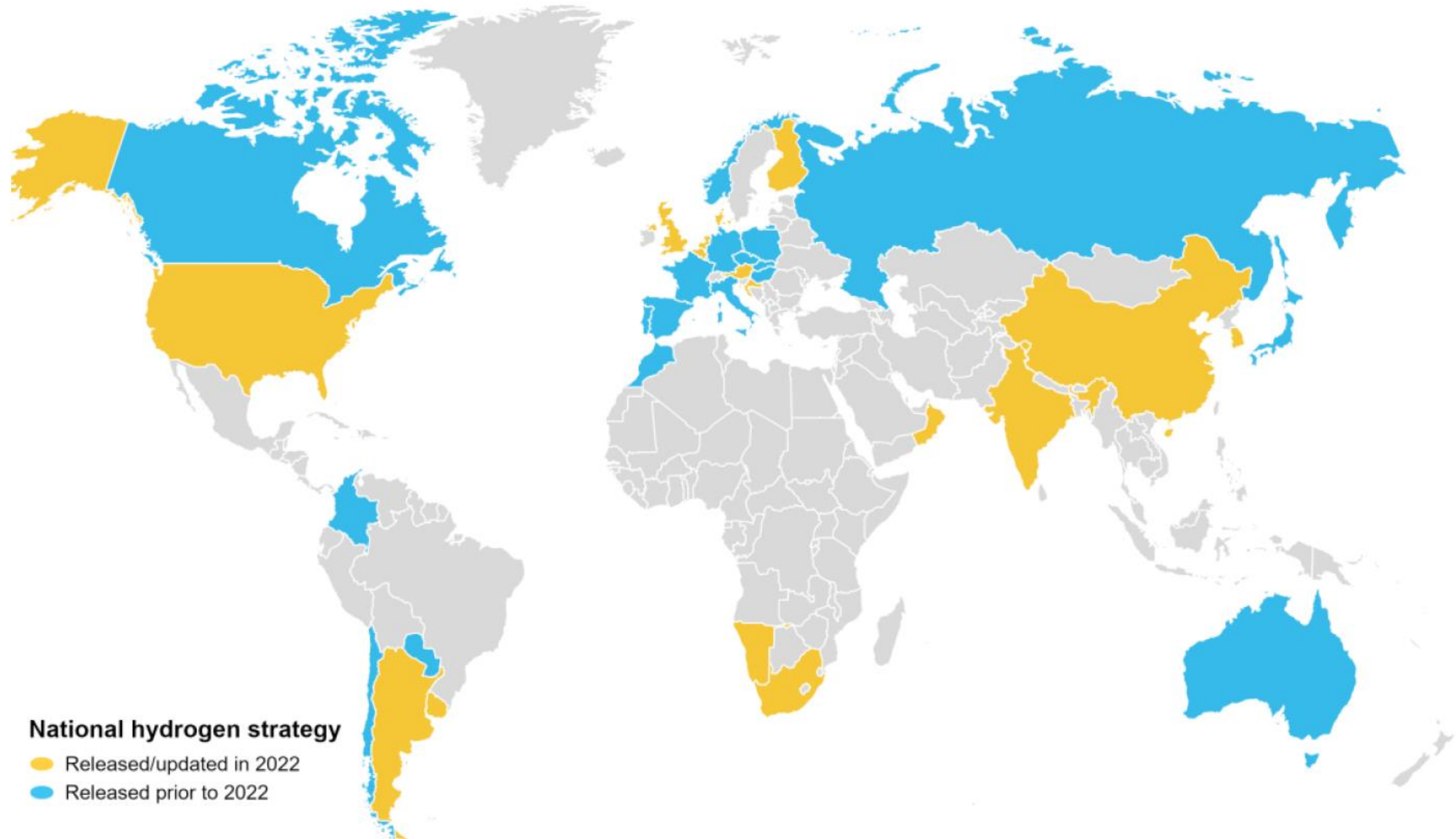


2019 to now

But is the Keystone of
Net Zero commitments

36 countries have hydrogen strategies

As of end-2022



Energy Carriers in a Net Zero World

Energy in a Net Zero Canada [or world] will be like a lobster claw. Clean electricity will do most of the work (the “mitten”) and clean hydrogen will do the rest (the “thumb”).







Clean Electricity

(wind, solar, hydroelectric, nuclear, geothermal, maybe fossil fuel with CO₂ capture...)

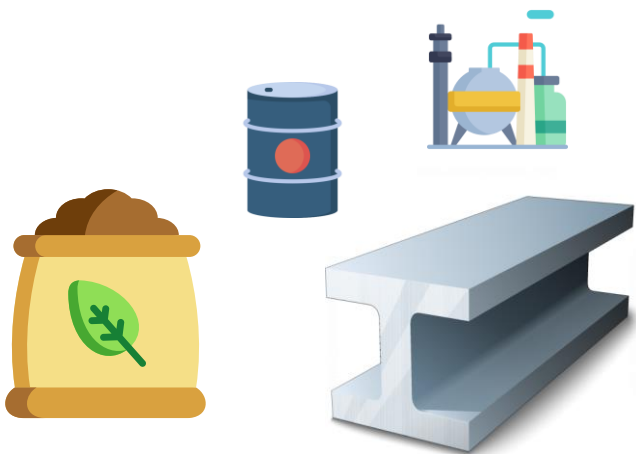


Clean Hydrogen

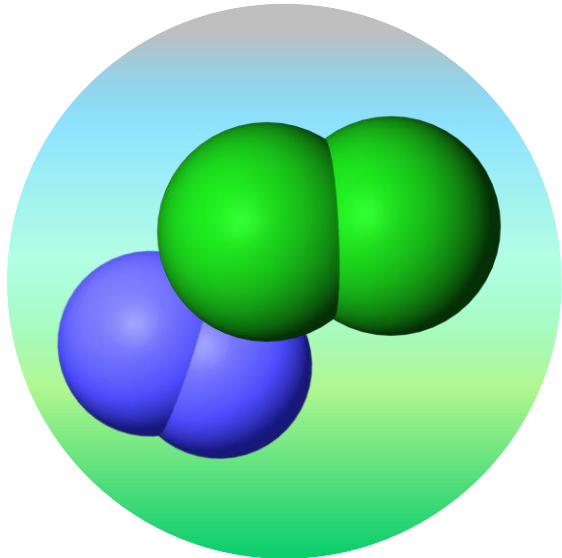
(feedstock, transport, gas energy, heat...)

up to 30%	
up to 14%	
20-35%	
16-25%	
33%	
BNEF: up to 24%	

Hydrogen's Many Roles



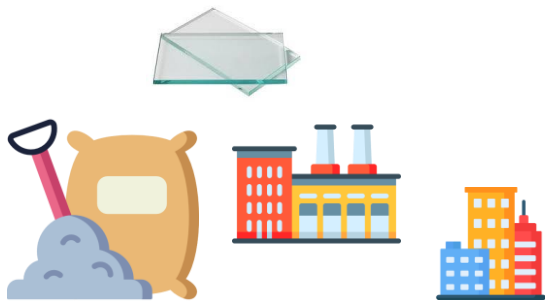
Feedstock



← Heat and Power →



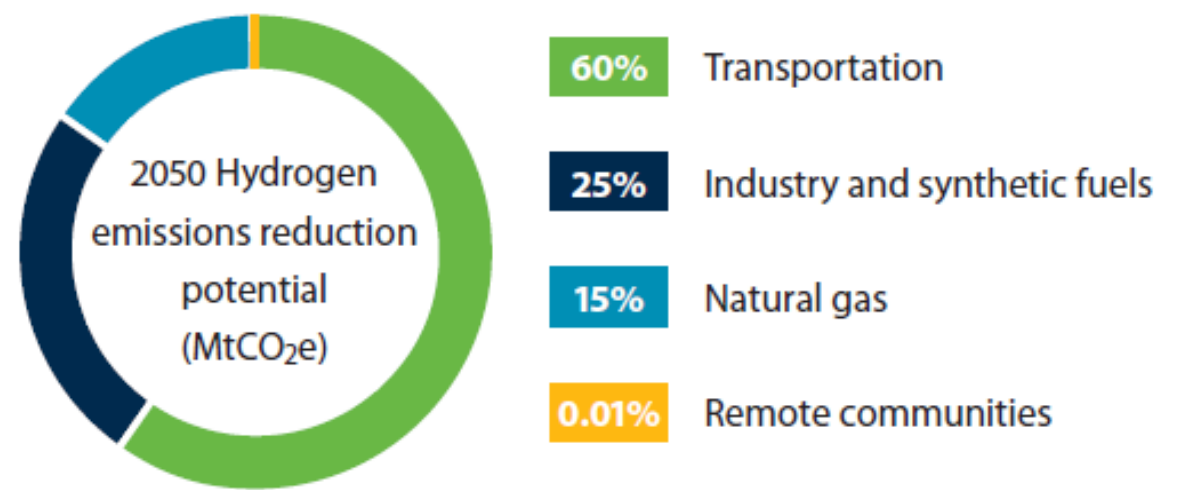
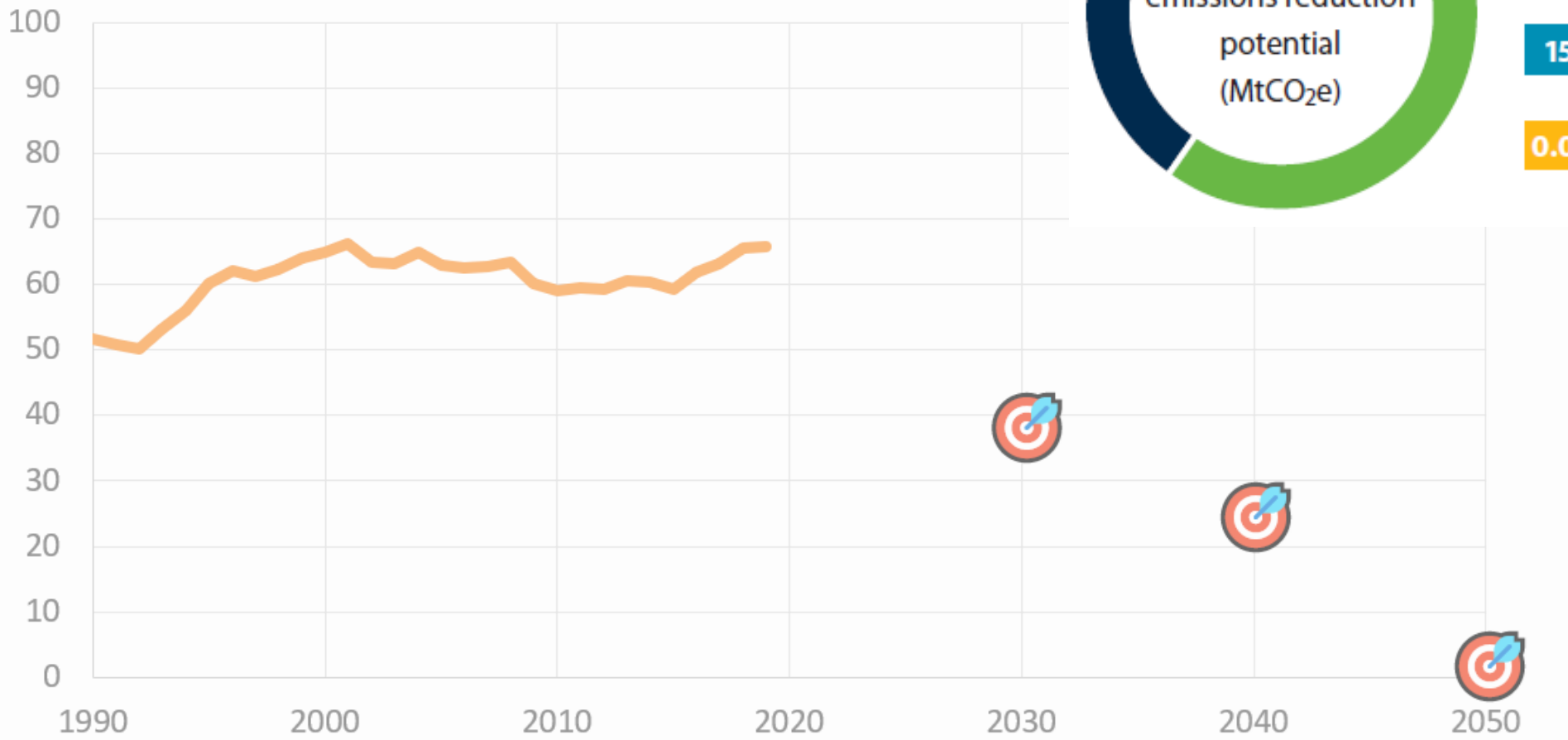
Transport



Hydrogen's Role in "Net Zero" BC

Added after the Thursday meeting...

- Displace 11% of GHG's (7.2 Mt)
- Mainly *but not only* transport



Batteries are Exoskeletons

Added after the Thursday meeting...



In nature, smaller animals tend to have exoskeletons while bigger ones have interior skeletons ("endoskeletons"). Above a certain size exoskeletons become too heavy and cumbersome.



exoskeletons

endoskeletons

Batteries are Exoskeletons II

In transport, we generally expect smaller or short-route vehicles to use electricity (batteries) while larger ones use hydrogen in some manner.

Added after the Thursday meeting... hydrogen will mostly be relevant for larger vehicles.



exoskeletons

endoskeletons



electricity
(batteries)



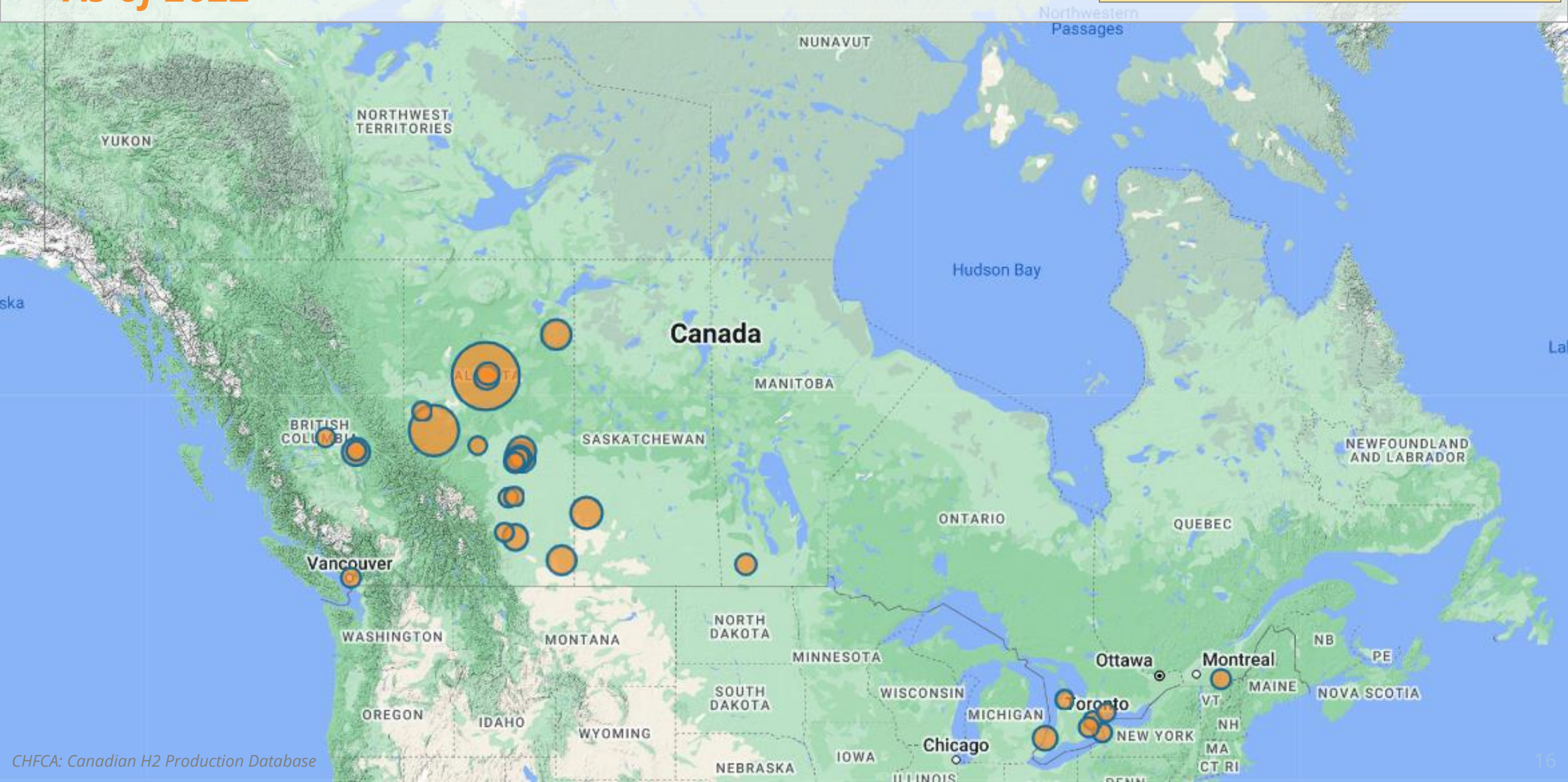
hydrogen
(FC, ICE)

H2, methanol
or ammonia
(NH3)

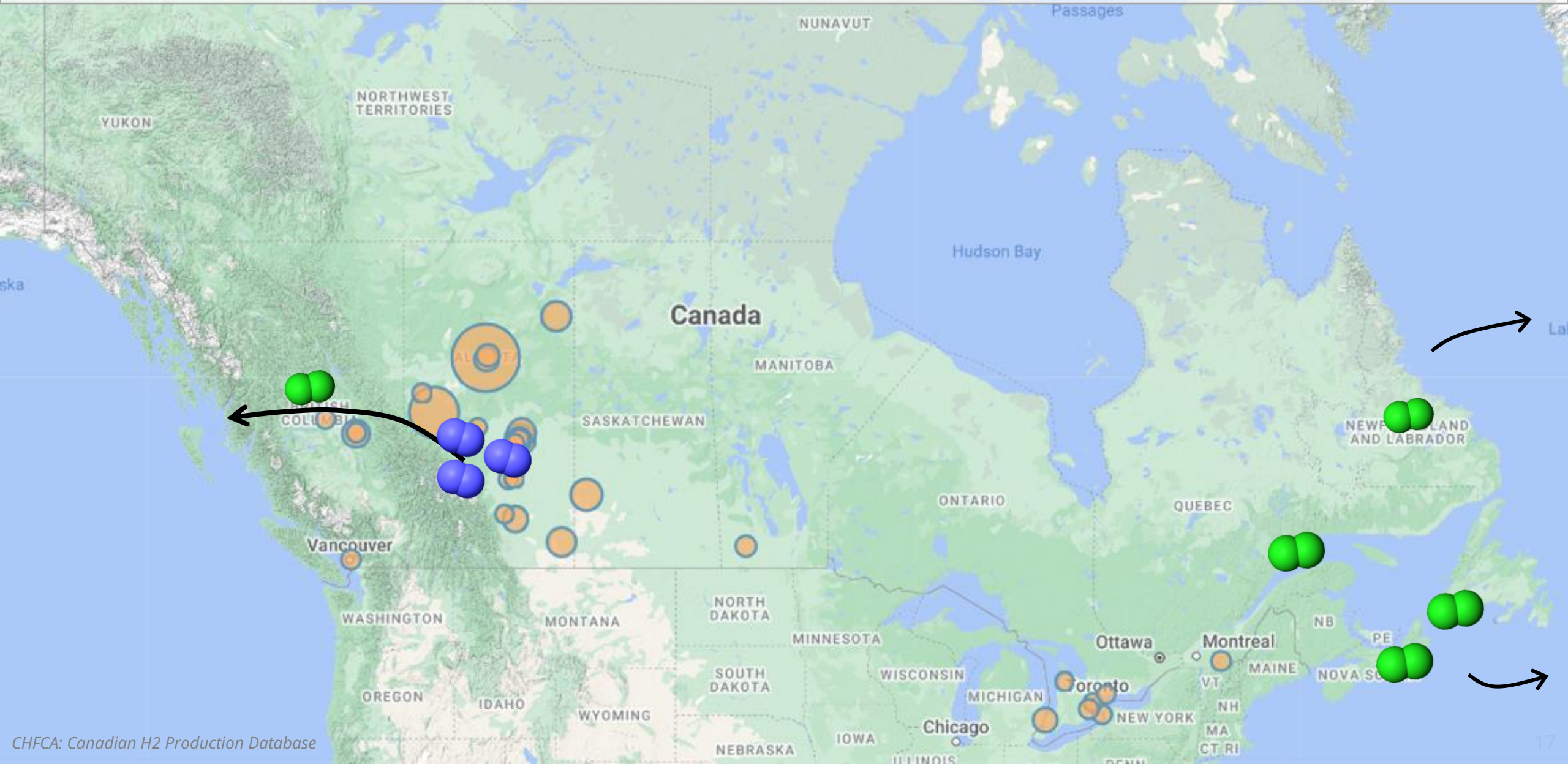
Hydrogen Production in Canada

As of 2022

Today hydrogen is mainly used in oil refining and to produce ammonia (for fertilizer).



Hydrogen Export Ambitions



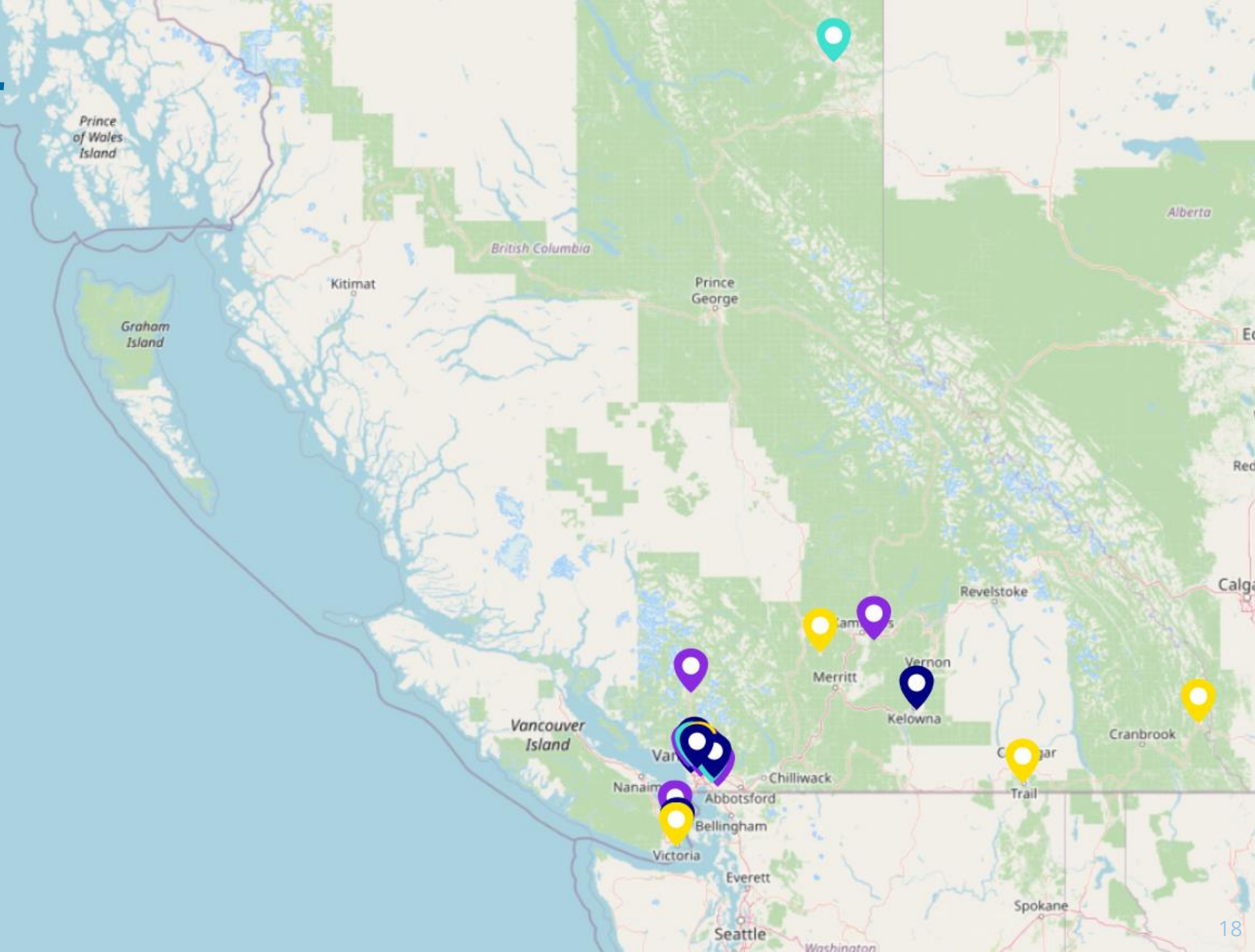
BC Hydrogen Fuel Cell Sector

\$375MM revenues

1,900 employees

30+ companies

~**8000** trucks and buses
powered worldwide



Metro Vancouver Fuel Cell Cluster

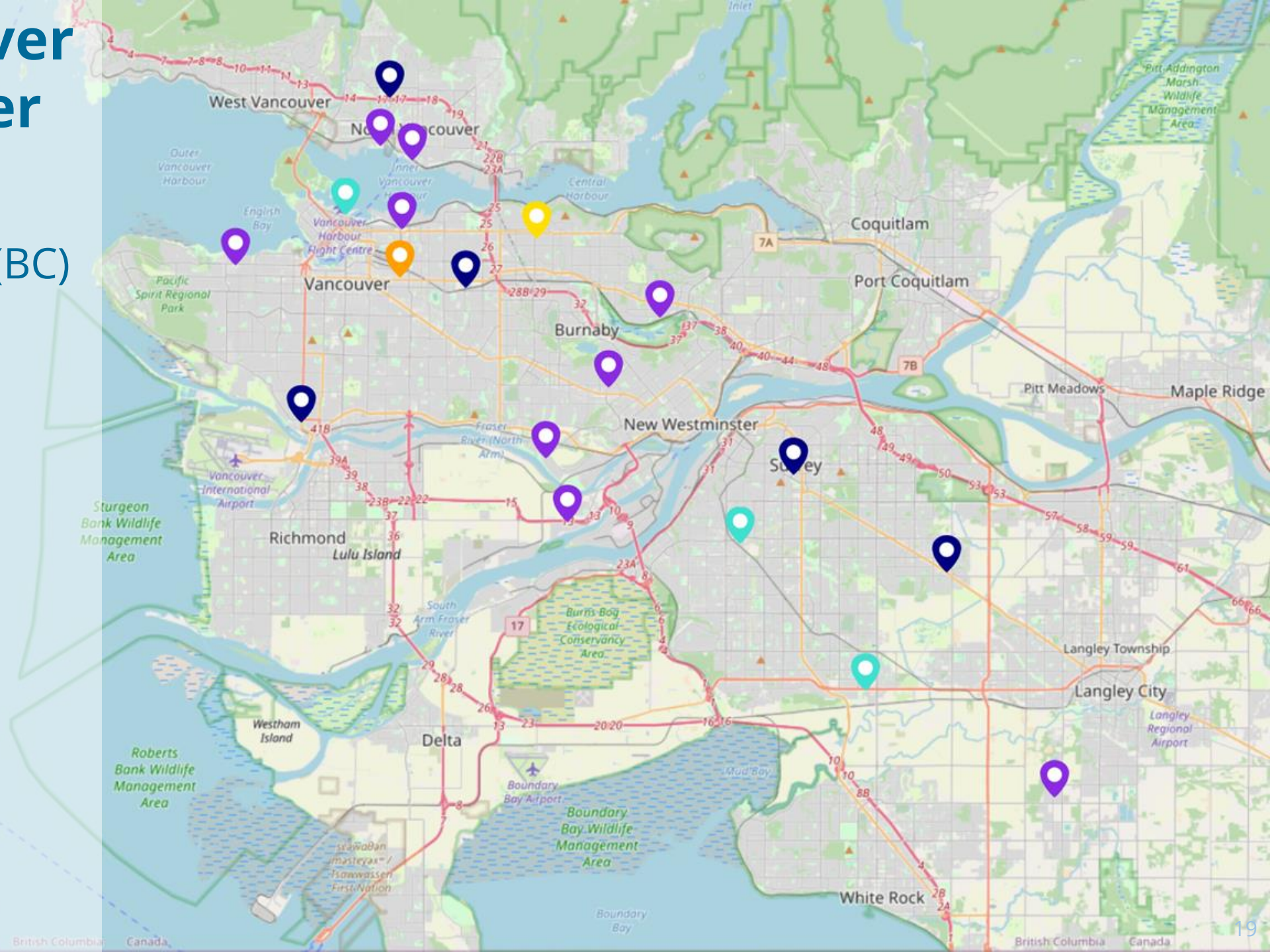
5 hydrogen stations (BC)

7 by end-2023

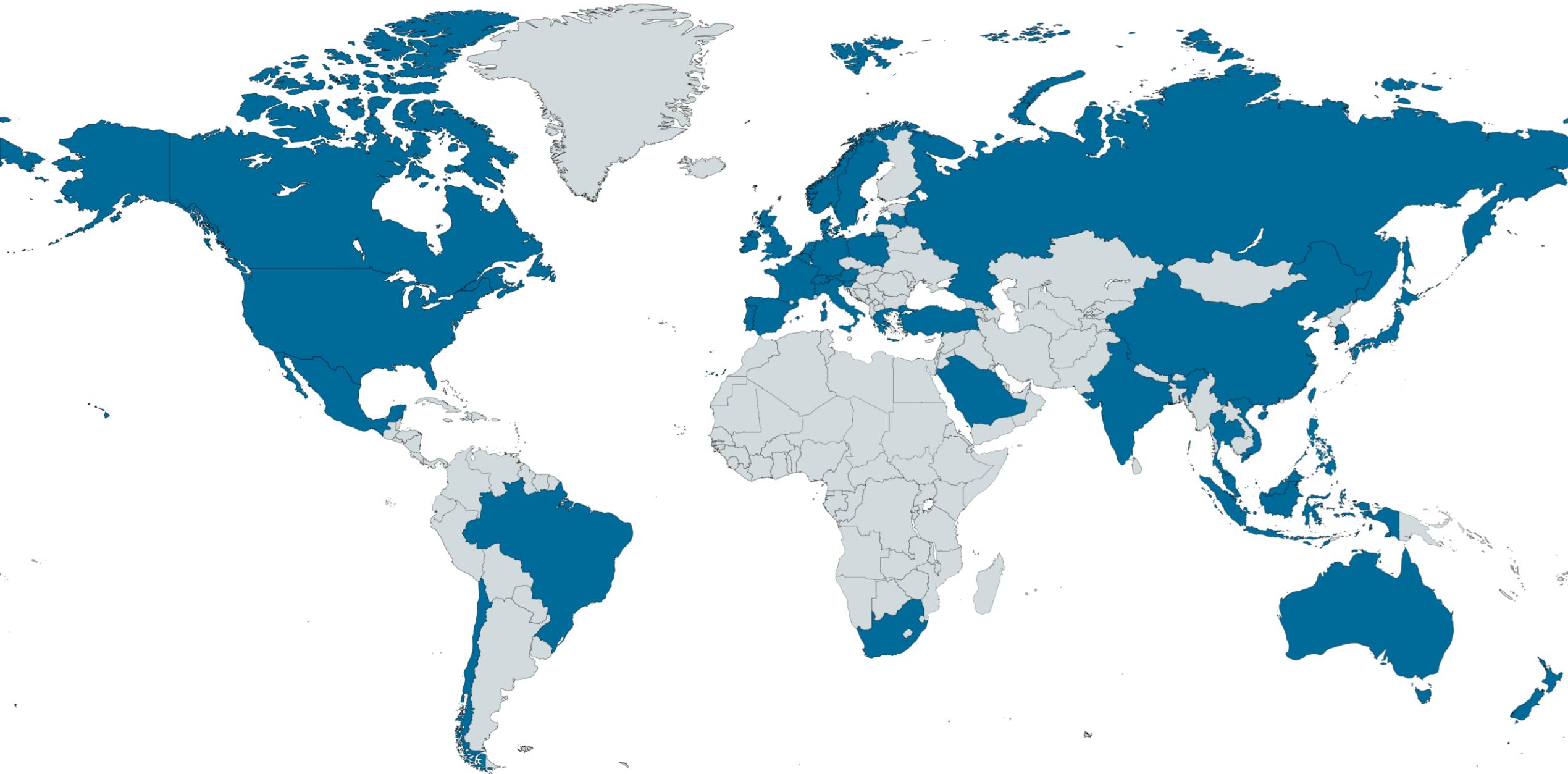
12 by end-2025

190+ Toyota Mirai

- - Academic
- - Fuel Cell Ecosystem
- - Hydrogen Consulting
- - Hydrogen End User
- - Hydrogen Infrastructure



(not all companies shown)



Clean Energy Technology Scale-Up

Early Wind Scale-Up (MW)

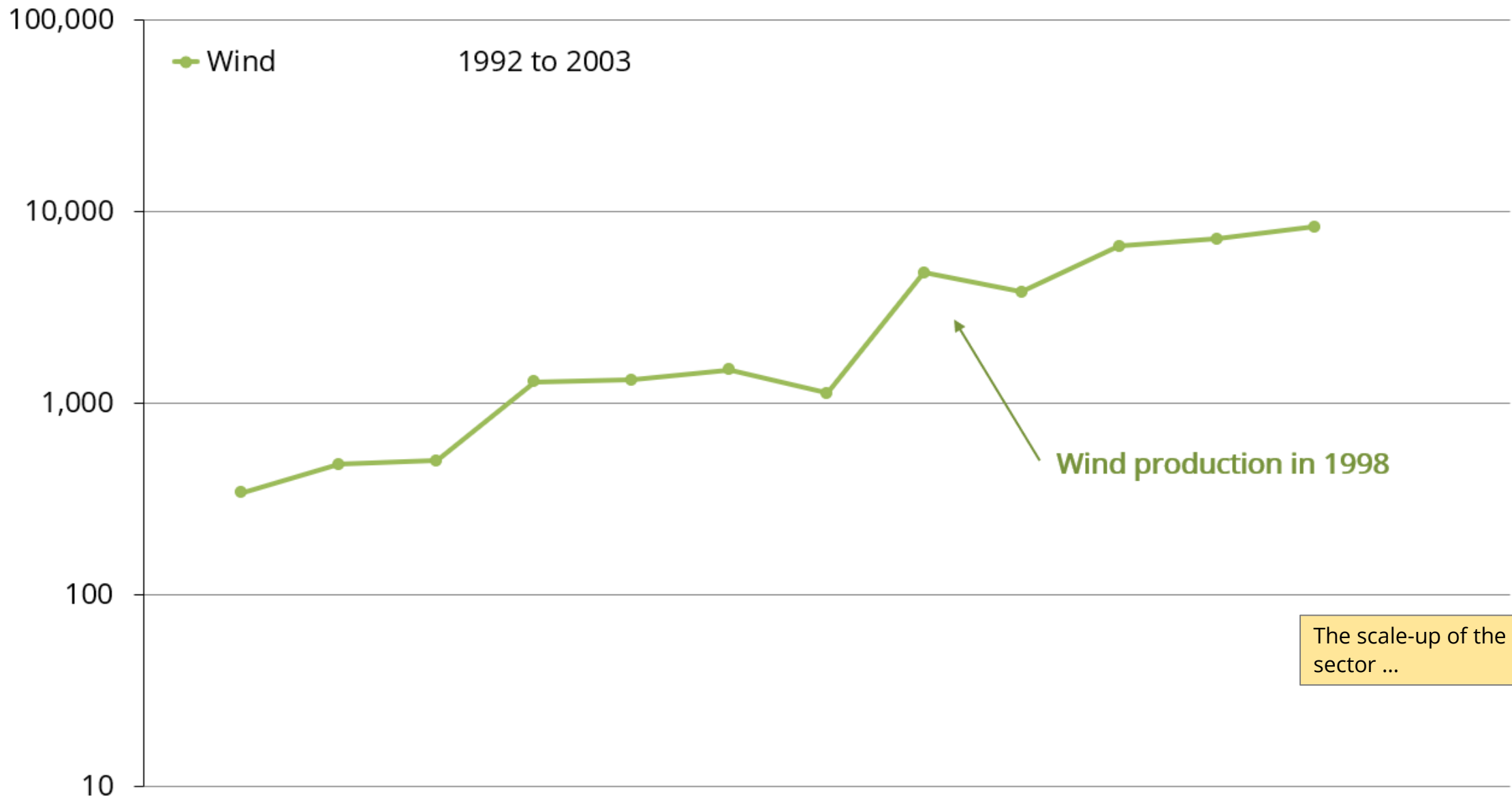
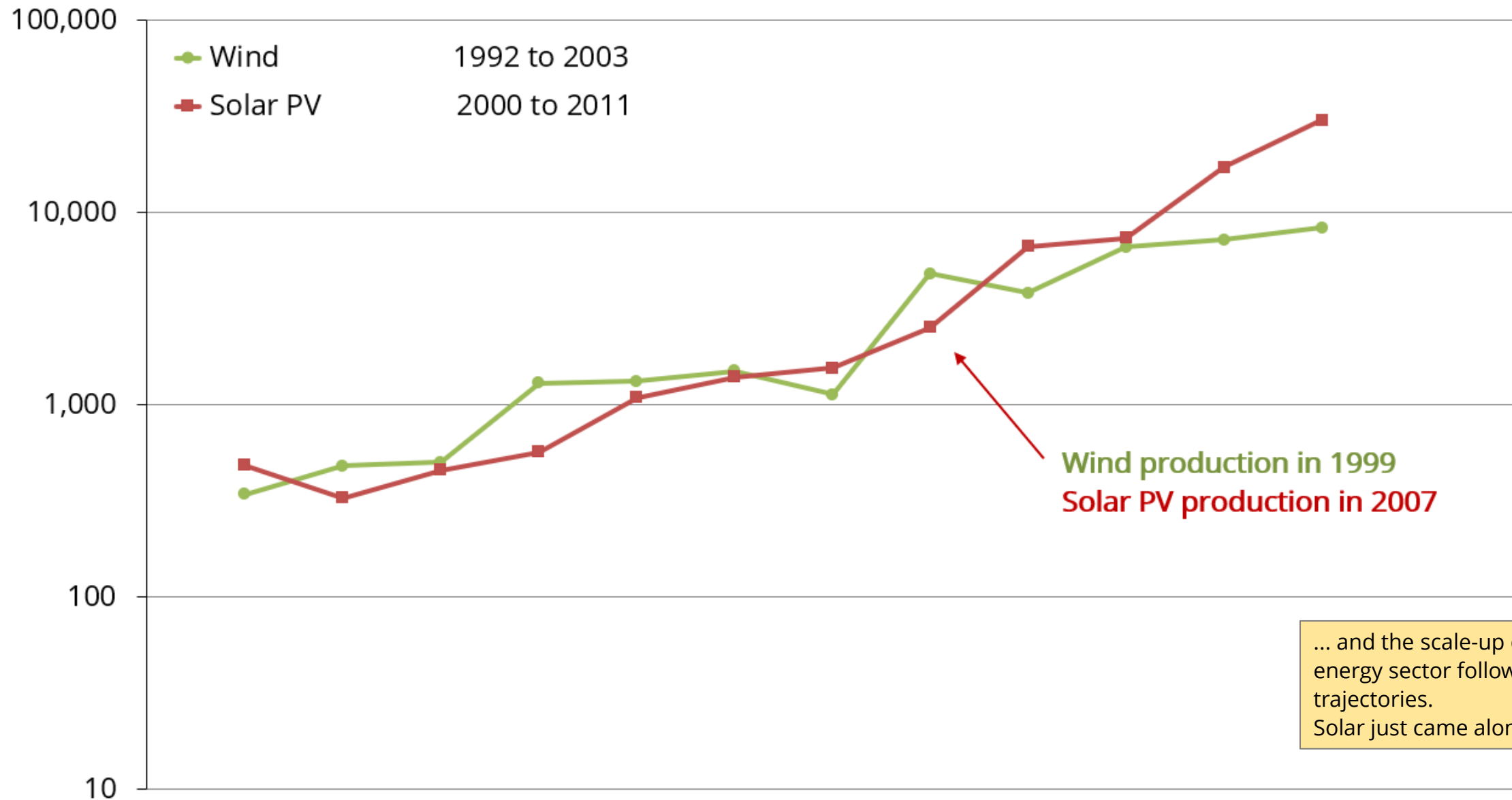


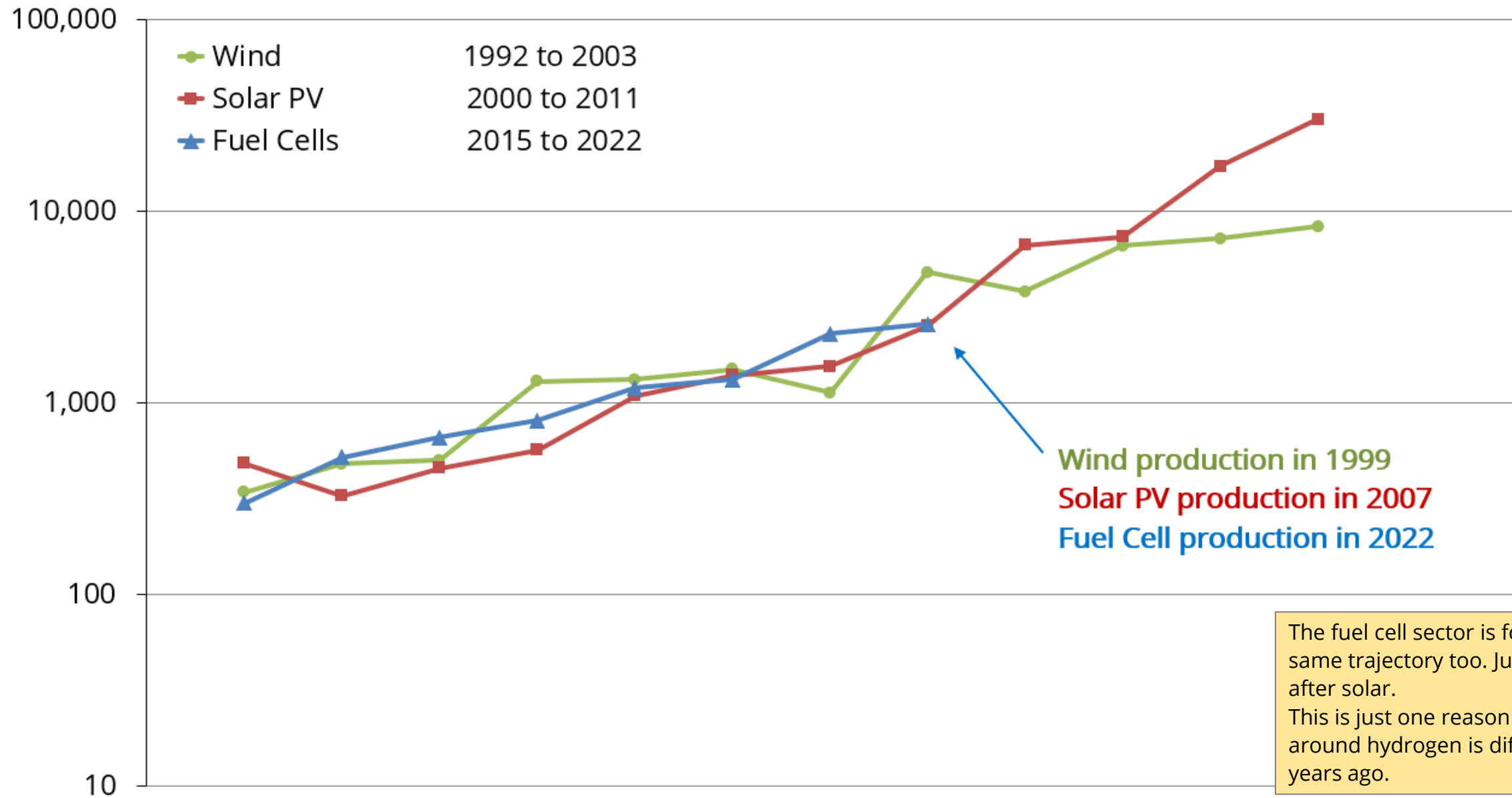
chart: Matthew Klippenstein (@ElectronComm). Lester Brown (Earth Policy Institute), World on the Edge, ch 9 supplement (via Wikipedia).

Early Wind and Solar Scale-Up (MW)



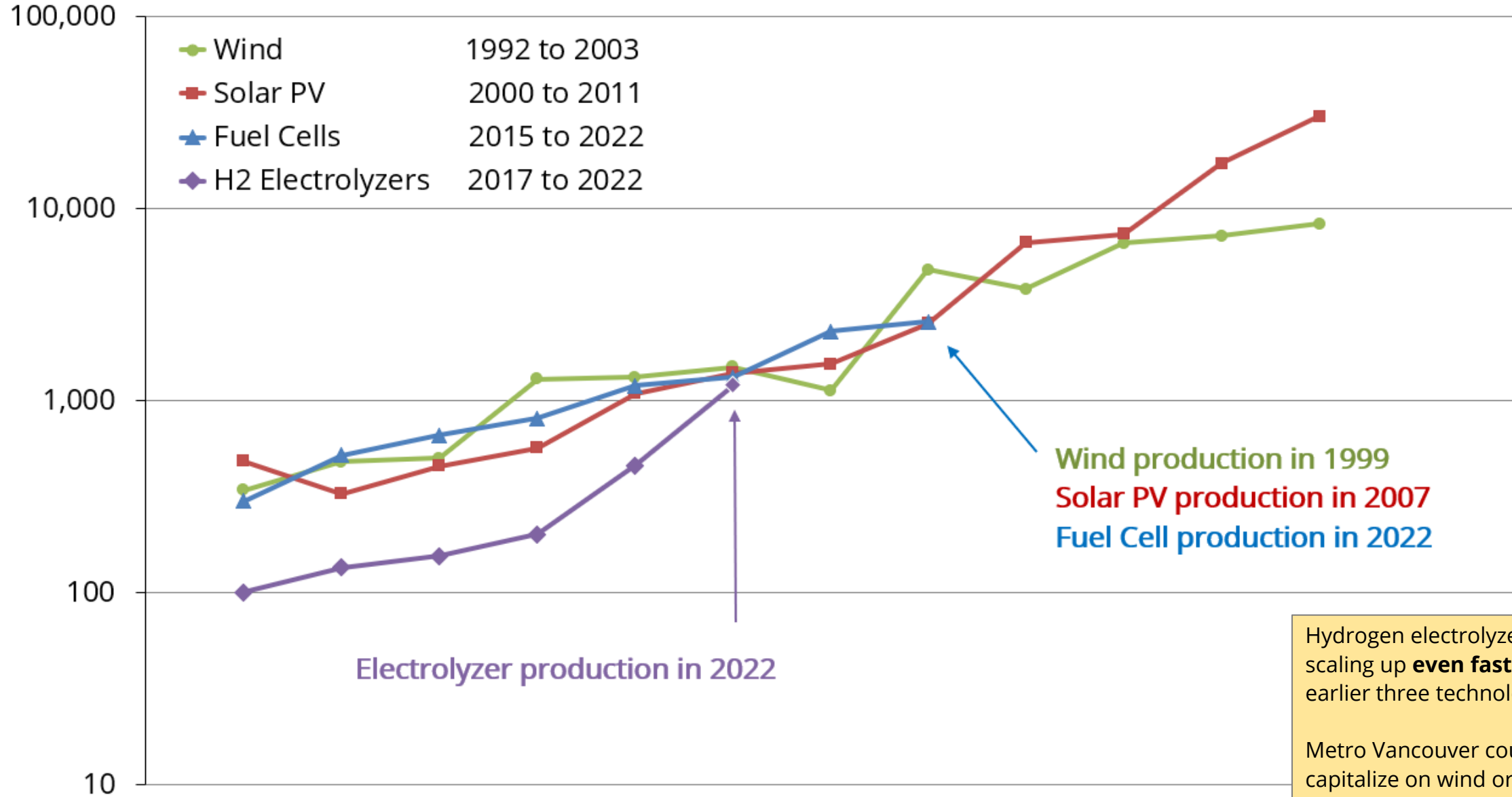
... and the scale-up of the early solar energy sector followed similar trajectories. Solar just came along 8 years later.

Early Wind, Solar, Fuel Cell Scale-Up (MW)



The fuel cell sector is following the same trajectory too. Just 15 years after solar. This is just one reason why the hype around hydrogen is different from 20 years ago.

Early Wind, Solar, FC and Electrolyzer Scale-Up (MW)



Hydrogen electrolyzers look to be scaling up **even faster** than the earlier three technologies.

Metro Vancouver couldn't really capitalize on wind or solar, but we can with fuel cells and electrolyzers.

Misc.



**BLIMPS
AND BOMBS**



**CORE
CLIMATE
SOLUTION**

Outreach + Education = Familiarization

New things are scary until they're familiar



If you told John A MacDonald future Canadians would ride in carriages powered by *controlled explosions*, he'd probably think one of you two had drunk too much.

It's understandable for people to be cautious of new technology – we're beginners at 99.99% of things in life. With education and experience, we learn how to handle new techs safely.

Powered by a series of controlled explosions!

Hydrogen 2023 = Cell Networks 1983



Early cellphones cost more, weighed more, had poor call quality, and network coverage was practically non-existent – like hydrogen fueling infrastructure today!

People consistently underestimated cellphones because of that limited network. The same underestimation is happening with hydrogen today.



In 1983 cellphones were expensive and there was little infrastructure.

McKinsey told AT&T “900,000 users worldwide by 2000”. There were 738,000,000.

As infrastructure gets built, hydrogen use will skyrocket too.

**hydrogen's
perceived
potential**



**actual
potential**

There are some things in life where electricity is fine.

For everything else, there's

